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Shared Control Of Natural Resources (Scor): A Market Oriented Watershed Management Strategy

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**INSTITUTIONAL FRAMEWORK
FOR
LARGE WATERSHED HUMAN SETTLEMENTS**

BY

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INSTITUTIONAL FRAMEWORK FOR LARGE WATERSHED HUMAN SETTLEMENTS

ABSTRACT

Colonial interventions of disturbed the traditional institutions of water and land use and this led to the creation of state-sponsored colonization schemes even in Mahaweli areas. Further, System by System development paid less attention to the settler community. With the introduction of the Participatory Irrigation Management self - management at the tertiary canal level and joint management at the System level evolved in each System. Commercialization process paved the way to the private sector and farmer associations to participate in System development. Transfer of functions of the Mahaweli Authority narrowed-down the scope of authority and led to a new concept of river basin management.

1. Historical Background

1.1 The British colonial policy based on neo-classical economics had a lasting impact on agrarian conditions in Sri Lanka. The main aspect of colonialism was to make use of natural resources, namely land and water, to suit their colonial policy. The Collebroke-Cameron reforms of 1832 abolished the traditional institutions of compulsory labour (rajakariya) and hereditary headmanship. In 1840, the Crown Lands (Encroachment) Ordinance converted at a stroke nearly 90 per cent of the land in this country to Crown property by law. These lands were sold not only to the British developers but also to Sri Lankan entrepreneurs for planting tea, rubber and coconut. The expansion of rubber might have caused the greatest hardship to peasants because these plantations were established in the most densely populated south-western part of the island. Irrigation was one of the main sectors affected by the reforms. In the mean time, colonial officers introduced the Paddy Lands Irrigation Ordinance of 1856 and entrusted the responsibility for irrigation development to the Government Agents (GA). In 1900, with the establishment of Irrigation Department (ID), the functions handled by the GA were transferred to the Director of Irrigation. Introduction of Government mechanism to implement irrigation programmes disturbed the ancient customs, traditions and practices in the paddy sector. The Land Development Ordinance of 1935 was enacted for the creation of a land-owning peasantry class in the Dry Zone areas. In this Zone, large areas of land were available without water and the colonial authorities decided to establish a State Department (eg. ID) and entrusted it the task of providing gravity water supply to the selected irrigation schemes in the Dry Zones. The manner of using of water and operating the canal system were prescribed in the Irrigation Ordinance of 1946 and the responsibility of implementing of this Ordinance was vested in the ID. With this State intervention of allocating water to the dry lands, value of such land increased. In other words, two natural resources were brought into use for rice production through peasant farmers.

1.2 From the 1850s to the 1940s, the British rulers concentrated on restoration of the ancient irrigation works. The Gal Oya multi-purpose river basin development project combining irrigation, agriculture, power and industries was commenced in 1949 and the Gal Oya Board was formed as the implementing Agency of the new Project. This was influenced by the American experience and model of the Tennessee Valley Authority. With this experience, construction of large scale new irrigation schemes were started in Sri Lanka.

1.3 In the 1930s, state-sponsored colonization schemes were started with a heavy incentive package to shift the Wet Zone population to the malaria infested and uncultivated jungle lands in the Dry Zone. Even at present, the Government is spending large amounts of money to continue the same 'colonization model' with strong intervention of Government Agencies. As a result, the settlers depend on the Agency staff mainly for the supply of irrigation water, agricultural input supply and output distribution and for their other day-to-day needs. The planners paid more emphasis on construction and settlement and not much thought was given to the long-term maintenance of the canal system. Accordingly, request foreign capital assistant every ten years for rehabilitation has become normal practice in major irrigation schemes.

2. Settlement Tenure

2.1 Although under the Crown Lands Ordinance State lands were sold at a nominal sum to the developers, under the LDO, a rigid State-sponsored tenure system was designed to protect the peasants and prevent large landholders from gaining access to large tracts of land. During the post-independence period, population pressure on cultivable land rapidly increased, and State control of land alienation was also very high and as a result, Paddy Lands Act (1958) and the Land Reform Law No: 1 (1972) were introduced ensure security to tenure to tenant cultivators and to fixe a ceiling on private ownership of agricultural lands respectively.

2.2 Land permits were given to the settlers on a provisional basis and their permits could be cancelled if violations such as non-development of land, non-residence, non-owner cultivator and non-adherence to water management rules were detected. Further, the ownership could be transferred to the spouse or to the eldest son. According to the land grants (eg. Swarna Bhoomi & Jaya Bhoomi), the tenure system is very close to a free hold title. However, the grantees can sell the Jaya Bhoomi land only to another peasant farmer and this is to prevent changing the land ownership from the peasant class to another class of people in the rural areas or in the urban centres. It is no secret that unauthorized subletting, mortgaging, leasing, sharecropping and extensive fragmentation is taking place in all settlements. These aspects of settlement tenure, both in policy and practice, are not entitled to (a) rights to water, (b) agricultural credit from regional banks and (c) requisite services from Agency staff. Although the settlement planners have proposed 'family farming', in Mahaweli Systems, at present, this aspect of farming is not practised.

