

**Working Paper  
367**

**DYNAMICS OF IRRIGATION  
INSTITUTIONS: CASE STUDY OF A  
VILLAGE PANCHAYAT IN KERALA**

**Vineetha Menon  
Antonyto Paul  
K N Nair**

February 2005

Working Papers published since August 1997 (WP 279 onwards)  
can be downloaded from the Centre's website ([www.cds.edu](http://www.cds.edu))

**DYNAMICS OF IRRIGATION INSTITUTIONS:  
CASE STUDY OF A VILLAGE PANCHAYAT IN KERALA**

**Vineetha Menon  
Antonyto Paul  
K N Nair**

February 2005

---

This paper comes out of a research project on “Sustainable Development: An Actor-oriented Perspective” jointly undertaken by the Centre for Development Studies and the Geographical Institute, University of Zurich, Switzerland. We are grateful to the farmers of Meloor, the office-bearers of various irrigation associations, functionaries of the irrigation department, CADA, and the Meloor Panchayat for co-operating with the study. We also thank Dr. Sunny George and Pradeep for help during data collection and to Prof. A. Vaidyanathan, Dr. Sreekumar Chattopadhyay and Dr. Santhakumar for valuable comments on an earlier version of the paper. However, we alone are responsible for the views expressed here.

## ABSTRACT

Based on field work in a village panchayat in Kerala, analyzing the complex issues concerning the development and working of irrigation institutions, the present study reveals that successful management of irrigation is contingent upon the level of participation of the water users in the management. By comparing irrigation institutions under different property rights, the study identifies the significant factors that contribute to the success and sustainability of irrigation institutions. It is found that albeit the physical characteristics of irrigation systems and the heterogeneities of the members of the user groups do impact the outcome, it is the institutional environment as reflected in the presence of clear as well as flexible systems of rules and regulations, enforcement mechanisms, nesting and networking of such institutions etc. that have become the most crucial determinants. For this, presence of able and fair leadership and the manoeuvring of various sources of power are found to be essential.

**Keywords:** irrigation, institutions, water management, irrigation organisations, sustainability

**JEL Classification:** D7, H4, Q15, Q25

## I

### **Introduction**

Merits and demerits of various institutional arrangements for irrigation and water management have attracted much academic and policy discussion (Tang 1992; Ostrom, 1990; Ostrom et al, 1994; Wade 1987; White and Runge 1995; Sengupta 1991; Vaidyanathan 1999). Such discussions largely drew upon the experiences of Asian countries where irrigation institutions<sup>1</sup> have evolved over a long period with state controlled institutional arrangements superimposed over traditional small-scale community irrigation systems. This has led to the erosion of community initiatives and involvement in irrigation development and weakened the efficiency, productivity, equity, and sustainability of irrigation systems. The concept of decentralized participatory irrigation management evolved out of a recognition of such inefficiencies as well as of the potential benefits of peoples' participation. However, mobilizing participation would depend very much on the local farmers' willingness to co-operate (Vaidyanathan 2001; Nair and Chattopadhyay 2001). These are more likely to be found where irrigation and water control institutions and organizations are already in existence (Bray 1986).

Existing literature informs us that resource endowments alone do not account for the success and sustainability of institutions, but that there are any number of other complex factors like ideology, power, knowledge and information as also the technology that influence participation of stakeholders in decision-making processes, management etc. (Rutton and Hayami 1984). A clear comprehension of the dynamics of interactions among the actors alone can inform us why some institutions fail while some others with similar design principles succeed.

For this comprehension, institutions with various design principles within an ecological system are to be examined in detail. In this paper, we attempt to understand the dynamics in the shaping of irrigation institutions in a Panchayat in Kerala and their performance within the context of participatory irrigation management.

Collection of data and information for institutional analysis is not that amenable to quantitative surveys. We have, therefore, employed qualitative methods for this study. Information regarding the processes that lead to the formation of the irrigation institution, levels of participation of the various actors in irrigation management, their motivations, facilitating and forbidding factors, conflict resolution, bottleneck management, leadership and other factors leading to the sustainability or disintegration of the institution etc., were inquired into. Time line, social mapping, transect walks, semi-structured interviews with selected actors and key informants were used for data collection along with direct observations of the irrigation activities and agricultural practices.

The organization of the paper is as follows: Section 2 provides a description of the development of the irrigation system in Meloor. Section 3 examines the changes in land use and cropping pattern in the study area, and in section 4 we make an attempt to bring out the processes leading to the development of different types of irrigation institutions and the underlying factors. The salient findings emerging from the case studies are discussed in section 5 and section 6 provides the conclusion.

## II

### **Development of Irrigation Systems in Meloor**

Meloor panchayat, in the Mukundapuram taluk of Thrissur district, lying adjacent to Chalakudy town was the area selected for the study. It is predominantly an agrarian village; out of the total area of the panchayat, more than 90% is used for agriculture. Land reforms introduced in Kerala

have had a notable impact in Meloor. Many of the present landowners in the higher landholding classes are former lessees of the temple (Devaswam) and Mana (ancient Namboodiri families) lands. Distribution of landholding size in the panchayat shows the predominance of smaller holdings, with about 75% of the land holdings belonging to the category of less than one acre. The pattern of cropping is at present mixed, with banana occupying an important place.

Meloor gets a good rainfall. However, about two-thirds of the normal rainfall in the year is received from June to August. In such a situation irrigation becomes inevitable for developing agriculture. The scope for developing irrigation in Meloor is high with Chalakudy river, formed by five small rivers namely Parambikulam, Kuriarkutty, Sholayar, Karappara, and Anakayam, (most of them originating from the Anamala Ranges in the western ghats) flowing through the panchayat boundary. There are three watersheds and five natural streams within the Meloor panchayat. Despite this, until the 1950s, irrigation had a low profile in Meloor. Ponds and tanks/*chiras* of the region were natural water bodies. Water was lifted from these sources through traditional techniques such as *Kalathekku* and *Thulavu* <sup>2</sup>.

The history of modern irrigation system in the study area began with the commissioning of the Chalakudy River Diversion Scheme (CRDS) in 1947 by the government of India as part of its *Grow More Food Campaign* to tackle the post-world war famine. As per this project, a weir was constructed in Chalakudy river at a place called Thumburmuzhi and water was diverted to two canals – Left Bank Canal (LBC) and Right Bank Canal (RBC) to irrigate an ayacut area (catchment area) of 14,170 ha. Execution of the project, nonetheless, was by the state of Cochin and later by the government of Kerala. The construction that was in two stages was completed in 1966. The then chief minister of Cochin State who later became a minister at the Union Government

had played a very active role in the planning and implementation of this project. The responsibility of operation and maintenance of CRDS was under the jurisdiction of the Executive Engineer of the Irrigation Department, Thrissur Division. The maintenance of the canals was carried out by the Department through licensed contractors, inviting tenders. As the system was poorly maintained, water availability to farmers was seriously constrained. The absence of proper field channels also prevented water from reaching fields situated away from the spouts. The time schedule for water distribution was fixed by the Canal Committee, which consists of the Assistant Engineer, President and members of the local Panchayat and one representative of the beneficiaries. Often, the timetable fixed by the Canal Committee for water distribution was not to the satisfaction of the farmers. However, irrespective of the fact whether they received water or not, farmers were forced to pay the water cess.

The people of Meloor had pinned great hopes on CRDS. They had brought about great changes in their cropping pattern in the hope of getting adequate water supply; but disappointments were in store for them. The bureaucratic machinery of the different state departments which lacked convergence not just in policy making and implementation, had no appreciation of the specific water needs for the various crops and the varying needs of the different farmers in different locations. The farmers had no involvement in policy making, as they were not involved in the irrigation management in any way. The CRDS canal system proved to be a frustrating experience for the farmers who were initially euphoric in anticipation of adequate supplies of water to meet their irrigation requirements. As an 86 year old farmer reminisced:

*We would leave in groups of ten to fifteen at night to Kottamurickal, about two miles from here to the nearest canal of CRDS to divert water to our fields in Naduthuruth in the light of burning torches made of lit-up dried coconut leaves and repair the spouts. It takes a full hour to reach the farthest end from where we begin our work. The*



*repaired spouts will be closed and water diverted. Such night trips to the water-spouts used to be frequent occurrences. We repair the spouts and leave, but when we arrive at our fields in order to water our scorched-up plants, we realize there would be no water. The farmers near the spouts would have diverted water to their fields. For them, the task was easy; we clean up the spouts and they irrigate. After such bitter experiences, some farmers in our group began to stand guard at the spouts to prevent people living near the spouts from diverting water to their fields after we depart. All this effort was to water our small patches of paddy. The water we so painstakingly divert was filled into a pond belonging to Aramballil Ousephunni. At this pond there would be the long queue of farmers to lift water either by kalathekku or thulavu.*

This old farmer recalls the songs they sang as they lifted water at the fruition of a strenuous task. However, the collective effort of the farmers was not entirely just and fair.

*Some farmers diverted water before those on the upper reaches of the canal returned to irrigate their fields. This prompted us to devise a system by which we could take water commensurate to the area of our cultivation. No one could then take more water than was allowed to him by the farmers' group.*

The narrative of a long struggle to ensure water and the collective negotiations and compromises for water continued thus, moving on to the rudiments of the institutionalisation process for irrigation management by the concerned farmers themselves. Understandably, after such hardships to get water, the scheme had raised hopes in the farmers for a better life. It was such high hopes that fell apart when the scheme failed to deliver. However, the farmers could not just sit back and blame the government machinery that failed them. The presumed assured supply of water had persuaded them to bring about tremendous changes to their

agriculture. Fruit-bearing trees had been cut down and replaced by water-intensive crops. Paddy cultivation had been extended to formerly dry and garden lands. The small patches of paddy had extended to larger plots. From the single crop and double crop cultivation, the practice had shifted to three-crop cultivation. High yielding varieties had also been introduced along with chemical fertilisers. When irrigation system failed, the tempo of life of the farmers considerably slackened and fell to a dull pace. Nevertheless, the farmers did not resort to any pressure tactics to get the state to correct the deficiencies in the irrigation system. They did not believe that they had the collective bargaining power to rectify the failings of a massive project like CRDS. Yet, the situation was too critical for them to be apathetic; they responded by looking for alternative sources of irrigation. The motivation to do so was further reinforced when more and more farmers began to notice the impact of irrigation and the prosperity it could bring.

Since the late 70s and 80s, sixteen lift irrigation schemes have come up in Meloor under various ownership regimes. Of these, twelve are still functioning. Since 1985 Command Area Development Authority(CADA) has done commendable work to make canal irrigation more efficient. Establishment of Beneficiary Farmers Associations (BFAs) that were made mandatory by CADA to elicit farmers' participation in the functioning of the irrigation system in terms of water allocation, maintenance of field channels etc. was an important step taken in this regard. Around 40 BFAs were established in Meloor.

Over and above these state and community irrigation systems, development of private water sources through installing private motors also began flourishing in Meloor. In the year 2001, there were 625 private motors used for irrigation purpose in the panchayat <sup>3</sup>. There was no restriction imposed on individuals in setting up their own irrigation arrangements, including the sale of water. There were 57 private landholders in Meloor who are selling their excess water to other farmers.

Earlier, water was sold for cash or kind. For one measure of paddy sown, the remuneration was four measures of paddy at the time of harvest. In the case of banana cultivation, water was charged @ Rs. 5/plant.

### III

#### Changes in Agriculture

Until early 1950s cultivation was quite sparse in Meloor. Tree crops like jack, cashew, mango etc., and annual crops like tapioca were cultivated in the garden lands and single crop rain-fed paddy in the wetlands. Since the late 1950s drastic changes took place in the cropping pattern. Most conspicuous was the expansion of paddy cultivation through increase in cropping intensity. On the garden lands, coconut, banana, and nutmeg began to occupy the pride of place. Still more radical are the changes observed since the 1980s with a significant decline in paddy vis-à-vis a sharp increase in banana and mixed crop cultivation. Of late, two more interesting phenomena are visible. One is the process of replacement of paddy by banana even in wetlands and the other is the waning interest of farmers in coconut. While area under paddy declined from around 600 ha in the 1950s to around 170 ha by the year 2000, the area under banana shot up from a nominal size to around 530 ha during this period. It is clear that the land use is centred on mixed crops in the coconut gardens. Of the total geographic area of 2306 ha, the cultivated area consists of 2100 ha of which, mixed crops cover 1405 ha, followed by 429 ha of converted paddy fields to coconut gardens, 166 ha paddy fields and 100 ha under rubber. Among the mixed crops banana has the largest area.

A look into the dynamics of these land use changes brings out some major contributing factors. The most important among them being the changes in *irrigation technology*. These changes can be classified into four phases, corresponding to four stages in the development of irrigation- a parallel development in irrigation and cropping pattern, as shown in the time line given below.

### Time Line of Irrigation and Cropping Pattern in Meloor

Irrigation		Changes in cropping pattern
<ul style="list-style-type: none"> <li>• Low levels of irrigation using traditional technologies like <i>Kalathekku, Thulav</i> etc.</li> </ul>		<ul style="list-style-type: none"> <li>• One season paddy in wetlands</li> <li>• Drought resistant tree crops (jack, cashew, mango) chama, tapioca and tubers in garden land</li> </ul>
	1950	
<ul style="list-style-type: none"> <li>• Major irrigation (CRDS) and period of water abundance</li> </ul>		<ul style="list-style-type: none"> <li>• Three fold increase in paddy area with three crops in wetlands</li> <li>• Increase in area under Coconut, tapioca and banana in the garden land</li> </ul>
	1980	
<ul style="list-style-type: none"> <li>• Increasing lift irrigations vis-à-vis weakening CRDS</li> </ul>		<ul style="list-style-type: none"> <li>• Significant decline in paddy area</li> <li>• Sharp increase in area under banana, mixed crops and coconut</li> </ul>
	1990	
<ul style="list-style-type: none"> <li>• Further increase in banana oriented lift irrigation</li> </ul>		<ul style="list-style-type: none"> <li>• Rubber cultivation starts</li> <li>• Further decline of paddy</li> </ul>
<ul style="list-style-type: none"> <li>• Self employment scheme of providing pump sets and financial assistance for digging wells by the government</li> </ul>		<ul style="list-style-type: none"> <li>• Faster expansion of banana into paddy fields</li> <li>• Increase in vegetable cultivation</li> </ul>

Concomitant to the expansion of irrigation, cultivation practices have also undergone several changes. From 1970s onwards, increased use of high yielding variety seeds and fertilizers has been quite evident in lieu of the hitherto popular local varieties of seeds and organic manure.<sup>4</sup>

Another important factor that has influenced the farmers' decision on crop shift was the changes in the *relative prices* of agricultural commodities. Paddy cultivation became unattractive with the increasing cost of cultivation unaccompanied by a commensurate increase in the price of paddy and it gave way to banana and coconut. Of late, even coconut has become less attractive due to the fall in price and the rampant diseases. Expansion of mixed cropping in the coconut gardens with banana, nutmeg, areca nut etc. is also price- induced; it is a defense mechanism of the farmers against the price fluctuations of agricultural products. One of the advantages of banana is that its cost of cultivation is distributed over different points of time in the year, reducing the burden of bulk investment.

*Institutional factors* also have played an important role in moulding farmers' decisions. Land reforms, for example, made many lessees and agricultural workers owners of land and thus furthered the incentives to intensify agriculture. However, because of the diversification in the economic activities, there has been decline in the interest in agriculture among a section of the land owning households on the one hand, and growing interest among landless agricultural labourers and marginal farmers in cultivation for their livelihood on the other. Informal land leasing arrangements have emerged in the study area on a significant scale. This is visible especially in banana cultivation<sup>5</sup>. It is estimated that in Meloor more than 30 % of the land under banana is leasehold.

There are also a few *organizations* that have influenced the farmers' decision concerning their crop choices. CADA provides a few agricultural benefits, apart from the irrigation activities. It gives subsidies for banana and coconut cultivation as incentive to the farmers. *Haritha*, a programme of the Agricultural Department for the development of vegetable cultivation, gives subsidy of Rs.10, 000 to those who grow vegetables in an area not less than 1ha. Under this scheme, vegetable cultivation has spread to about 60 hectares in Meloor. The Agricultural

Department gives free power and input subsidies to *Padasekhara Samithis* (group farm associations) for paddy cultivation. The existence of paddy in Meloor, though in a small-scale, owes to such associations. There are six such associations in the panchayat. Story of banana cultivation would be incomplete without mentioning *Kerala Horticultural Development Programme* (KHDP). Intervention of KHDP since 1997 has given a fillip to banana cultivation in Meloor. It helps farmers by provision of loans (@ Rs.56 per plant in leased lands and Rs.51 otherwise), marketing of bananas, and by giving training to farmers in better cultivation methods. Moreover, the formation of small groups of farmers under KHDP (called, 'swasraya samithi'/ self-help group) has become a catalyst for the collective action of farmers.<sup>6</sup> *Bank credit* has been another facilitating factor in the cropping pattern changes<sup>7</sup>.

Thus, we find that along with price and institutional factors, the development of canal irrigation in the study area paved the way for agricultural transformation there. However, there was deterioration in canal irrigation and farmers responded to the situation by developing alternative sources of irrigation. The changes in cropping pattern from subsistence crops to high valued commercial crops needed assured supply of irrigation during critical months and this has been the linchpin in the development of various institutional arrangements for irrigation management at the community level. The processes underlying such local initiatives and their outcomes will be examined in the case studies to follow.

## IV

### **Case Studies of Irrigation Organizations**

We have documented seven case studies of irrigation organizations under various property right regimes in the study area. Of these two are from the category "Promoted and controlled by the State" (Puthenkara and Thanguchira), one from the category "Co-managed by the State and

the Farmers”(Poolani-Chettithope), three from the category “Owned and Managed by Farmers” (Naduthuruthu, Poolani-Mukkalvatty, and Koovakkattukunnu) and one from the category “Owned and Managed by NGOs”(Kuruppam). Of the three in the category “Owned and Managed by Farmers”, one (Naduthuruthu) is a success story, another, a failure (Poolani-Mukkalvatty) and the third, a dream project struggling against odds to materialize (Koovakkattukunnu). Similarly, among the two under ‘promoted and controlled by the State’, one narrates success (Puthenkara) while the other (Thanguchira) represents a failed initiative. The cases vary not just in the property regimes, but also in certain other objective conditions as is evident from Annexure I.

Some of these characteristics pertain to physical features and institutional environment of the units while some others are users’ characteristics. Puthenkara and Thanguchira are canal irrigation units and the rest are lift irrigation systems. Quality of field channels was ranked under three categories: good, average, and poor. It is found that Puthenkara, Poolani-Chettithope, and Naduthuruth maintain *good* quality whereas Poolani-Mukkalvetti and Thanguchira fall under *poor* quality. Quality of field channels of Kuruppam scheme is found *okay*. The ayacuts served by these units are rather small and among them Poolani-Chettithope has the highest (214 acres). However, average holding size is slightly higher in Puthenkara (1.12 acres) than in Poolani-Chettithope (1.07 acres). The inequality in the landholding size as measured by the Gini-coefficient shows that it is highest in Thanguchira (0.67) and lowest in Naduthuruth (0.09). In all the units, the major purpose of irrigation is found to be irrigation of banana and nutmeg. Only in Naduthuruth paddy is being cultivated, though in a modest scale (Poolani- Mukkalvetti scheme, originally designed purely for paddy cultivation, is now non-existent and at Thanguchira the wet land is mostly kept fallow). The variable, *water days*, namely, the days in which irrigation water is available is more relevant in the case of canal irrigation than in the lift irrigation units where supply is arranged as per demand. It is found that

whereas Puthenkara unit gets water for 12 days a month, Thanguchira gets only for 7 days.

Distribution of user households is found to follow the pattern similar to that of ayacut. Poolani-Chettithope has the largest number of user households (200) followed by Koovakkattukunnu (potential number is 100). All others have much smaller numbers. We have attempted to make a rough assessment of the political and caste homogeneity of the users by measuring whether at least 75 % of the households belong to the same political party or caste. As per this, Naduthuruth has shown both political and caste homogeneity while Poolani-Mukkalvetti and Puthenkara units displayed caste homogeneity and political homogeneity respectively. The rest of the units were heterogeneous in both respects.

In order to understand the institutional environment of the units we have examined four variables: presence of water allocation rules, presence of monitoring system, strength of the organizational set up, and presence of able and fair leadership. It is found that Thanguchira and Poolani-Mukkalvetti units do not have any of these whereas Puthenkara, Poolani-Chettithope, and Naduthuruth units were positive in all these four characteristics. Further, while Puthenkara followed self-monitoring by the users, Poolani-Chettithope has appointed special guards to monitor rule compliance. In Naduthuruth and Kuruppam the pump operators do the monitoring too. The impact of these different factors on the management of irrigation in these units would be explicated in the case studies.

## **1. Promoted and Controlled by the State**

### ***Puthenkara BFA***

Puthenkara BFA formally came into being in 1987 under the initiative of CADA<sup>8</sup>. The farmers of this area had to their credit a long tradition of collective action in irrigation activities, ever since the



introduction of Thanguchira branch canal of CRDS. Though their management role is confined to spout bottom, they proudly remember the adventurous attempts and hard toil in the past to bring in water by going in the nights to close down other spouts and removing all the blocks in the canals. Thanks to such a tradition, formation of BFA at Puthenkara was very easy for CADA.

Water allocation in canal irrigation has two stages. The first stage is the allocation of water into the canals, and the Project Committee of CRDS decides it. Farmers were poorly represented in the Project Committee. However, the president of Puthenkara BFA is one of the nominated members in the Project Committee. As per the decision, water reaches the Thanguchira canal 12 days a month, with two days' supply at an interval of 5 days. Except during severe drought, this schedule is followed and hence the farmers have no serious complaints.

The second stage of the allocation is distribution of water below the spouts into individual farms. There existed a traditional water allocation rule based on a fixed time per unit of land. The standard followed was 30 minutes' irrigation per acre of land. It has become somewhat a convention and complied to almost perfectly by the farmers. Another aspect of the institutional mechanism is the turn system. Water turning starts from the 'head reach'. The farmers are well aware of their respective timetables of irrigation. At the same time, a little flexibility in the timetable is allowed. For example, by mutual agreement, neighbouring farmers can exchange or extend their irrigation timings. So far, no serious conflicts are recorded here. In case some petty conflicts occur, the BFA office bearers intervene and resolve the problems.