3. Features of Mahaweli Watershed

3.1 Sri Lanka has a total land area of about 6.5 million ha. of which about 1.6 million ha. have been cultivated permanently. Shifting cultivation is practiced on about 1.1 million ha. Tree crops account for about 900,000 ha. and paddy for about 600,000 ha. About 80 per cent of paddy lands is under the command of irrigation systems. To date, 302,035 ha. of irrigated land are served by 197 major schemes including 85,700 ha. under Mahaweli Systems (Table 1). The multi-purpose Mahaweli Development Programme was the Government's single largest investment scheme during the late 1970s and in 1980s. In its peak year (1984), 30 per cent of total public capital investments and 92 per cent of all investment were made in the irrigation sector. In the Mahaweli Project, human settlement schemes were started not only in the downstream areas but also in the upper catchment of the Mahaweli, namely Kotmale, Victoria, Randenigala and Rantambe. However, this paper will mainly focus attention on Systems B, C, H and Walawa.

Table 1: Irrigation Systems in Sri Lanka

No.	Implementing Agency	Scale of Irrigation System	Total Command Area (Ha.)	%	Average Command Area (Ha.)	No. of Projects/ Systems	Annual Av. Yield Per Ha.
1	IMD	Major (1)	157,134	29	4,762	33(3)	4.1
2	MASL	Major	85,700	16	21,425 ha/Scheme	4(4)	4.3
3	ID (5)	Major	59,201	11	370 ha/Scheme	160	-
4.1	DAS Legal Requirement Fulfilment	Minor (2)	87,074	16	8.8 ha/Scheme	95(Anicuts)	1-9
4.2	Custodian		149,589	28	16.1/ha Scheme	294(Tanks)	1-9
TOTAL			538,698	100			

Source: D/IMD, Co/DAS, ID &IMI

(1) Major - More than 80 ha.

(2) Minor - Less than 79 ha.

(3) Total No. of Projects 37. Active No. of Projects 33

(4) Systems B, C, H & Walawa

(5) Main Activities are: rehabilitation and construction. Field Level implementation done through the DCs in consultation with PSs.

DAS - Dept. of Agrarian Services

MASL - Mahaweli Authority of Sri Lanka

ID - Irrigation Dept.

DS - Divisional Secretary

PC - Provincial Council

3.2 The basic feature of the Mahaweli Master Plan (UNDP/FAO-1969) was that the Project area was divided into 13 engineering, irrigation, landuse and settlement Systems and a new network of canals providing gravity irrigation for each System. This type of System by System planning and implementing approach is not considered as river basin development and it is focused on network of major reservoirs and trans basin diversion canal system. In other words, these newly developed Mahaweli land areas can be identified as created watersheds in selected river basins.

3.3 In the Dry Zone, for the undulating terrain, a traditional irrigation network have been designed with the provision of village tanks and cascade system but this approach was not taken into consideration in the Mahaweli Systems. The irrigation System in the Mahaweli Project was originated through the experience gained in very large rice growing areas abroad such as the Thailand central plane which is extensive and generally of terrain whercas in Mahaweli Systems the land surface is not flat but it is undulating with avcragc slopes of 3 per cent. As a result, the canal system was located on the highly permeable upper ridges of the valleys and the water losses of this soil type is very high. For example, in Walawa Chandrika Wewa Block the conveyance loss (CMC) was 35 per cent of the total issues.

3.4 The settlement planners recommended a three tier hierarchy of functions and the settlement structure was designed on functional classification of centres and was based exclusively on population (Table 2). The settlement layout provided for rural road networks with individual entry to each homestead as well as to each paddy land. Therefore, social harmony did not advance among the settlers and they always considered themselves only as individual family units. Although the administrative Unit was planned at the initial stages for 250 families and the administrative Block for 2,000 families, in view of the fact that much administrative work would be involved at the early settlement stages, yet with the passage of time when the work load of Unit and Block Managers lessened, it was possible to amalgamate the Units and the Blocks to accommodate approximately 1,000 and 5,000 families respectively.

3.5 The Mahaweli Authority of Sri Lanka (MASL) was created with a highly centralized administrative system to manage massive construction and settlement programmes. The settlers were from different backgrounds, such as landless poor families. Selected on an electoral basis, evacuees from Mahaweli construction sites and second generation families from early settlement schemes. Due to these cosmopolitan features of the Mahaweli settlers they could not act as a group or even as an irrigation society in the carly stages of the Mahaweli Project. As a result,, in 1972, the Sogreah/MDB Report recommended a Community Development (CD) programme to promote social cohesion among the settlers. In the Dry Zone, the small tank system and the tank cascade system were very efficient for the community management of water allocation and the maximum use of water from the upper to the lowest level in the valley. In other words, farmer participation in: (a) the water and (b) the operation and maintenancce (O&M) were not considered in the CD programme. On the other hand, on early 1990s, there were 13 different divisions, in the MASL, to implement various types of activities within (each System) of each watershed (Table 3).

4 Water and Institutional Framework

4.1 A complex canal system has been designed to supply irrigation water to thousands of farm-families to fulfill their individual requirements. This type of water delivery system will operate successfully only if each farmer cooperates with the water Agency. In the early stages of Mahaweli (1970s), turn-out groups or field canal groups (FCGs) were formed at the field canal (FC) level with 15-20 farm families. These FCGs, arranged on the basis of hydrological boundaries bind these farmers solidly with a common cause and they are combined through their representing at grass-route level by leaders to form higher level organizations for the management of the irrigation system. As they are concentrated at the FC level, some farmers diverted the maximum possible water into their farms at the upper level (Distributory Canal level) of the canal system. Therefore, in the early 1990s, Mahaweli Water Users Associations (WUAs) were established as Non Governmental Organizations (NGOs) within the hydrological limits, based on the Distributory Canal. The centralized management was changed and farmer level and hydrological level NGOs were introduced and this was the changing point in the MASL activities.