Maintenance of the field channels is another important collective action. As per the guidelines of CADA, the BFAs are supposed to clean and repair the field channels. As we noted early, CADA provides a *management subsidy/ functional grant* for the same. Puthenkara BFA

has shown an impressive record of utilization of this fund for the maintenance works. In addition to this routine maintenance of channels, Puthenkara BFA took special interest in taking up a novel project of taking up the task of canal maintenance. Usually, the canal maintenance is given on tenders to contractors by the Irrigation Department. Due to the poor maintenance of the canal by the contractors, the Puthenkara BFA's president took initiative in bringing together with it the four neighbouring BFAs (Kottamury, Koppimattam, Puthenchira, and Karippakuzhi) to form 'Thanguchira Canal Committee' to take up the maintenance contract for Thanguchira canal in order to augment the water flow by maintaining the canal properly. Since 1997 Thanguchira Canal Committee is obtaining the annual maintenance contracts. Thanks to this new maintenance arrangement, Thanguchira canal is now widely acclaimed as a model canal in the LBC. As farmers contribute free labour for the maintenance, they are able to make a good saving from the contract. With this fund, the committee is planning to construct a 'krishi office' (farm office) for the farmers.

A General Body and an Executive Committee are the two organizational bodies of Puthenkara BFA. Each water user household is given membership in the General Body and the present membership strength is 33. Usually, the general body meets once in a year. Three important functions of the general body are approving the annual accounts, deciding on water allocation and maintenance, and electing the office bearers for the executive committee.

The executive committee consisting of the President, Secretary, and three committee members meets at least twice a year. If there is any urgent matter, emergency meetings are also convened. In addition to the irrigation related duties, the committee also distributes benefits from CADA to the members. This BFA is excellent in book-keeping. The account books, ayacut register, minutes book, and the lists of beneficiaries of the various benefits distributed through the BFA are all maintained

well. Puthenkara BFA also organizes periodic seminars adding to the knowledge fund of farmers. Such activities also help to cement the relationship among the members<sup>9</sup>.

### ***Thanguchira BFA***

This BFA is an interesting case that helps us to understand how organizations can undergo a silent death. It too was organized in 1987 under the initiative of CADA<sup>10</sup>. However, there were no activities thereafter. It was revived in 1993 when CADA made it compulsory that the beneficiaries of the new agricultural schemes it introduced should be members of BFAs. The then agricultural officer at CADA, Chalakudy, had also inspired the farmers of Thanguchira to renew the BFA.

Practically, there exist no allocation rules in this BFA. As most of the members in this BFA have very small landholdings and water reaches their spouts only 7 days a month they have little incentive for irrigation. Thanks to this, the few large land owners in the ayacut do not experience much irrigation pressure during the seven water days. Rest of the days they depend on private motors. Moreover, most of them own land in the command areas of nearby BFAs too and hence, they can avail the agricultural benefits through those BFAs. Thus, without bearing the cost of organizing this BFA, they are able to increase their net returns. The net result is that no one feels it imperative to formulate allocation rules or to make collective effort in the maintenance of the channels. It is no wonder that neither the managerial subsidy nor the functional grant of CADA has been utilized by the members so far.

Thanguchira BFA does not have an active organization. Though there is a general body and an executive committee, they are seldom convened. The president, who owns a tiller is always on the move in search of jobs and the secretary, a coolie, has to go out in search of work daily. Thus, neither of the two finds time to organize the BFA activities. Even so, no one else is ready to take up the responsibilities. It is observed

that within one year of its renewal in 1993, the BFA slipped back into inaction.

## **2. Co-Managed by the State and Farmers - Poolani-Chettithope Lift Irrigation**

The Poolani-Chettithope lift irrigation unit selected for the study is a case of de facto co-management. Though the legal ownership of the scheme is with the state, farmers' association plays a very active role in the allocation of water and maintenance of the canal system.<sup>11</sup> Not only in the water allocation but also in the maintenance, the farmers' association has an active participation.

The genesis of this scheme indicates that acute water scarcity can become a boon and boost for the people to realize the need for collective action. Though the Poolani-Chettithope region falls in the ayacut of the Poolani Branch Canal of CRDS, water scarcity there was very severe even for purposes of drinking. Since the 1970s water has not flowed through this canal except during the rainy season<sup>12</sup>. Since the seventies, farmers of this place were running from pillar to post for an alternative irrigation scheme. In 1975 some of the farmers approached the Small Farmers Development Agency (SFDA), under the leadership of a few very important personalities of the locality, for a financial assistance to start a lift irrigation. SFDA agreed to finance 50 % of the total expenditure. So the farmers decided to mobilize the rest of the amount. In the same year, they registered an association of the farmers under the name *Poolani Lift Irrigation Cherukida Karshaka Sangham*.

Meanwhile, they came to know about the possibilities of a 100 % subsidized scheme under the Minor Irrigation Department (MID). Thereafter, the attention of the association turned to a new proposal for an MID lift irrigation. With the technical assistance of an irrigation

engineer, they prepared a new proposal for a scheme to irrigate about 75 ha with an estimate of Rs. 450, 000 and submitted to MID. In 1980, the government sanctioned the scheme. The foundation stone for the pump house was laid on 30 October 1982 by the then irrigation minister of Kerala and the scheme was commissioned on 8 October 1984.

MID has appointed three pump operators for this scheme, one permanent and two others temporarily appointed for the irrigation season to operate the motor on three shifts. Pumping is done round the clock except during 5 p.m. to 10 p.m., the rest time for motor, on all days other than public holidays.

Water allocation is managed by the farmers' association. For an efficient allocation of water, the whole ayacut is divided into three segments and water is allocated to each segment in a week (in terms of number of days) in proportion to the extent of area to be irrigated. Besides this regulation, farmers in each area appoint a *watchman* to divert water to the fields and to enforce the time schedule. Being an MID scheme, water cess is collected by the village office. The present rate of Rs 62/- per acre is to be paid by the farmers to the revenue office (village office). However, the area committees make a special collection of Rs 0.40 per cent of irrigated land from the members towards paying the watchmen. Usually, this is collected directly by the watchmen themselves.

MID is responsible for the maintenance of the system. However, occasionally, maintenance works are delayed due to delay in the release of funds by the Department. If and when this happens, the committee members come forward to mobilize the funds by borrowing from some of the members, to be paid back as and when the fund is released by the Department. Very minor repairs are financed by the committee itself. If serious lapses occur from the MID in the maintenance, the farmers'

association uses pressure tactics by way of dharnas and demonstrations in front of the MID office at Chalakudy.

Organizational structure of this unit is rather strong with a well-attended General Body and an active Executive Committee. The General Body consists of all the beneficiaries in the ayacut. Presently, there are over 200 households in the unit. Annual GB elects the Executive Committee members that consist of 11 members. Of these, six are *area committee* members (in each of the three areas the respective water users elects an *area committee* and sends two of its members to the executive committee). The General Body meets at least once in a year, usually, on 25 December. The standard agenda consists of irrigation schedule for the next year, passing of the accounts, and election of the Executive Committee and the office bearers. The executive committee meets almost every month to discuss the irrigation matters. If any conflicts occur among the members, the committee promptly intervenes to settle them amicably. The committee involves even in social activities other than irrigation. For example, the committee gives donations for the local temple feast.

The *area committees* and the appointment of *watchmen* deserve special mention because these two institutional mechanisms are unique to this irrigation unit and add to its institutional strength. We will be able to appreciate this much more if we compare it with the other MID scheme in Meloor, namely, Muringoor-Palathuzhy scheme where not even a farmers' association exists and is managed purely by the MID and is often vexed with problems like delays in the repairs, poor quality of channels, and frequent conflicts.

It is also seen that the institutional system in Poolani was flexible enough to accommodate more land under irrigation than the officially prescribed ayacut. As a result, the extension of area under irrigated crops did not result in water scarcity.

### **3. Irrigation Units Owned and Managed by Farmers**

#### ***Naduthuruth Lift Irrigation Unit***

Introduction of the Naduthuruth Lift Irrigation (NLI) was necessitated by the deterioration of CRDS canals and the consequent decrease in the supply of water since the early seventies. We have already observed that with the arrival of canal water the cropping pattern shifted to water intensive crops. In the Naduthuruth region of Meloor panchayat this shift was quite significant. The dwindling of water supply through the canals, therefore, caused much shock and tension to the farmers of this area. The need to find some alternative supply of water motivated the industrious farmers of Naduthuruth to search for lift irrigation. As the river was far away from here, finding an alternative source of water was a big problem. Meanwhile, one of the lead farmers in this venture heard of a lift irrigation functioning at Vennur Chira, in Meladur, a near by village, that irrigates crops by lifting water from a small natural drain. He visited the place and studied the scheme in detail. On his return, he discussed the matter with the panchayat president and some of his fellow farmers. All were enthused by his proposal for a similar irrigation scheme in Naduthuruth. The panchayat president also had some land in Naduthuruth, and showed a special interest in convening a meeting of the farmers to discuss the issue. The meeting unanimously supported the lift irrigation project. However, regarding the location of the scheme, there arose a dispute in the very first meeting. Some of the farmers argued for the scheme to be located in the upper region, to which those from lower Naduthuruth had objected. Nonetheless, as the support of the panchayat president went to the latter the location was decided to be in lower Naduthuruth. The meeting also decided to approach the Small Farmers' Development Agency (SFDA) through the Block Development Officer (BDO) for financial support. It also decided to have a registered association. Thus, in 1976, the Naduthuruth Karshaka Samithi (NKS) was registered with the registrar of charitable societies. An executive committee was elected with 8 members, including president, vice

president, secretary, and treasurer. The committee decided to mobilize funds from the farmers to complement the funds allotted by SFDA. SFDA sanctioned the project on the condition that NKS should produce a no-objection certificate from the irrigation department since the proposed ayacut falls within the ayacut of CRDS. Accordingly, NKS first collected a certificate from the village officer certifying that Naduthuruth region does not receive water from CRDS<sup>13</sup>. In the light of this, SFDA sanctioned the project. In 1978 the scheme was completed.

Meanwhile, there was another hurdle, namely, power connection. Kerala State Electricity Board (KSEB) was dilly-dallying with the farmers' request for electricity. This forced the farmers to make use of pressure tactics. The farmers, en masse, decided to boycott the 1977 election to the state assembly. The threat paid off. Naduthuruth being a vote bank of the Congress party, for the success of the Congress candidate a resolution of this problem was unavoidable and before the election there came three-phase power connection for the scheme. In 1978 the scheme started functioning.<sup>14</sup>

All the 46 households of the member farmers belong to the same caste, and have similar political affiliations. There is homogeneity also in the size of landholding. It deserves special mention that detailed institutional arrangements are designed and enforced by the NKS in water allocation. In fact, these arrangements are the outcome of years of trial and error, and are characterized by an element of flexibility.

Water is distributed into three directions and for that the water tank is provided with three outlets. Specific days are allotted to the three directions: north, south, and north-west. North and south regions get water on Mondays and Thursdays; Tuesdays and Fridays are for north-west region. Saturday is kept as a common irrigation day so that farmers of any region can approach the pump operator and avail water. Sundays and Wednesdays are holidays. However, even on holidays emergency requests for water are not rejected. Such a flexible institutional



environment makes the system quite robust. Time allocation is determined by area. One acre is allotted 36 minutes of watering @ Rs 40 per acre per month.

A pump operator is appointed by the organization. Presently, he is paid Rs 500/- per month. In fact, he does many more functions other than the pump operation. He is the major actor disseminating irrigation related information from the committee to the members. Monitoring of time allocation, and fees collection is also done by him. Fees are collected monthly, in the first week of the following month. Defaulters are charged a fine in the tune of Rs 3/-for arrears less than Rs 50/- and Rs 5/- for arrears above. In the initial years, the NLS beneficiaries had to pay CRDS water cess too. However, thanks to the successful litigation by the NKS, they were subsequently relieved from that burden.

Maintenance of the entire system, except the farm channels is vested with the NKS committee. Field channels are repaired by the water users themselves. The maintenance works are done during the first week of January, every year. Whenever the fund is not sufficient for the work, special collections are taken from the farmers. Presently, the organization is in the grip of some financial difficulties. As the motor is running beyond its life span, repair expenses are mounting. There are also huge arrears in the payment of electricity charges to the KSEB. It is to be noted, however, that the default in the payment was not due to negligence. In 1995, when the government lifted electricity tariff for irrigation to benefit private individuals having land up to 1 ha, the NKS committee presumed a similar exemption for them too and stopped paying electricity bill. But, in 1999 KSEB disconnected the power supply due to the accumulated arrears to the tune of Rs 30,000. Now the power supply has been restored on the condition that NKS would pay the arrears in 10 instalments. So far, three instalments have been paid up. It deserves special mention that at this time NLS initiated an attempt for nesting the irrigation organizations in Meloor for pressurizing the government to waive the electricity charges of irrigation organizations too. Nevertheless,

as the response from other organisations was not encouraging, they had to give up.

NLS has a General Body consisting of all the beneficiary members and an elected committee. At least twice a year the general body meets. Committee has a regular meeting once in two months and emergency meetings as and when required. It is said that the attendance in the meeting is almost full. The general body is the decision-making body while the committee is the executive body. As there is a well-maintained transparency in the accounts and procedures, there seems no information asymmetry between members and office bearers.

#### ***Poolani- Mukkalvatti Lift Irrigation Scheme***

This unit had its origin as a panchayat scheme and later it came under the management of farmers themselves. Many actors could be traced in the initiation of this scheme. In 1968, the state government introduced a special scheme of supplying motors to panchayats for intensive paddy development. Out of around 70 motors supplied under this scheme, Meloor panchayat received five. Some of the local leaders of Poolani area could successfully influence the president of Meloor panchayat to install one of these five motors at Mukkalvatti. Motorshed construction was left to the farmers for which the panchayat contributed Rs. 500/-. Some of the farmers took initiative to mobilize the rest of the funds and completed the construction at a site donated by a local farmer. Field channels were constructed by the farmers individually. On 26 June 1969 the scheme was commissioned.

The Panchayat had entrusted the farmers with the management and maintenance of the scheme. However, the farmers failed to set up a formal organization and instead, the community leaders (the group was predominantly of the Nair and other high caste Hindus) selected the office bearers and pump operators in an ad hoc manner.

The Mukkalvatti scheme lacked any definite rules for water allocation and fee collection. It was just an ad hoc arrangement in which

those who want water inform the pump operators and get the same. The fee collection also was by the pump operators. There were many complaints of financial misappropriation and embezzlement by the pump operators. Moreover, there was free riding by some community leaders. All these pushed the unit into financial crisis. There was no money for maintenance or for paying the electricity bills. As the arrears of electricity bill mounted up to Rs.13, 000 in 1980, the KSEB disconnected the power supply. Thereafter, the system became dysfunctional.

The failure of Mukkalvatti scheme highlights the problem of institutional and organizational failures. The system lacked clear rules and regulations for water allocation, fees collection and maintenance. Also, it lacked the monitoring and enforcement mechanism. Such an environment gave ample incentive for more powerful and influential actors to free ride and appropriate the benefits of a public good while several small farmers became net losers. Besides, the system lacked committed leadership<sup>15</sup>.

### ***Koovakkattukunnu Harijan Colony Vikasana Samiti Lift Irrigation***

This is a case, which highlights how political interest groups could bring about or destroy an irrigation scheme. The commissioning of this scheme is long overdue despite the fact that Koovakkattukunnu is one of the water scarce regions in Meloor Panchayat. There are about 100 households residing in this area of which 55 are scheduled castes; the rest belong to Ezhava, Christian and Chavalakkar communities. The general economic condition of this region is very poor. Average size of land holding is about 20-25 cents. One of the major deprivations the people in this hill experience is the shortage of water for drinking and for irrigation. Even though the Kerala Water Authority has put up 14 taps for supplying drinking water, water seldom reaches here. There is another drinking water scheme that operates on this hill, run by a church. Nonetheless, it is like a mirage for the poor scheduled caste people on account of the entrance fee of Rs. 6000/- being charged from a beneficiary

by the church committee, over and above the plumbing charges and the monthly water charge of Rs.50/-<sup>16</sup>. This effectively serves as an entry barrier for the poor.

The irrigation scenario is equally worse. The scheduled caste people at Koovakkattukunnu, although having an average landholding of 20 – 25 cents, which is much larger in relation to their counterparts elsewhere in the panchayat, have no access to irrigation. They eagerly longed to have an irrigation scheme not just to cultivate some crops, but also as a partial solution to the drinking water problem by the seepage into the wells when lands are irrigated.

In 1985, one of the scheduled caste leaders of Koovakkattukunnu and a Congress party worker got the information that through the Special Component Plan (SCP), the Agricultural Department can provide assistance for irrigation schemes, provided at least 55 % of the beneficiaries belong to scheduled castes. He and a few others took the initiative to convene a meeting of the farmers of the locality, irrespective of caste. That meeting selected a committee. The priest of the local church was made chairman of the committee and a local leader of another community, the convenor. The committee contacted the Agricultural Department and got the approval for the irrigation scheme on the condition that the water source and the tank site are to be provided by the beneficiaries.

A dispute arose at the very outset concerning the tank site. The priest offered to donate a site close to the church. But some of the members objected to it alleging that it was for irrigating the large area under the church and that would adversely affect the water availability for others. There ended the activities of that committee. A new committee was later constituted, comprising only of scheduled caste members. Nonetheless, all the farmers, irrespective of caste, were included in the beneficiary list. The committee convened a general meeting of all the farmers in which the local scheduled caste leader was elected as the new

convenor. The meeting decided to collect a contribution of Rs. 3/- per cent of land towards purchasing land for tank site and a pond. They could collect nearly Rs. 7000/- and the land was bought. In 1987, the then agricultural minister laid the foundation stone for the tank. The construction work was monitored by the convenor. In 1990 the work was completed. However, to get the three-phase power connection they had to wait for 2 more years! In 1992 the system became ready to be commissioned. However, unfortunately, then came up a political tussle. When the irrigation engineer came to check the system, the capacitor of the motor was found missing. Immediately, the convenor's political opponents who belonged to the Communist Party of India (Marxist) raised much hue and cry alleging that the capacitor was stolen by him and demanded his immediate resignation and stalling of the commissioning of the project. The stalemate continued for years with mud slinging on both sides. Finally, after six years, in 1998 the convenor resigned and another committee was formed with a supposedly a political local resident as the convenor. However, within a few months, he too resigned alleging that the previous convenor was blocking all his attempts for the commissioning of the system. Subsequently, a member of the Communist Party of India (Marxist) was made the new convenor. The new convenor and the president claim that they will get the scheme commissioned immediately. Nonetheless, till now, no much progress is observed.

It is noteworthy that in a place having such a severe water scarcity, the people failed to make a concerted effort to commission the scheme that could offer a solution to their crucial problem of water. Political and social rigidities and power play have become counteractive to the collective action of the people of Koovakkattukunnu. In a society where most of the members remain illiterate or uneducated, as in the case of Koovakkattukunnu, actors who are relatively better off in information and contacts with outer world can either help the community or can easily cause dissension in the community. In the case of

Koovakkattukunnu the second thing had happened, making a collective action difficult.

Another grave problem that was simply overlooked in this political power-game is that it is the women who suffer more on account of water scarcity than men. Thanks to the prevailing gender inequality in the division of labour, women are to carry water for household needs and that too by travelling long distances. Unfortunately, these women have no voice in the decision making body of the water committees.

#### **4. Owned and Managed by NGOs**

##### ***Kuruppam Church Lift Irrigation Scheme***

Kuruppam is a small plateau in ward 3 of Meloor panchayat. The inhabitants of this area are mostly small and marginal farmers and agricultural labourers. The land holding size varies from 0.2 acres to 2 acres. Poolani branch canal of the CRDS passing through this place was the only source of irrigation and the indirect source for drinking water. However, since 1970s, and much more since 1980s, the canal irrigation was in doldrums due to the deterioration of the canals. Interestingly, in Kuruppam one could observe a clear U-turn in the irrigation-induced crop shift. If with the arrival of canal irrigation there came up three-crop paddy in the wetlands and expansion of banana cultivation in the dry lands, with the reduction in canal water, wetland paddy has come down to single crop and dry land has gone for tapioca cultivation. Drinking water shortage has become more severe.

Meanwhile, the people heard about an irrigation scheme started at the near-by Pushpagiri Church. Kuruppam, having 83 catholic families, was a substation of Pushpagiri Church. When the Parish Priest of Pushpagiri Church who was coming to Kuruppam for Sunday Mass enquired about the availability of some land to construct a new church, the people told him their more serious concern for water. And one of the parish people offered to sell 85 cents of land for the church at a highly

subsidized rate (@ Rs. 750 /cent of land against the market rate of Rs.2000) on one condition that the church should provide a water supply scheme. The priest readily agreed. The first plan was to start a drinking water project. However due to the difficulty in locating a source for potable water, it was changed to an irrigation project. In order to finance the project the priest started a unit of the Social Welfare Centre – the official agency for social work in the diocese of Ernakulam to which the Church belongs – at Kuruppam. The parish committee undertook the construction. In 1990 they purchased 2 cents of land at the rate of Rs. 300/- cent from a farmer for digging a pond from which water could be lifted. To feed the pond a diversion canal was made through the adjacent paddy field from the nearby natural drain, called *Nayyamveli thodu*. A temporary check dam was built in the drain to keep the water level high. The diversion canal brings water to a collection pit and from the pit an underground pipe carries the water to the pond. A 15 HP motor was installed near the pond. When the work was over, they applied to the KSEB for electricity connection. In order to get the power at the earliest, a special fee of Rs 8000/- was paid. The project was completed in April 1991 and on 26 April 1991 the scheme was commissioned. On 20 January 1992 the scheme was formally inaugurated along with the inauguration of the new church. The total expenditure for the scheme was said to be Rs 1,26,000 which was funded partly by the social welfare centre (12%) and the rest by the church. Some members of the parish had contributed voluntary labour in the construction of the pond. It is seen that the ideology of Christian charity was an important motivating factor behind spending such a huge sum by the church for this project.