4.2 The number of farmers at the FC level is far too small to sustain a viable WUA and at the main and branch level it would be difficult to form and develop an institution with such a numbers of farmers and that would not serve the needs of water distribution or of canal maintenance. At the D- canal level, the average area would be 150-200 ha of irrigable land and the same number of farm-families. The total irrigable area, the number of FCGs and WUAs in the respective Systems are shown in Table 2.

Table 2: Present Status of WUAs

System	Irrigable Area	No of FCGs	No of WUAs
B	19,200	1,673	124
C	20,800	1,921	86
H	31,500	2,516	226
Walawe	14,200	1,386	165
Total	85,700	7,496	701

Source: IDU Statistical Book, 1997

5 Need for Institutional Mechanism

5.1 As was pointed out earlier, the centralized administrative system of the MASL, and the physical lay out of the irrigation network failed to develop farmer co-operation and local level farmer participation and resource mobilization was not effective. Because of these reasons, it has been decided to introduce Participatory Irrigation Management (PIM) in all major irrigation Systems under the MASL. Such participation is effected

through a sharing of responsibilities between the Agency and the WUAs on a mutually acceptable basis.

5.2 The work involved in implementing the above activities (Para 4) is being executed through the Institutional Development Unit (IDU) in the Mahaweli Economic Agency. In early 1992, the staff for this Unit was drawn from the existing staff of the MASL. DI Units were established in the Head Office, in respect of each Project Office and in respect of each Block of each Project. Organizing of farmers requires a carefully planned programme and the fielding of change agents directed by experienced ID staff. In order to perform the role of change agent in the transformation to PIM, educated youth from amongst the settlers' second generation have been selected and they are designated Institutional Organizer Volunteers (IOVs). These volunteers are paid an allowance for incidental expenses and given a bicycle for official transport. The catalyst programme has already been terminated with effect from December 1997.

6 Participation Through Coordination Committees

6.1 A WUA area covers only a small part of the irrigation System but can be as large as 15,000 hectares. Further, the activities within the WUAs directly affect the performance of the main and branch canals which are inter-dependent. If the System is to be well-managed, there should be an organized inter-connection among all WUAs mainly for water management and O&M of the whole System. These Committees operate at three administrative levels namely, Unit, Block and Project levels with the WUAs representatives in each Committee being in a majority. This Committee system was empowered to decide on such questions as water distribution, cropping pattern, prioritization of canal maintenance and improvement works and to participating in monitoring and evaluation of project activities. As all these Committees meet regularly it promotes better understanding between the Agency staff and the farmers and also help the Agency staff to identify and resolve problems in a systematic manner, it becomes possible to progressively increase the participation of WUAs in the overall management of the System.

6.2 The most significant benefit derived from participation in the Coordination Committees is the development and strengthening of a WUA. The effectiveness of the Committees would necessarily improve as the WUAs representatives would develop maturity through participation in these Committees. The success of the Committee system will largely depend on the capabilities of the farmers and their degree of participation in the deliberations of the meetings. Therefore, it is important to monitor regularly the progress of effective participation of the Agency staff and the WUA representatives at these meetings. In 1992, the Irrigation Ordinance was amended and legal status was provided for the Project Management Committee and this Committee system will act as the 'basin council' of the Mahaweli River Basin Authority. Further, through these Committees 'Joint Management' was introduced to the MASL management.

7 Turnover Programme

7.1 The turnover of Distributory and Field (D&F) canals to WUAs for O&M is being considered as the package of PIM. The main components of the PIM are: (a) the establishment and development of sustainable WUAs capable of participating in the management of the System (b) coordination of all activities of the Agency and the WUAs through the Coordination Committees and (c) the O&M of the D&F canals (tertiary irrigation canals) by WUA and the O&M of the Main and Branch canals by the Agency.

7.2 In the first phase, the WUAs take over management responsibilities with technical and financial support from the Agency. When the Agency and WUAs agree that both parties are ready for 'joint operation', they sign a Memorandum of Understanding under which the roles and responsibilities of both parties are clearly defined in respect of O&M.

7.3 A second phase, is reached when the WUAs are able to self-finance O&M through funds generated and resources mobilized by themselves, but with continued technical assistance from the agencies. Through this process 'self-management' was introduced at the tertiary level of the canal system. At that phase, all Government funds allocated for the maintenance of the System could be diverted to better O&M of the Main and Branch canals.

8 Farmer Companies

8.1 Following on the New Agricultural Policy of the Ministry of Agriculture and Lands, action has been already taken to set in motion the necessary institutional changes by organizing WUAs on the lines of Farmer Companies and these Companies were registered under the provision of the Companies Act No. 17 of 1982. The present degree of contribution of agriculture to Gross National Product (GNP) and the contribution of the paddy production to the GNP was on the decrease from 1982 to 1996 (Table 3).

Table 3: Agriculture and Paddy Production - Contribution to GNP

Description	Unit	1982	1992	1996
Contribution of Agriculture to GNP	%	26	21	18
Contribution of Paddy Production to GNP	%	5.7	4.2	3.0

Source: Dept. of Census & Statistics & Annual Report, Central Bank

Therefore, it is important to take remedial action to improve productivity and to ensure a reasonable price to the farmers. Measures such as increasing productivity, reducing cost of production, reducing post-harvest losses, value addition and diversification, development of local and foreign markets are some of the responsibilities of this new

Farmer Companies. In other words, the main objective of these Companies is commercialization of small farm agriculture. The farmers and the WUAs become shareholders of the Company. The appropriate area of authority of the Company should not be more than 3,000 ha. and therefore, the Block Manager's area is the most suitable area to form these Companies.

8.2 In early 1997, the National Development Council (NDC) prepared and submitted a Policy Paper on a pilot project for implementation in the irrigated agriculture areas. Consequent to a decision by the NDC, two pilot projects were undertaken, one at Ridi Bendi Ela (non Mahaweli area) and one at Chandrika Wewa (Mahaweli area) to pilot test different objectives of the policy paper which are: (a) start commercial activities (b) handover O&M activities (c) undertake agricultural extension and research (d) develop company's assets base (e) pilot testing of water rights policy (f) pilot testing of land titles for granting freehold. In early 1998, Chandrika Wewa (Janatha) Farmer Company was registered and the above activities have already been started.

9 Transfer of Functions to Government and Local Institutions

9.1 At present, one of the main function of the MASL is to transfer essential functions such as education, health, postal, main roads, drinking water supply to Government and Local Institutions and rural roads, and town administration, to the local institutions, namely, Provincial Councils and Pradeeshiya Sabhas.

9.2 The above transferring sector with handing over of process is not only limited to the Government sector but also to the commercial sector with handing over of commercial allotments to the private traders, provision of sites for state banks and private banks. Cultivation in Mahaweli Systems is not limited to small farmers but private sector investment is also encouraged. In System C, Informatics Agrotech (Pvt) Ltd. is cultivating highland crops on 500 ha and they have planned to invest nearly Rs. 100 million in 1999.

10 Conclusions

10.1 The above processes can not be ascribed to one specific Institutional Framework but it has evolved during the past several decades. In future, the MASL will act as a facilitator to achieve future goals and objectives. With the downsizing of the MASL, self-management, participation and commercialization will be the key roles for the new institutions in the Mahaweli areas.

10.2 Due to the magnitude of the Mahaweli watersheds, the water users' demand has increased not only for surface irrigation water but also for domestic, industrial, power, fisheries, environmental and recreational purposes, within their own areas as well as in the adjacent areas of these watersheds. Increasing usage of pesticides and provision of irrigation facilities for Dry Zone areas create environmental and vector borne health hazards respectively. Under these circumstances, an effective institutional framework is needed for productive and efficient water use among different water users. Further, the small and large scale water users are scattered throughout the river basins. Therefore,

managing water resources in Mahaweli areas should not be limited only to the watershed and it is necessary, to introduce an integrated approach of 'river basin management'. In Mahaweli areas, there are large river basins namely, Mahaweli Ganga, Kala Oya and Walawe Ganga. In these basins, there are several stakeholders and their rights have to be safeguarded. Therefore, it is necessary to identify water control areas in those river basins, appoint water managers to plan future strategies of water allocation and issue concession titles and allocate water rights for different water users. The above institutional framework has to be introduced in a professional manner to the water users as well as to the provincial authorities within the river basin.

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Catchment Water balance Studies

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on

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Abstract

In the dry zone of Sri Lanka Catchment water balance has shown a contribution to water table by rain only in wet months (positive values in the last row of table 3) of the year. In dry months continuous depletion of soil moisture is clearly evident (negative values in the last row of table 47 except during first few weeks).

It could be generalised stating that the recharging of the Ground Water table in the Dry zone of Sri Lanka takes place in the wet season by rain and by heavy irrigations in the Dry season.

Introduction

This paper report on a hydrologic study undertaken in the Catchment "C" project, in the dry zone research agricultural station at Mahailuppallama. This catchment bears well drained Reddish Brown Earth soils, Imperfectly drained Reddish Brown earth soils, and their drainage associate the Low Humic Gley soils. Full catchment (12.2 Ha) was cropped on both graded and bench terraces. The catchment has an average slope of 2% and was developed to practice Surface Irrigation. Runoff from the well drained and Imperfectly drained area were monitored separately from that of the poorly drained area.

Materials and Methods

Water budget or storage equation was used in this study.

$$E_T = P + I \pm U - O \pm S \quad (\text{Wilson, 1975})$$

- Where
- E_T = Evapotranspiration
 - P = Total precipitation
 - I = Surface Inflow (ie. Irrigation if any)
 - U = Underground outflow
 - O = Surface outflow
 - S = Change in Storage (Both surface and sub-surface)

This study was done with a full catchment bearing crops. During Maha 1978/79 the poorly drained member was restricted only for paddy whilst the imperfectly drained and well drained members were cropped with Maize, Soybean, Chillies and Paddy.

In Yala 1979 the whole catchment was cropped with Cowpea and Soybeans. The surface outflow from the well drained and Imperfectly drained area was measured using a Parshallmeasuring flume (0.92 meters wide) filled with an automatic water level recorder. The subsurface inflow and outflow in the catchment was not taken into consideration.