The parish council had appointed a pump operator. As in other private water markets, water is allocated for one user at a time. Those who want water inform the pump operator of the time and duration. The fee is charged on time- basis. In 1992 the rate was Rs. 20 per hour that was raised to Rs 25 in 1997 and to Rs 30 in 1999. The pump operator is the fee collector. He is to remit the fees to the trustee of the church after

deducting his wage. Since 1999 pump operator's wage is at Rs 6 per hour (in 1992 it was Rs. 2.50 and later raised to Rs 3 in 1993 and to Rs 4.5 in 1996 and to Rs 5 in 1997). Pumping of water depends upon the water level in the pond. During the dry season the pump cannot be operated for more than 3 hours a day. Members complain that they do not get enough water as per demand and on time. Maintenance of the system is carried out by the parish council. The field channels, however, are to be maintained by the water users themselves.

As we mentioned at the beginning, the management of the system is solely vested with the parish council. The water users have no role to play in any of the decision-making processes except those water users belonging to the parish who happen to be members of the parish council. Interestingly, the vast majority of the water users (nearly 70%) who are Hindus do not have any say in the management. Rules and regulations are designed and revised at the will of the parish committee. The council members fear that if a separate committee of water users is set up for the management of the unit, the church may lose its control.

Since January 2001, the parish council has introduced a new arrangement for the management of the system. Accordingly, the management of the system is *subcontracted* to a private individual through auction. The new decision is said to have been taken due to a financial loss incurred last year by the church in the running of the system. What makes it intriguing is that the loss was just of Rs 500/-. In the auction, one of the parish members took the bid on the condition of paying to the church Rs.1100/- for a year and returning the system in working condition at the end of the year. Many of the water users complain that the new arrangement is for them like falling out of frying pan into the fire. The new 'proprietor' is an employee in a college in the town and he is willing to pump water only during nights. As a result, those who want to irrigate the crops have not only to pay the fee but also to keep vigil !



It is observed that the members of this unit are losing interest in this scheme. At present, there are only 20 members. As new schemes came up in the vicinity, several members opted out of this. For instance, many of the members of this unit deserted the unit and joined the Kuruppam Lift Irrigation, initiated by the Kerala Horticulture Development Programme (KHDP). Some other members work hard to clean the CRDS canals to avail more water from the CRDS, instead of putting in labour for strengthening the check dam to bring in more water to the church scheme. The new management system introduced by the parish council, although creates revenue for the church, is neither efficient nor it fulfils the charity motive with which the scheme was originally started.

## V

### **Discussion of the Case Studies**

The inquiry into the development of irrigation institutions in the study area has shown how the development of canal irrigation had introduced to the local people the benefits of irrigated agriculture and how over the years they shifted their cropping pattern from subsistence crops to high valued commercial crops that needed assured supply of irrigation during the summer months. However, despite the expansion of irrigated crops, the canal irrigation could not cope up with the demands for irrigation and therefore the farmers started developing alternative sources of irrigation. Some of these responses were in the form of collective action for the development of lift irrigations. There were also responses at the individual level by investing in well irrigation and developing private water market. Apart from such initiatives, the state has also intervened by forming BFAs to improve the efficiency of canal irrigation. The availability of water in the summer months for irrigation has contributed to the enhancement of the groundwater table, thereby augmenting the supply of drinking water. We have described in detail the skill, knowledge, information and social capital with which the

individual actors and actor groups have developed different types of irrigation institutions. The rules for allocation of water appear to be flexible in taking into account the situations that exist in the different micro locations. These rules also did not discriminate between different size groups of farms, thereby maintaining equity in irrigation. Regarding the question of the productivity of irrigation water, the present study did not probe into the details, but notes that it depends very much on the variations in the crop mix across farms.

The comparison of the different institutional arrangements we have undertaken provides useful insights into the effectiveness and sustainability of institutions. Granting the Coasian argument (Coase 1998) that property right matters when transaction costs are positive, we may add that for the property right to matter, there should be the regime of rules and regulations and their enforcement. Under the *state-owned* canal system, Puthenkara BFA had the advantage of well-designed and enforced allocation and maintenance rules. On the contrary, Thanguchira BFA or the Poolani-Mukkalvatti lift irrigation *managed by farmers themselves*, failed miserably in the absence of such a regulatory mechanism. In the *co-managed* Poolani lift irrigation well-enforced institutional arrangement has been a crucial factor for its success. One can thus infer that rules and regulations and their proper enforcement are crucial factors in determining the success of collective irrigation systems and more so, in their sustainability; property right per se does not enable us to predict the success and sustainability of irrigation systems.

It is also seen that *flexibility* of institutions is equally important for their robustness, as is evident from the water allocation rules in Naduthuruth, Poolani, and Puthenkara. For this situation-specific decision-making on how much flexibility and stringency is required in rules and regulations, a certain level of local capacity is called for (see also McKean, 1986) as the delicate balancing between clear rules and regulations and their strict enforcement on the one hand, and the flexibility

in employing rules and regulations to cater to unforeseen situations and the justifiable demands of members that were not foreseen when rules were framed on the other, while ensuring transparency in decisions as well as democratic functioning of the institution, will require a certain discretionary and decision-making capabilities on the part of those taking leading roles in these institutions. Leadership, therefore, emerges as very crucial in the success and sustainability of these institutions. The comparison of Poolani-Mukkalvatti lift irrigation with that of Peenikkakadavu or a comparison between Thanguchira and Puthenkara BFAs brings to light the role of leadership. In the presence of good leadership, the farmers become more confident of the outcomes of participation and therefore their expected benefits get enhanced. In such an environment, cooperation in irrigation becomes a rational strategy of the farmers. In the Kuruppam scheme it is very clear how the absence of such leadership makes the institution more rigid and less robust.

Advantages to the institution from leadership capabilities are further strengthened by the power of the leaders and various actors from three sources - political influence, wealth and knowledge.<sup>17</sup> The remarkable instance in Naduthuruth lift irrigation history of collective bargaining by farmers during the election to the state assembly to get electricity connection for the scheme has given us an interesting case of people exercising power through successful political manoeuvring.

Local capabilities in both leadership and networking using these capabilities as well as the various sources of power are very important. Only with such capabilities, nesting of institutions and networking for such nesting or manoeuvring of power to the advantage of the institution may come about. Such networking and nesting at the right time with the right people may determine the success and sustainability of the institution. Though the innovativeness of NLS committee in attempting for *nesting* of lift irrigation organizations has not borne fruit, the strength of the leadership has definitely kept the organization going. At

Thanguchira branch canal, six BFAs could nest together to form ‘Thanguchira branch canal committee’, reaping the economies of scale in canal maintenance and facilitating many co-ordinated activities like agricultural seminars, farm office project etc. Such networking and nesting allows small primary groups to enjoy the advantages of small groups on the one hand and to strengthen its bargaining power on the other by the co-ordination of primary groups into a bigger group. The President of Puthenkara BFA stands as ample testimony to the crucial role of committed and active leadership capable of mobilizing farmers’ participation, effecting advantageous networking and institutional nesting.

The case of Koovakkattukunnu gives us another dimension of leadership—one that turns political and refuses to recognize the difficulties its power games cause to people. In this case leadership is bent on catering to what they perceive as serving the interests of another organization—their respective political parties. They cannot see that an already deprived people are being further deprived by their political games. Those in leadership sacrifice the welfare of the weaker sections in this case. Even the non-governmental organization – the church—does not come to the aid of these hapless people. This case highlights the fact that power games could erode or hamper the positive potential of networking and nesting. One could see how important is people’s empowerment. In the Kuruppam scheme, a major weakness was the total neglect of the user community in the decision-making processes.

Demand for water is found to play an important role in determining the institutional strength. In the light of the case studies the following general observation is in order: wherever the effective demand for irrigation water is high there the people have spent more resources in institution building. At Puthenkara, where 79 % of the households depend on agriculture as the major source of income and 76.5% of the area under cultivation is utilized for water intensive crops like banana and nutmeg and average holding size is rather high (1.12 acres), irrigation

institution stands quite robust. Similar is the case with Poolani-Chettithope having 60 % households depending primarily on agriculture, 58 % of area under banana and nutmeg, and 1.07 acre of average holding size and with Naduthuruth, having 65 % households depending primarily on agriculture and 79 % of area under banana and nutmeg, and 5 % area under paddy. Conversely, at Thanguchira only 23 % households depend primarily on agriculture. At Poolani-Mukkalvatti too, the proportion is relatively smaller.

How heterogeneities affect the collective action potential of the farmers is difficult to say conclusively. Our case studies do not establish a uniform effect of heterogeneities in landholding, or political and caste heterogeneities. In the current literature on common property resource management also, the role of heterogeneity remains contested (Varughese and Ostrom, 2001; Baland and Platteau, 1996). Heterogeneity of assets as measured by the Gini coefficient of landholdings of the user households was lowest in Naduthuruth (0.09) and there cooperation of farmers for collective irrigation was very high. However, even at Puthenkara and Poolani-Chettithope where the Gini-coefficient was found to be relatively higher (0.59 and 0.57 respectively) collective action was rather successful. It would imply a non-linear relationship between heterogeneity of assets and collective action. Similarly, a non-linear relationship exists with regard to caste and political heterogeneities too. We could observe successful collective action of farmers in Naduthuruth where both variables were homogeneous and at Poolani-Chettithope where both were heterogeneous.

## VI

### Conclusion

The present study has found that development of irrigation has been the linchpin of the land use dynamics of Meloor panchayat and the successful management of irrigation, in turn, has been contingent upon

the level of farmers' participation. Even in the state-controlled canal irrigation, the extent of farmers' participation became the decisive factor in determining whether the system delivers or not. The analysis has also shown that property right per se does not allow us to predict the success or failure of irrigation organizations; it has identified a few more important factors that determine the performance of irrigation organizations. Physical characteristics like location of the area in relation to the source, demand and availability of water, socio-economic heterogeneities of resource users etc. do have impact on the collective action of the farmers in organizing irrigation. Without sustaining the water resources, irrigation institutions cannot be sustained. The institutional environment too is crucial in determining the success and sustainability of the irrigation organizations as illustrated by the presence of clear and flexible system of rules, enforcement mechanisms, strong organizational set up, and able and fair leadership. Nesting and networking of institutions further strengthen the institutional environment. For this, local capability and leadership and the manoeuvring of various sources of power are found to be essential.