Four nonrecording rain gauges were installed at different points according to Theissen polygon method to obtain mean rainfall in the catchment. All the environmental weather parameters were obtained from Mahailuppallama Agromet Station. These data were used in modified Penmann formula (FAO, 1977) to estimate E_t grass. The stage by stage crop factors were used to obtain E_T crop. Irrigation schedule was based on soil and crop data for Maha 1978/79 (Table 1), and for Yala 1979 (Table 2).

Table 1 Soil and Crop data for Maha 1978/79

Crop	Growth Stages			
	1	2	3	4
Paddy (Variety - 75 - 150)	20 days	30 days	30 days	20 days
Assumed root depth	0.31 m	0.46 m	0.46 m	0.46 m
Depletion level	25%	25%	25%	25%
CSMD (m)	0.0102	0.0153	0.0153	0.0153
Soybean (Variety - Pb-1)	15 days	20 days	30 days	20 days
Assumed root depth	0.31 m	0.61 m	0.92 m	0.92 m
Depletion level	50%	75%	75%	75%
CSMD (m)	0.0203	0.0610	0.0910	0.0910
Maize (Variety Thai - Compositae)	20 days	35 days	45 days	30 days
Assumed root depth	0.31 m	0.61 m	0.61 m	0.61 m
Depletion level	50%	50%	50%	50%
CSMD (m)	0.0203	0.0406	0.0406	0.0406
Chillies (Variety - MI-1)	20 days	35 days	45 days	30 days
Assumed root depth	0.31 m	0.61 m	0.61 m	0.61 m
Depletion level	50%	50%	50%	50%
CSMD (m)	0.0203	0.0406	0.0406	0.0406

CSMD = Cumulative Soil moisture depletion.

Table 2 Soil and Crop data for Yala 1979

Crop	Growth Stages			
	1	2	3	4
Soybean (Variety Pb-1) and } Cowpea (MI-35) }-	15 days	20 days	35 days	20 days
Assumed rooting depth	0.31 m	0.61 m	0.92 m	0.92 m
Depletion level	75%	75%	75%	75%
Irrigation depth	0.0305 m	0.0610 m	0.0914 m	0.0914 m
Assumed pan factor required (to account for variation in Crop E_T with growth stages)	0.65	0.85	1.05	0.75
Cumulative pan evaporation value for irrigation timing	0.047 m	0.0716 m	0.0871 m	0.122 m

Table 3 Catchment "C" Water Balance Data - 1978/79 Maha

Standard week number	42	43	44	45	46	47	48	49	50	51	52	01	02	03	04	05	06	07	08	Total
Rainfall Ha. m	1.0	1.67	1.99	0.17	0	3.17	0.03	0.31	0.35	0.1	1.27	0	0	0	0.09	0	0	0	0.21	10.36
Irrigation Ha. m	0	0	0	0	0.1	0.2	0	0	0	0.1	0	0	0.04	0.09	0	0.07	0.03	0.02	0	0.65
E_T loss Ha. m	0.33	0.22	0.18	0.28	0.31	0.27	0.39	0.31	0.27	0.28	0.28	0.33	0.34	0.36	0.32	0.39	0.34	0.38	0.34	5.92
Runoff Ha. m	0.15	0.84	0.89	0.01	0	2.52	0	0	0	0	0.84	0	0	0	0	0	0	0	0	5.25
Surface Balance	+ 0.52	+ 0.61	+ 0.92	- 0.12	- 0.21	+ 0.58	- 0.36	0	+ 0.08	- 0.08	+ 0.15	- 0.33	- 0.30	- 0.27	- 0.23	- 0.32	- 0.31	- 0.36	- 0.13	- 0.16

- 11.01

- 11.17

Note: Of the total inputs 53.6% was as E_T
 Of the total inputs 47.6% was Runoff
 Of the total rainfall 50.73% was as Runoff

The change in soil moisture storage before and after the beginning of the season has resulted in an overall negative balance.

For all crops except paddy the ridge and furrow system of irrigation was used. Streams were cut back ten feet before the end of the furrow to achieve high application efficiencies. A furrow length of 46 meters at 0.5 percent slope was used in both well and imperfectly drained soils.

In the case of paddy for operational easiness 31 meters long 0.92m wide borders were used. In Maha 1978/79 only a few irrigations were required.

Results and Discussions

Water balance for Maha 1978/79 are reported (Table 3). A positive balance indicates replenishment of the water table which was seen in rainy weeks.

The overall negative balance could probably be due to the changes in soil moisture content of the profile over the season, Evapotranspiration and runoff losses were nearly equal. Applicability of this data for runoff prediction in the dryland areas is limited due to high antecedent moisture contents in the soil caused by irrigation.

1979 Yala water balance results are also reported (Table 4). Overall positive balance in the season confirms the accuracy in scheduling practice adopted.

Conclusions

Of the total inputs 53.6% was lost as Evapotranspiration by crops whilst 47.6% was lost as surface runoff. As shown in the overall balance, irrigation caused no runoff. Thus 50.73% of the total rainfall was yielded as surface outflow from the catchment.

Unlike in the Maha 1978/79, Yala 1979 yielded no surface runoff. In Maha 78/79 with a crop combination of Maize, Soybean, Chillies and Paddy (2:2 1/2:1:2 1/2), 0.2 Ha. were managed with 0.1233 Ha.m of water whilst with a crop combination of Cowpea and Soybean (1:1) 0.17 Ha. were managed with 0.1233 Ha. m of water. Thus for the above cropping pattern duty of water in Maha is 1.23 time greater than that of yala season.

Acknowledgement

The author acknowledge with thanks Dr. Earnest Abeyratne, Dr. C.R. Panabokke, Dr. G.W.E. Fernando, Mr. J.A. Lewis, Dr. W.D. Joshur and Dr. S. Somasiri who were the pioneering mentors of this study and Mr. K.P. Alfred who spear headed the field level management.

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Table 4 Catchment "C" Water Balance Data 1979 Yala

Standard week number	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	Total
Rainfall Ha. m	0.01	0	0	0	0.02	0	0.01	0	0	0.01	0.13	0	0	0	0	0.18
Irrigation Ha. m	0.74	0.41	0.74	0.49	0.31	0.36	0.43	0.35	0.34	0.35	0.38	0.15	0.39	0.23	0.14	5.81
E _r loss Ha. m	0.4	0.15	0.15	0.3	0.27	0.27	0.45	0.46	0.48	0.43	0.41	0.2	0.2	0.21	0.2	4.58
Runoff Ha. m	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Balance	+ 0.35	+ 0.26	+ 0.59	+ 0.19	+ 0.06	+ 0.09	- 0.01	- 0.11	- 0.14	- 0.07	+ 0.10	-0.05	+ 0.19	+ 0.02	- 0.06	+ 1.41

- 5.9

- 4.5

SHARED CONTROL OF NATURAL RESOURCES (SCOR)
- A MARKET ORIENTED WATERSHED MANAGEMENT STRATEGY-
- C. M. Wijayarathna and Kumudini Jayawardena¹ -

Executive Summary

This paper examines the concepts, strategy and outputs of a Participatory Action Research Project on Watershed Management. The Project, Shared Control of Natural Resources, SCOR, hypothesized that a package of measures such as crops/livestock/fish production, appropriate soil and water conservation practices and user rights connected to economic benefits, is more effective in conserving natural resources. The package, formulated jointly by professionals and resource users, focused on the needs of small farmers/users such as an appropriate cash flow and profits as well as non monetary benefits in return for action on conservation. With watersheds as basic units, SCOR operated at multiple levels. At the lowest level, the sub- or micro-watershed, which typically included a couple of villages, the local officials, resource users, and SCOR catalysts/change agents, interacted to understand the present resource use pattern, developed a vision for the future and translated it into action plans followed by action and monitoring and evaluation. The Project's experiences have been utilized in Policy formulation, specially in the establishment of Farmer Companies.

1. INTRODUCTION – THE PROJECT DESIGN

This paper examines an **action-research** project on participatory management of natural resources in a watershed context. It was aimed at *developing and testing* a holistic approach to integrate environmental and conservation concerns with production goals. The project, namely the Shared Control of Natural Resources, SCOR, funded by the United States Agency for International Development (USAID) has been implemented (September 1993 to October 1998) by the International Water Management Institute (IWMI) in collaboration with the Government of Sri Lanka, resource users and selected Non-Governmental Organizations (NGOs). The project concepts and strategies were developed through a unique participatory project design process spearheaded by a core group of experts including senior policy makers and other Government staff associated with the management of land and water resources of Sri Lanka. The design process included a review of past experiences in the management of natural resources in Sri Lanka and elsewhere, a series of consultations with a cross section of resource users, government officials at various levels, development banks and representatives of non-governmental organizations (NGOs).

The SCOR design was built on the progress already made in Sri Lanka and elsewhere in participatory irrigation management and social forestry. In Sri Lanka, as in many other

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developing countries, there is an urgent need for more intensive, but environmentally appropriate utilization of its natural resources base, particularly land and water resources, for profitable and sustainable agricultural and related industrial production. There is an increasing body of evidence from Sri Lanka and other countries that farmers, even those with very small holdings make production responses to the economic environment within which they carry out their farming activities. *These responses are largely influenced by the availability of competitive markets, production inputs and other support services; the availability of information on profitable enterprises, production technologies, value-added production and competitive markets; the degree of control the users can exercise over their means of production -- such as the tenurial security or usufructuary rights-- etc.* These facts need to be considered in designing strategies to integrate conservation with production. For example, profitability of conservation practices to the small farmer is an important determinant in the adoption process. On this basis the design team hypothesized that the natural resources base, particularly land and water, can be conserved and their productivity could be sustained if environmental and conservation concerns are incorporated into the production process.

PROJECT CONCEPTS, STRATEGY AND OBJECTIVES.

The prime **goal** of this **action-research** project was to develop and test strategies to increase the sustainable productivity of the natural resources base in Sri Lanka in ways that will equitably improve the livelihood of the people now and in the future with due regard to the *environment*. A participatory analysis of constraints to the potential for sustainable increase in productivity of land and water resources paved the way to SCOR concepts and strategy. Four types of major constraints have been identified in relation to environmentally appropriate increases in production.

- (a) The lack of a *production environment* (including profitability, security of tenure and local control of resources) that motivates the resources user to effectively manage the combination of resources essential to optimize economic production while conserving land and water resources
- (b) The lack of an effective combination of technology, skills, incentives and (mechanisms to enforce) penalties that encourage *internalization of environmental considerations into management decisions*.
- (c) The lack of adequate information about land and water resources management at appropriate levels.
- (d) Institutional and organizational constraints, including inadequate coordination between projects/activities of land and water resources development. (SCOR Project Proposal, IIMI, 1993).