***Vineetha Menon** worked as Visiting Fellow in the Kerala Research Programme on Local Level Development at the Centre for Development Studies, Thiruvananthapuram. She is currently Reader in the Department of Anthropology in Kannur University. Her areas of interest are Medical Anthropology, Developmental Anthropology and Marginalized Communities.*

*email: [vineetha@cds.ac.in](mailto:vineetha@cds.ac.in)*

***Antonyto Paul** serves as Research Officer in the NCCR Research Programme at the Centre for Development Studies, Thiruvananthapuram. His areas of interest are Environmental and Resource Economics and Institutional Economics.*

*email: paul@cds.ac.in*

***K. N. Nair** is Fellow & Director at the the Centre for Development Studies, Thiruvananthapuram. His research interests include Agriculture and Rural Development, Decentraliazation and Local Level Development, Science and Society, Economic Policy and Planning and Institutional Economic analysis.*

*email: knn@cds.ac.in*

## Notes

- 1 Following Douglas North, we have conceptualized institutions as follows: institutions are rules of the game in a society, or more formally, are the humanly devised constraints that shape human interaction. In consequence, they structure incentives in human exchange, whether political, social, or economic. Institutional change shapes the way the society evolves through. Institutions are the rules and norms of interaction. They identify constraints - what people are prohibited from doing and under what conditions individuals or group of people are allowed to undertake certain actions (North 1990).
- 2 In Kalatheku, bullocks are used to lift water while in Thulavu water is lifted manually by the humans.
- 3 As per the Krishibhavan data 10 % of these motors are of above 5 horsepower (hp); 70 % are of 3 hp and 20 % of 1.5 hp.
- 4 Presently, more than 85 % of the manure used in Meloor is chemical fertiliser. Within this panchayat itself, there are eight fertiliser sales units operating. Of these, from one sales unit of Meloor Co-operative Bank alone sales increased from 80 metric tonnes in 1965-66 to 321 by 1985-86 and to 423 by 2000-2001.
- 5 As per this temporary leasing arrangement, the lessees pay a fixed amount per plant, say, Rs 10/- to the lessor for one crop.
- 6 For instance, it is one such group that has initiated a lift irrigation scheme at Kuruppam.
- 7 For instance, the agricultural credit supplied by the Meloor Cooperative Bank in 1995/96 was just Rs 1, 26,000 whereas in 2000/01 it soared to Rs 52,81,000 and revealingly, of this, Rs 47,56,000 was for banana cultivation.
- 8 Puthenkara BFA belongs to the Spout 14 of Thanguchira branch canal. The ayacut of Puthenkara, though formally comprizes only of 25 acres of dry land, presently, includes 37 acres. Coconut, banana, and nutmeg are the three major crops irrigated here. Nonetheless, of recent, the farmers show very little interest in irrigating coconut on account of the plummeting of coconut price, and the wide spread disease (called, 'mandari') affecting the trees. Farmers perceive that the incidence of this disease is more with the irrigated coconut trees than with the unirrigated ones. At Puthenkara, during the field study, there were about 15,000 banana trees and 2000 nutmeg trees being irrigated. In the ayacut there are 33 households, of which 20 are Christians and the rest, Hindus. They live in good harmony.



- 9 It establishes the *By-Product Theory* of Olson. According to Olson (1965) when organizations, even large ones, indulge in the provision of private or non-collective goods as by-products along with collective goods, they acquire *selective incentives* to coerce the group members to elicit collective action.
- 10 It is located at the tail end of Thanguchira canal. The ayacut is small, just 17 acres (8 acres wet land and 9 acres dry land). Spout 16, and the tail end spout come within the ayacut. There are 40 households in the ayacut, most of whom have only small or marginal holdings of 20 to 30 cents.
- 11 The scheme irrigates about 214 acres of dry land by lifting water from Chalakudy river. There are two motors, each with a capacity of 90 HP, of which one is kept as stand- by. The motor shed is situated at the bank of the river. There is also a diversion tank constructed at a site donated by a farmer. This tank facilitates the diversion of water into three different directions. The canal system is concrete and only the farm channels are earthen. Thanks to the introduction of this scheme, Poolani area has become an intense cropping area. During the survey period, there were around 15,000 banana plants and 5,000 nutmeg trees in the area, apart from the large-scale coconut cultivation.
- 12 We were told by the farmers that in the dry season, water flowed through the canal only once and interestingly that was on the occasion of the visit of the irrigation minister of the State to Poolani for inaugurating the lift irrigation.
- 13 Interestingly, this certificate turned out to be the trump – card for NKS in their litigation in the High Court for securing exemption from CRDS water cess.
- 14 The capacity of the motor used in the NLS is 15 HP. Source of water is a pond, which is fed by a natural drain. As this drain gets seepage when water flows through the canal, NLS can be seen as an indirect benefit from CRDS. A diversion weir is constructed in the drain to keep the water level in the pond high. A pump house and a water diversion tank are constructed close to the pond. The ayacut is only 26 acres, of which 5 acres is wet land. The major crops in the garden land are banana, nutmeg and coconut. In the wet land, paddy is cultivated.
- 15 It would be very insightful if we contrast this scheme with a similar scheme at Peenikkadavu. Under the able leadership of an irrigation committee headed by a lead farmer, that scheme functions as an ideal irrigation scheme in Meloor panchayat, with a strong institutional

mechanism for water allocation, fee collection and maintenance. While in Mukkalvatti, the leaders turned free riders in irrigation, in Peenikkadavu, the farmers could strengthen irrigation under the able leadership of this farmer. Thanks to his leadership, Peenikkadavu scheme could get one more motor; all the farmers got exemption from the CRDS water cess and avail power subsidy for paddy cultivation as soon as the government declared the scheme in 1995.

- 16 Only two years back the amount was raised to Rs. 6000. However, prior to that, although the amount was less, there prevailed a discrimination against those who do not belong to the parish. While the entrance fee for the parish members was Rs.4000, the non-parishioners had to pay Rs.5000.
- 17 In Devarajagiri BFA, the source of the popularity and influence of the secretary comes from his political tradition. His father was one of the earliest communist leaders of Meloor. At Moozhikkadavu BFA, the members have selected a Congress party leader as the President and a Communist party leader as the Secretary. At Koppimattam BFA, the President is a district level leader of the Congress (S) party. At Kunnappalli lift irrigation, known for en-masse support for Communist party, the compliance to rules and obedience to office bearers in irrigation is strengthened by the allegiance of the members to the party. In some other irrigation units, relatively wealthier farmers have been the office bearers. Wealthy leaders could elicit compliance from other members out of respect and could also make unilateral contributions to bring about irrigation. At Muringoor-Palathuzhy lift irrigation unit where no farmer organization exists, the scheme runs mainly because of the unilateral contributions of a few big landlords towards the repairs of the motor. Of course, they have much larger net returns for taking up such action. As one of them informed, his opportunity cost of time to be spent for organizing the farmers would be more than the contributions he makes for the emergency repair of the motor. At Kallukuthy BFA, one of the farmers who also works as a watchman, has a clear logic. To quote him: "Since I have more land, I want more water. So unless I do this work, I would bear more loss". It was also observed that more knowledgeable farmers having contacts and networks with outside world are also preferred as office bearers.

## References

- Baland, J.M and J.P. Platteau (1996): *Halting Degradation of Natural Resources. Is there a Role for Local Communities?* Food and Agricultural Organisation, Clarendon, Oxford.
- Bray, Francesca. (1986): *The Rice Economies, Technology and Development in Asian Societies*. Basil Blackwell.
- Coase, R (1998): *The Firm, the Market and the Law*, University of Chicago Press, Chicago.
- McKean, M. (1986): 'Management of Traditional Common Lands (Iriachi) in Japan', National Research Council (1987) *Proceedings of the Conference on Common Property Resource Management*, Washington DC.
- Nair, K.N. and Srikumar Chattopadhyay (ed.) (2001): *Watershed Management for Sustainable Development. Field Experiences and Issues*, Thiruvananthapuram, KRPLLD.
- National Research Council (NRC) (1987:)*Proceedings of the Conference on Common Property Resource Management*, Washington DC.
- North, D. (1990):*Institutions, Institutional Change, and Economic Performance*, Cambridge University Press, Cambridge.
- Olson, M. (1965): *The Logic of Collective Action: Public Goods and the Theory of Groups*, Harvard University Press, Cambridge.
- Ostrom, E. (1990):*Governing the Commons: The Evolution of Institutions for Collective Action*, Cambridge University Press, Cambridge.
- Ostrom, E., Gardner R., and J. Walker (1994): *Rules, Games, and Common-Pool Resources*, University of Michigan Press, Ann Arbor.
- Rutton, V. and Y. Hayami. (1984): 'Toward a Theory of Induced Institutional Innovation', *Journal of Development Studies*, 20(4): 203-223

- Sengupta, N. (1991): *Managing Common Property: Irrigation in India and the Philippines*, Sage Publications, New Delhi.
- Tang, S.Y. (1992): *Institutions and Collective Action: Self Governance in Irrigation Systems*, ICS Press, San Francisco.
- Vaidyanathan, A. (1999): *Water Management: Institutions and Irrigation Development in India*, Oxford University Press, New Delhi.
- Vaidyanathan, A. (2001): Watershed Development: Reflections on Recent Developments, *KRPLLD Discussion Paper Series*, 29, Thiruvananthapuram.
- Varughese, G. and E. Ostrom (2001): 'The Contested Role of Heterogeneity in Collective Action, Some Evidence from Community Forestry in Nepal', *World Development*, 29 (5): 747-765.
- Wade, R. (1987): *Village Republics: Economic Conditions for Collective Action in South India*, Cambridge University Press, Cambridge.
- White, T. A. and Runge C.F. (1995): The Emergence and Evolution of Collective Action: Lessons from Watershed Management in Haiti, *World Development* 23 (10), 1683-1698.

**Annexure-I**  
**Characteristics of the Irrigation Units**

Characteristics/Units	Puthenkara	Thanguchira	Poolani Chettithopp	Nadu-thuruth	Poolani-Mukkalvetri	Koovak-kattakunnu	Kuruppam
Ownership Pattern	State	State	Co managed	Farmers	Farmers	Farmers	NGO
Mode of irrigation	Canal	Canal	Lift	Lift	Lift	Lift	Lift
Quality of field channels	Good	Poor	Good	Good	Poor	N.A.	Average
Number of user households	33	40	200	46	37	100	20
Total Ayacut (acres)	37	17	214	26	40	25	15
Average holding size (acres)	1.12	0.43	1.07	0.57	1.08	0.25	0.75
Area under banana & nutmeg (%)	76	30	58	79	0	N.A.	70
Area under paddy (%)	0	47	0	5	100	N.A.	0
Agricultural HHs (%) <sup>1</sup>	79	23	60	65	40	N.A.	65
Water days <sup>2</sup>	12	7	12	22	Not fixed	N.A.	25
Gini coefficient of land holding	0.59	0.67	0.57	0.09	0.39	0.25	0.41
Caste homogeneity <sup>3</sup>	No	No	No	Yes	Yes	No	No
Political homogeneity <sup>4</sup>	Yes	No	No	Yes	No	No	No
Presence of water allocation rules	Yes	No	Yes	Yes	No	N.A.	Yes
Monitoring	Self	No	Guard	Pump operator	No	N.A.	Pump operator
Able and fair leaders	Yes	No	Yes	Yes	No	N.A.	No
Organizational set up	Strong	Weak	Strong	Strong	Absent	N.A.	Absent

Source: Survey data

Note: 1= % of households with agriculture as the major source of income.

2= Number of days in a month water available for irrigation.

3= Whether at least 75 % of households belong to the same caste.

4= Whether at least 75 % of households belong to the same political party.