Therefore, SCOR strategy was aimed at striking a balance between "production" and "protection" in relation to the utilization of land and water resources through the intensification and institutionalization of participatory and shared management processes coupled with appropriate technologies and resources. In addition, the Project intended to identify policy changes that may help to adapt this strategy in other areas of Sri Lanka and elsewhere under similar conditions.

The SCOR concepts, strategies and major areas of activity are summarized in Figure 1. *The focus on watersheds as the basic planning, coordinating and implementation unit is an important feature of SCOR.* The term watershed is defined as the area of land surface that drains water into a common point along a stream or river. Various parts of the watershed is physically and operationally linked in important ways, and the potential benefits from integrated use can be large. For example, the SCOR Huruluwewa watershed contains about 220 small tanks (in addition to the major reservoir). Most of these small tanks are in series of clusters or in cascades. In addition, ground water extraction from the weathered rock up to a depth of about 10 m is taking place at an increasing rate. No regulations or accepted norms have been adopted with regard to well density, spacing between wells, pumping duration etc. Moreover, the people in the different components of the watershed having access to different aspects of the natural resources base are engaged in different economic activities, and are of different social and/or cultural backgrounds. For example, people in the upper catchment have very different environmental, economic and social conditions from those in associated irrigated commands and those in downstream areas of the irrigated areas. Hence it was assumed that institutional linkages (e.g. federation of user organizations) between different segments (e.g.: upstream and downstream) of the watershed would promote profitable and sustainable use of land and water resources. SCOR project expected to assist the Government of Sri Lanka (GSL) to identify, develop, and field test a strategy for increasing the sustainable productivity of natural resources - mainly land and water - in a watershed context. (SCOR Project Proposal, IIMI, 1993).

The Project identified the *need for enhancing the information and the understanding* (of the government, user-groups and individuals) about potentials of and prospects for the natural resources (land and water) base for production and protection. It was assumed that an adequate knowledge of the natural resource base and resource use of a watershed is essential in designing, planning and implementing management interventions which would be mutually beneficial to different segments of watershed. Knowledge about resources base information systems and capacity building were considered as necessary conditions for decentralized management of natural resources. The project expected to test methods of local/shared/community management of land and water resources and, understanding the resources base, developing information systems and building capacity were assumed to be integral components of such efforts.

In summary, the SCOR strategy was to catalyze a process to motivate partners to use an integrated package of technology, organization, resources and policies through collaborative initiatives. The appropriateness of this strategy has been tested and demonstrated in two pilot watersheds in Sri Lanka (namely Huruluwewa in the North Central Province and Nilwala in the Southern Province) chosen for their different social, agricultural and environmental characteristics. *In these pilot areas, appropriate production and conservation techniques and technologies have been used to augment and sustain the resource base and its productivity through active involvement of small farmers in competitive markets, participatory processes, novel modes of tenurial arrangements, and state-user partnerships.*

THE INTERVENTION PROCESS.

With watersheds as basic units, SCOR operated at *multiple levels* with different organizational arrangements that are vertically integrated. At the lowest level, the sub- or micro-watershed, which typically includes a couple of villages, the local officials, the resource user organizations, and SCOR catalysts/change agents, interacted to understand the present resource use pattern, developed a vision for the future and translated it into action plans. At the divisional and watershed levels, the officials, representatives of farmers and SCOR professionals discussed plans emerging from grass roots levels.

The project has selected about 25 sub-watersheds ranging from 75 ha to 600 ha. for interventions. In the sub-watershed, a participatory appraisal of the characteristics of resource uses and users as well as mapping of current resource use were done by groups comprising of resource users, NGO, Government agencies and SCOR project team. Subsequently, a participatory resource management “mini project” was formulated. The “mini-project” aimed at changing the present land and water use pattern to a more profitable yet environmentally sound resource use. Measures adopted by the implementation team in order to improve the *accuracy of the information base, efficiency of action-research and the acceptance by partners* at different stages of project implementation (specially at the *participatory appraisal, formulation of “mini projects” at sub watershed level, implementation, monitoring and evaluation*) included: *participatory* mapping using air photographs; walk-through surveys; use of different sources of data and the use of Geographic Information Systems, GIS; participation of a mixed group of participants including resources users, local officers, scientists and catalysts at all stages of the project. This strategy was proved to be useful in developing a “sense of ownership”, belonging and commitment for action by users and other partners.

As constraints to group activities are identified, the project assisted in their removal. When the constraints are the result of policies, rules, regulations, or actions of a higher level, the project worked at those levels to achieve its purposes. Underlying assumption was that *demand-driven changes* are likely to be more expeditiously addressed than recommendations for change from above. It was expected that the project would be guided at different levels—divisional, provincial and national-- by a system of committees, which united resources users, state officials and other professionals. At the provincial level, which covered several divisions, action was mostly related to the review of progress and remedial measures to cover gaps in line agency functions, and interdepartmental relations. At the national level, primary emphasis was on relevant changes in policy and processes, based on experiences from interventions at lower levels.

THE OUTCOMES AND IMPACTS.

The Project’s performance in terms of the achievement of targeted outputs is summarized in Table 1. This section will first present a brief account on farm and sub-watershed level

outcomes by analyzing the “past and present” status of a typical sub-watershed (namely *Puwakpitiya*) in the SCOR Huruluwewa watershed. Next, a summary of selected SCOR achievements in the policy area will be presented. Finally the constraints encountered by SCOR will be outlined.