N.A.= Not applicable

**CENTRE FOR DEVELOPMENT STUDIES**  
**LIST OF WORKING PAPERS**  
*[New Series]*

The Working Paper Series was initiated in 1971. A new series was started in 1996 from WP. 270 onwards. Working papers beginning from 279 can be downloaded from the Centre's website ([www.cds.edu](http://www.cds.edu))

- W.P. 366 VIJAYAMOHANAN PILLAI N.** *Causality and Error Correction in Markov Chain: Inflation in India Revisited.* December 2004.
- W.P. 365 R. MOHAN.** *Central Finances in India - Alternative to Procrustean Fiscal Correction.* November 2004.
- W.P. 364 SUNIL MANI.** *Coping with Globalisation Public R&D Projects in Telecommunications Technologies in Developing Countries.* November 2004.
- W.P. 363 K C ZACHARIAH, S IRUDAYA RAJAN.** *Gulf Revisited Economic Consequences of Emigration From Kerala, Emigration and Unemployment.* September 2004.
- W.P. 362 M. VENKATANARAYANA.** *Educational Deprivation of Children in Andhra Pradesh, Levels and Trends, Disparities and Associative Factors.* August 2004.
- W.P. 361 K. P. KANNAN, VIJAYAMOHANAN PILLAIN.** *Development as a Right to Freedom: An Interpretation of the Kerala Model.* August 2004.
- W.P. 360 VIJAYAMOHANAN PILLAI N.** *CES Function, Generalised Mean and Human Poverty Index: Exploring Some Links.* July 2004.
- W.P. 359 PRAVEENA KODOTH,** *Shifting the Ground of Fatherhood: Matriliney, Men and Marriage in Early Twentieth Century Malabar.* May 2004.
- W.P. 358 MRIDUL EAPEN.** *Women and Work Mobility: Some Disquieting Evidences from the Indian Data.* May 2004.
- W.P. 357 K. RAVI RAMAN.** *The Asian Development Bank Loan for Kerala (India): The Adverse Implications and Search for Alternatives,* March 2004.

- W.P. 356 VIJAYAMOHANAN PILLAI N.** *Liberalisation of Rural Poverty: The Indian Experience*, March 2004.
- W.P. 355 P.L.BEENA** *Towards Understanding the Merger-Wave in the Indian Corporate Sector: A Comparative Perspective*, January 2004.
- W.P. 354 K.P. KANNAN AND R. MOHAN** *India's Twelfth Finance Commission A View from Kerala*, December 2003.
- W.P. 353 K.N. HARILAL AND P.L. BEENA** *The WTO Agreement on Rules of Origin Implications for South Asia*, December 2003.
- W.P. 352 K. PUSHPANGADAN** *Drinking Water and Well-being In India: Data Envelopment Analysis*, October 2003.
- W.P. 351 INDRANI CHAKRABORTY** *Liberalization of Capital Inflows and the Real Exchange Rate in India : A VAR Analysis*, September 2003.
- W.P. 350 M.KABIR** *Beyond Philanthropy: The Rockefeller Foundation's Public Health Intervention in Thiruvithamkoor, 1929-1939*, September 2003.
- W.P. 349 JOHN KURIEN** *The Blessing of the Commons : Small-Scale Fisheries, Community Property Rights, and Coastal Natural Assets*, August 2003.
- W.P. 348 MRIDUL EAPEN,** *Rural Industrialisation in Kerala: Re-Examining the Issue of Rural Growth Linkages*, July 2003.
- W.P. 347 RAKHE PB,** *Estimation of Tax Leakage and its Impact on Fiscal Health in Kerala*, July 2003.
- W.P. 346 VIJAYAMOHANAN PILLAI N,** *A contribution to Peak load pricing theory and Application*. April 2003.
- W.P. 345 V.K. RAMACHANDRAN, MADHURA SWAMINATHAN, VIKAS RAWAL** *Barriers to Expansion of Mass Literacy and Primary Schooling in West Bengal: Study Based on Primary Data from Selected Villages*. April 2003.
- W.P. 344 PRADEEP KUMAR PANDA** *Rights-Based Strategies in the Prevention of Domestic Violence*, March 2003.
- W.P. 343 K. PUSHPANGADAN** *Remittances, Consumption and Economic growth in Kerala: 1980-2000*, March 2003.
- W.P. 342 D NARAYANA** *Why is the Credit-deposit Ratio Low in Kerala?* January 2003.

- W.P. 341 MRIDUL EAPEN, PRAVEENA KODOTH** *Family Structure, Women's Education and Work: Re-examining the High Status of Women in Kerala.* November 2002.
- W.P. 340 J. DEVIKA,** *Domesticating Malayalees: Family Planning, the Nation and Home-Centered Anxieties in Mid- 20<sup>th</sup> Century Keralam.* October, 2002.
- W.P. 339 M PARAMESWARAN,** *Economic Reforms and Technical Efficiency: Firm Level Evidence from Selected Industries in India.* October, 2002.
- W.P. 338 PRAVEENA KODOTH,** *Framing Custom, Directing Practices: Authority, Property and Matriliney under Colonial Law in Nineteenth Century Malabar,* October 2002.
- W.P. 337 K.NAVANEETHAM,** *Age Structural Transition and Economic Growth: Evidence From South and Southeast Asia,* August 2002.
- W.P. 336 PULAPRE BALAKRISHNAN, K. PUSHPANGADAN, M. SURESH BABU,** *Trade Liberalisation, Market Power and Scale Efficiency in Indian Industry,* August 2002.
- W.P. 335 J.DEVIKA,** *Family Planning as 'Liberation': The Ambiguities of 'Emancipation from Biology' in Keralam* July 2002.
- W.P. 334 E. ABDUL AZEEZ,** *Economic Reforms and Industrial Performance an Analysis of Capacity Utilisation in Indian Manufacturing,* June 2002.
- W.P. 333 K. PUSHPANGADAN** *Social Returns from Drinking Water, Sanitation and Hygiene Education: A Case Study of Two Coastal Villages in Kerala,* May 2002.
- W.P. 332 K. P. KANNAN,** *The Welfare Fund Model of Social Security for Informal Sector Workers: The Kerala Experience.* April 2002.
- W.P. 331 SURESH BABU,** *Economic Reforms and Entry Barriers in Indian Manufacturing.* April 2002.
- W.P. 330 ACHIN CHAKRABORTY,** *The Rhetoric of Disagreement in Reform Debates* April 2002.
- W.P. 329 J. DEVIKA,** *Imagining Women's Social Space in Early Modern Keralam.* April 2002.
- W.P. 328 K. P. KANNAN, K. S. HARI,** *Kerala's Gulf Connection Emigration, Remittances and their Macroeconomic Impact 1972-2000.* March 2002.



- W.P. 327 K. RAVIRAMAN**, *Bondage in Freedom, Colonial Plantations in Southern India c. 1797-1947*. March 2002.
- W.P. 326 K.C. ZACHARIAH, B.A. PRAKASH, S. IRUDAYA RAJAN**, *Gulf Migration Study : Employment, Wages and Working Conditions of Kerala Emigrants in the United Arab Emirates*. March 2002.
- W.P. 325 N. VIJAYAMOHANAN PILLAI**, *Reliability and Rationing cost in a Power System*. March 2002.
- W.P. 324 K. P. KANNAN, N. VIJAYAMOHANAN PILLAI**, *The Aetiology of the Inefficiency Syndrome in the Indian Power Sector Main Issues and Conclusions of a Study*. March 2002.
- W.P. 323 V. K. RAMACHANDRAN, MADHURA SWAMINATHAN, VIKAS RAWAL**, *How have Hired Workers Fared? A Case Study of Women Workers from an Indian Village, 1977 to 1999*. December 2001.
- W.P. 322 K. C. ZACHARIAH**, *The Syrian Christians of Kerala: Demographic and Socioeconomic Transition in the Twentieth Century*, November 2001.
- W.P. 321 VEERAMANI C.** *Analysing Trade Flows and Industrial Structure of India: The Question of Data Harmonisation*, November 2001.
- W.P. 320 N. VIJAYAMOHANAN PILLAI, K. P. KANNAN**, *Time and Cost Over-runs of the Power Projects in Kerala*, November 2001.
- W.P. 319 K. C. ZACHARIAH, P. R. GOPINATHAN NAIR, S. IRUDAYARAJAN** *Return Emigrants in Kerala: Rehabilitation Problems and Development Potential*. October 2001
- W.P. 318 JOHN KURIEN, ANTONYTO PAUL** *Social Security Nets for Marine Fisheries-The growth and Changing Composition of Social Security Programmes in the Fisheries Sector of Kerala State, India*. September 2001.
- W.P. 317 K. J. JOSEPH, K. N. HARILAL** *India's IT Export Boom: Challenges Ahead*. July 2001.
- W.P. 316 K. P. KANNAN, N. VIJAYAMOHANAN PILLAI** *The Political Economy of Public Utilities: A Study of the Indian Power Sector*, June 2001.

- W.P. 315** **ACHIN CHAKRABORTY** *The Concept and Measurement of Group Inequality*, May 2001.
- W.P. 314** **U.S.MISHRA, MALA RAMANATHAN** *Delivery Compli-cations and Determinants of Caesarean Section Rates in India - An Analysis of National Family Health Surveys, 1992-93*, March 2001.
- W.P. 313** **VEERAMANI. C** *India's Intra-Industry Trade Under Economic Liberalization: Trends and Country Specific Factors*, March 2001
- W.P. 312** **N. VIJAYAMOHANAN PILLAI** *Electricity Demand Analysis and Forecasting –The Tradition is Questioned*, February 2001
- W.P. 311** **INDRANI CHAKRABORTY** *Economic Reforms, Capital Inflows and Macro Economic Impact in India*, January 2001
- W.P. 310** **K. K. SUBRAHMANYAN. E. ABDUL AZEEZ**, *Industrial Growth In Kerala: Trends And Explanations* November 2000
- W.P. 309** **V. SANTHAKUMAR, ACHIN CHAKRABORTY**, *Environmental Valuation and its Implications on the Costs and Benefits of a Hydroelectric Project in Kerala, India*, November 2000.
- W.P. 308** **K. P. KANNAN, N . VIJAYAMOHANAN PILLAI**, *Plight of the Power Sector in India : SEBs and their Saga of Inefficiency* November 2000.
- W.P. 307** **K. NAVANEETHAM, A. DHARMALINGAM**, *Utilization of Maternal Health Care Services in South India*, October 2000.
- W.P. 306** **S. IRUDAYA RAJAN**, *Home Away From Home: A Survey of Oldage Homes and inmates in Kerala*, August 2000.
- W.P. 305** **K. N. HARILAL, K.J. JOSEPH**, *Stagnation and Revival of Kerala Economy: An Open Economy Perspective*, August 2000.
- W.P. 304** **K. P. KANNAN**, *Food Security in a Regional Perspective; A View from 'Food Deficit' Kerala*, July 2000.
- W.P. 303** **K. C. ZACHARIAH, E. T. MATHEW, S. IRUDAYA RAJAN ,** *Socio-Economic and Demographic Consequenes of Migration in Kerala*, May 2000.
- W.P. 302** **K. PUSHANGADAN, G. MURUGAN**, *Gender Bias in a Marginalised Community: A Study of Fisherfolk in Coastal Kerala*, May 2000.
- W.P. 301** **P. L. BEENA** *An Analysis of Mergers in the Private Corporate Sector in India*, March, 2000.
- W.P. 300** **D. NARAYANA** *Banking Sector Reforms and the Emerging Inequalities in Commercial Credit Deployment in India*, March, 2000.
- W.P. 299** **JOHN KURIEN** *Factoring Social and Cultural Dimensions into Food and Livelihood Security Issues of Marine Fisheries; A Case Study of Kerala State, India*, February, 2000.

- W.P. 298 D. NARAYANA, K. K. HARI KURUP**, *Decentralisation of the Health Care Sector in Kerala : Some Issues*, January, 2000.
- W.P. 297 K.C. ZACHARIAH, E. T. MATHEW, S. IRUDAYA RAJAN** *Impact of Migration on Kerala's Economy and Society*, July, 1999.
- W.P. 296 P.K. MICHAEL THARAKAN, K. NAVANEETHAM** *Population Projection and Policy Implications for Education: A Discussion with Reference to Kerala*, July, 1999.
- W.P. 295 N. SHANTA, J. DENNIS RAJA KUMAR** *Corporate Statistics: The Missing Numbers*, May, 1999.
- W.P. 294 K. P. KANNAN** *Poverty Alleviation as Advancing Basic Human Capabilities: Kerala's Achievements Compared*, May, 1999.
- W.P. 293 MRIDUL EAPEN** *Economic Diversification In Kerala : A Spatial Analysis*, April, 1999.
- W.P. 292 PRADEEP KUMAR PANDA** *Poverty and young Women's Employment: Linkages in Kerala*, February, 1999.
- W.P. 291 P. K. MICHAEL THARAKAN** *Coffee, Tea or Pepper? Factors Affecting Choice of Crops by Agro-Entrepreneurs in Nineteenth Century South-West India*, November 1998
- W.P. 290 CHRISTOPHE Z. GUILMOTO, S. IRUDAYA RAJAN** *Regional Heterogeneity and Fertility Behaviour in India*, November 1998.
- W.P. 289 JOHN KURIEN** *Small Scale Fisheries in the Context of Globalisation*, October 1998.
- W.P. 288 S. SUDHA, S. IRUDAYA RAJAN** *Intensifying Masculinity of Sex Ratios in India : New Evidence 1981-1991*, May 1998.
- W.P. 287 K. PUSHPANGADAN, G. MURUGAN** *Pricing with Changing Welfare Criterion: An Application of Ramsey- Wilson Model to Urban Water Supply*, March 1998.
- W.P. 286 ACHIN CHAKRABORTY** *The Irrelevance of Methodology and the Art of the Possible : Reading Sen and Hirschman*, February 1998.
- W.P. 285 V. SANTHAKUMAR** *Inefficiency and Institutional Issues in the Provision of Merit Goods*, February 1998.
- W.P. 284 K. P. KANNAN** *Political Economy of Labour and Development in Kerala*, January 1998.
- W.P. 283 INDRANI CHAKRABORTY** *Living Standard and Economic Growth: A fresh Look at the Relationship Through the Non- Parametric Approach*, October 1997.
- W.P. 282 S. IRUDAYA RAJAN, K. C. ZACHARIAH** *Long Term Implications of Low Fertility in Kerala*, October 1997.

- W.P. 281 SUNIL MANI** *Government Intervention in Industrial R & D, Some Lessons from the International Experience for India*, August 1997.
- W.P. 280 PRADEEP KUMAR PANDA** *Female Headship, Poverty and Child Welfare : A Study of Rural Orissa, India*, August 1997.
- W.P. 279 U.S. MISRA, MALA RAMANATHAN, S. IRUDAYA RAJAN** *Induced Abortion Potential Among Indian Women*, August 1997.
- W. P. 278 PRADEEP KUMAR PANDA** *The Effects of Safe Drinking Water and Sanitation on Diarrhoeal Diseases Among Children in Rural Orissa*, May 1997.
- W. P. 277 PRADEEP KUMAR PANDA** *Living Arrangements of the Elderly in Rural Orissa*, May 1997.
- W. P. 276 V. SANTHAKUMAR** *Institutional Lock-in in Natural Resource Management: The Case of Water Resources in Kerala*, April 1997.
- W.P. 275 G. OMKARNATH** *Capabilities and the process of Development* March 1997.
- W.P. 274 K. PUSHPANGADAN, G. MURUGAN** *User Financing & Collective action: Relevance sustainable Rural water supply in India*. March 1997.
- W.P. 273 ROBERT E. EVENSON, K.J. JOSEPH** *Foreign Technology Licensing in Indian Industry : An econometric analysis of the choice of partners, terms of contract and the effect on licensees' performance* March 1997.
- W.P. 272 SUNIL MANI** *Divestment and Public Sector Enterprise Reforms, Indian Experience Since 1991* February 1997.
- W.P. 271 SRIJIT MISHRA** *Production and Grain Drain in two inland Regions of Orissa* December 1996.
- W.P. 270 ACHIN CHAKRABORTY** *On the Possibility of a Weighting System for Functionings* December 1996.

## **BOOKS PUBLISHED BY THE CDS**

### **Biodiversity, Sustainable Development and Economic Analysis**

J. Hans B. Opschoor

CDS, 2004, Rs. 100/\$11

### **Plight of the Power Sector in India: Inefficiency, Reform and Political Economy**

K.P. Kannan and N. Vijayamohanan Pillai

CDS, 2002, Rs. 400/\$40

### **Kerala's Gulf Connection: CDS Studies on International Labour Migration from Kerala State in India**

K.C. Zachariah, K. P. Kannan, S. Irudaya Rajan (eds)

CDS, 2002, pp 232, Hardcover, Rs. 250/\$25

### **Performance of Industrial Clusters: A Comparative Study of Pump Manufacturing Cluster in Coimbatore (Tamil Nadu) & Rubber Footwear Cluster in Kottayam (Kerala)**

P. Mohanan Pillai

CDS, 2001, pp 158, Paperback, Rs. 175/\$18

### **Poverty, Unemployment and Development Policy : A Case Study of Selected Issues With Reference to Kerala**

United Nations, 2000 (reprint), pp 235

(available for sale in India only), Rs. 275

### **Land Relations and Agrarian Development in India: A Comparative Historical Study of Regional Variations**

Sakti Padhi

CDS, 1999. pp 335, Hardcover, Rs. 425/\$48

### **Agrarian Transition Under Colonialism: Study of A Semi Arid Region of Andhra, C.1860-1900**

GN Rao

CDS, 1999. pp 133, Paperback, Rs. 170/ \$19

### **Property Rights, Resource Management & Governance: Crafting An Institutional Framework for Global Marine Fisheries**

John Kurien

CDS & SIFFS, 1998. pp 56, Paperback, Rs. 50/ \$10

**Health, Inequality and Welfare Economics**

Amartya Sen

CDS. 1996. pp 26, Paperback, Rs. 70/ \$ 10

**Industrialisation in Kerala: Status of Current Research and Future Issues**

P Mohanan Pillai & N Shanta

CDS. 1997. pp 74, Paperback, Rs. 110/ \$ 12

**CDS M.Phil Theses (1990/91-1993/94): A Review Vol.II**

T T Sreekumar

CDS. 1996. pp 99, Paperback, Rs. 120/\$ 14

**Trends In Agricultural Wages in Kerala 1960-1990**

A A Baby

CDS. 1996. pp 83, Paperback, Rs. 105/ \$ 12

**CDS M.Phil Theses (1975/76-1989/90): A Review Vol.1**

G N Rao

CDS. 1996. pp 162, Paperback, Rs. 155/ \$ 18

**Growth of Education in Andhra - A Long Run View**

C Upendranath

CDS. 1994. pp 158, Paperback, Rs. 135/ \$ 15

**Growth of Market Towns in Andhra: A Study of the Rayalseema Region C 1900-C.1945**

Namerta

CDS. 1994. pp 186, Paperback, Rs.125/ \$ 14

**Floods and Flood Control Policies: an Analysis With Reference to the Mahanadi Delta in Orissa**

Sadhana Satapathy

CDS. 1993 pp 98, Paperback, Rs. 110/\$ 12

**Growth of Firms in Indian Manufacturing Industry**

N Shanta

CDS. 1994. pp 228, Hardcover, Rs. 250/ \$ 28

**Demographic Transition in Kerala in the 1980s**

K C Zachariah, S Irudaya Rajan, P S Sarma, K Navaneetham,  
P S Gopinathan Nair & U S Mishra,

CDS. 1999 (2<sup>nd</sup> Edition) pp 305, Paperback, Rs.250/ \$ 28

**Impact of External Transfers on the Regional Economy of Kerala**

P R Gopinathan Nair &amp; P Mohanan Pillai

CDS 1994. pp 36, Paperback, Rs.30/ \$ 10

**Urban Process in Kerala 1900-1981**

T T Sreekumar

CDS. 1993. pp 86, Paperback, Rs.100/ \$ 11

**Peasant Economy and The Sugar Cooperative: A Study Of The Aska Region in Orissa**

Keshabananda Das

CDS. 1993. pp 146, Paperback, Rs.140/ \$ 16

**Industrial Concentration and Economic Behaviour: Case Study of Indian Tyre Industry**

Sunil Mani

CDS. 1993. pp 311, Hardcover, Rs. 300/ \$ 34

**Limits To Kerala Model of Development: An Analysis of Fiscal Crisis and Its Implications.**

K K George

CDS. 1999 (2<sup>nd</sup> edition) pp 128, Paperback, Rs. 160/ \$ 18**Indian Industrialization: Structure and Policy Issues. (No Stock)**

Arun Ghosh, K K Subrahmanian, Mridul Eapen &amp; Haseeb A Drabu (EDs).

OUP. 1992. pp 364, Hardcover, Rs.350/ \$ 40

**Rural Household Savings and Investment: A Study of Some Selected Villages**

P G K Panikar, P Mohanan Pillai &amp; T K Sundari

CDS. 1992. pp 144, Paperback, Rs. 50/ \$ 10

**International Environment, Multinational Corporations and Drug Policy**

P G K Panikar, P Mohanan Pillai &amp; T K Sundari

CDS. 1992. pp 77, Paperback, Rs.40/ \$ 10

**Trends in Private Corporate Savings**

N Shanta

CDS. 1991. pp 90, Paperback, Rs. 25/ \$ 10

**Coconut Development in Kerala: Ex-post Evaluation**

D Narayana, K N Nair, P Sivanandan, N Shanta and  
G N Rao

CDS. 1991. pp 139, Paperback, Rs.40/ \$ 10

**Caste and The Agrarian Structure**

T K Sundari

Oxford & IBH. 1991. pp 175, Paperback, Rs.125/ \$ 14

**Livestock Economy of Kerala**

P S George and K N Nair

CDS. 1990. pp 189, Hardcover, Rs. 95/ \$ 10

**The Pepper Economy of India (No Stock)**

P S George, K N Nair and K Pushpangadan

Oxford & IBH. 1989. pp 88, Paperback, Rs. 65/ \$ 10

**The Motor Vehicle Industry in India  
(Growth within a Regulatory Environment)**

D Narayana

Oxford & IBH. 1989. pp 99, Paperback, Rs. 75/ \$ 10

**Ecology or Economics in Cardamom Development  
(No Stock)**

K N Nair, D Narayana and P Sivanandan

Oxford & IBH. 1989. pp 99, Paperback, Rs. 75/ \$ 10

**Land Transfers and Family Partitioning**

D Rajasekhar

Oxford and IBH. 1988. pp 90, Hardcover, Rs. 66/ \$ 10

**Essays in Federal Financial Relations**

I S Gulati and K K George

Oxford and IBH. 1988. pp 172, Hardcover, Rs. 82/ \$ 10

**Bovine Economy in India**

A Vaidyanathan

Oxford & IBH. 1988. pp 209, Hardcover, Rs. 96/ \$ 11

**Health Status of Kerala**

P G K Panikar and C R Soman

CDS. 1984. pp 159, Hardcover, Rs.100/ \$ 11 & Paperback, Rs. 75/ \$ 10









This work is licensed under a  
Creative Commons  
Attribution – NonCommercial - NoDerivs 3.0 Licence.

To view a copy of the licence please see:  
<http://creativecommons.org/licenses/by-nc-nd/3.0/>