Mini project in Puwakpitiya, like in other SCOR sample sub-watersheds, aimed at changing the pre-project *land and water use pattern to a more profitable and diversified resource use pattern. This was attempted by combining production and conservation using appropriate technologies/ techniques; novel shared control arrangements and resource augmentation.* New commercial enterprises and conservation practices included: integrated wet and dry season water management in command areas e.g., water saving techniques to improve cropping intensity and introducing short duration commercial crops like soybean in the dry season, fish farming, participatory forestry and stabilized cultivation (of field crops such as maize for an identified market, medicinal plants, fruits and vegetables) coupled with conservation methods - - such as contour or graded bunds, alley cropping, mulching, water harvesting, green manuring, integrated pest management, mixed cropping and integrated livestock farming, combination of agriculture and forestry, etc.- - in areas hitherto used for “slash and burn” or shifting cultivation. This means that the villages in such pilot sub-watersheds have had “action plans” that guided them along a path to the planned future from the current status of resource use. The pre-project land use pattern is illustrated in *figure 2* (and Table 2) while the “planned/future vision” and end of project status (as of September 1998) are illustrated in *figures 3 & 4*(and Table 2).

In “mini projects”, novel modes of state-user partnerships in land use (such as the long-term usufructuary rights for participants who do not “own” the land) have been arranged. SCOR learning experience suggests that the issue of property rights should be treated in the context of culture, local values and local market conditions. For example, a complete transfer of ownership of land and water to individuals (i.e. individual property rights) may be important in some cases while in certain other cases - such as irrigation canal or natural stream reservations -instead of exclusive individual property rights the concepts of *shared control*, usufructuary rights, longer-term lease arrangements, and *state-user partnerships* may provide adequate incentives to the users to maintain a good balance between production and protection. Such alternatives to exclusive individual property rights may provide the respective natural resources users a *sense of ownership*.

As profit is a major determinant in the adoption of conservation based production, and in order to achieve scale economies as well as adequate bargaining power, SCOR facilitated the formation of three Farmer Companies in pilot areas. For example, farmers in all the sub-watersheds in the Huruluwewa watershed have become shareholders of “Hurulu” and “Dambulu” Farmer Companies. These two companies have already assessed the potential of producing special crops for special markets, entered into forward contracts with those identified markets, and “honored” such contracts. The Farmer Companies have obtained loans and extended production credit to share holders through farmer organizations. The farmer organizations function as the “production and collection coordinators” of the companies. In the SCOR pilot areas resource users, mainly the small farmers, have proved that, with effective external catalyzing inputs, they can mobilize resources to carry out their

plans and finally become shareholders of their own companies managing the production process, which is an effective way of small farmers to gain and share prosperity in an open economy.

The significant policy changes initiated by SCOR includes:

- grant of usufructuary rights for using state reservations (such as irrigation reservations, on pilot basis in Huruluwewa and Nilwala);
- Government's acceptance of "Farmer Company" strategy and a). The decision by the Ministry of Agriculture to include the formation of farmer companies as a function of the Department of Agrarian Services; b). Testing Irrigation Management Turn-Over using Farmer Company Strategy;
- decision to establish an agricultural settlement incorporating "encroachers" in the Huruluwewa upper watershed;
- granting of body corporate status to Tea Small Holders Societies;
- legal recognition of watershed-based farmer organizations by the government (Department of Agrarian Services), even though they are not coterminous with administrative boundaries;
- Extending the mandate of the Irrigation Management Division of the Ministry of Irrigation, Power and Energy, to manage watersheds associated with major irrigation systems.

The SCOR action-research or the "learning process" was not free from constraints. Certain researchers could not understand/accept Participatory Action Research in general, and learning process approach in particular, as research methods. At the same time the project suffered from uncertainties in donor funding, drought conditions prevailed in the dry zone areas during certain crop seasons. Due to the "project-driven" nature of the experiment the researchers were compelled to focus more on targeted physical achievements than the learning process. In regard to the rate of adoption of conservation techniques, it has been observed that many farmers did not adopt them in package form. It should however be noted that most of the recommended practices do not yield substantial benefits in the short term and therefore it is too early to evaluate such aspects of the project. Moreover, the business activities of the Farmer Companies suffered from factors that can be attributed to market failures/imperfections in the market such as the vested interest of some businessmen, rent-seeking behavior etc.

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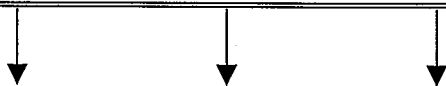
IIMI, 1993, Shared Control of Natural Resources Project - Technical Proposal, Unpublished report.

IIMI, 1998, Shared Control of Natural Resources Project – Quarterly Progress Report, 2nd Quarter, July 1998.

FIGURE 1 - STRATEGIES / CONCEPTS

- Participatory Action-Research : A Learning Process
- Watershed Focus : Ecosystem Approach
- Integrated Planning in a watershed context
- Integrating Conservation Concerns with Production Goals
- Proper Mix of Technology, Organizations and Resources
- Natural Resources Tenurial Security
- Shared Control : State-User Partnerships
- Building Local Capacities
- Policy and Institutional Interventions.

Combined Effect on Activities



ACTIVITY AREAS:

- Organizing users, participatory planning and implementation
- Co-ordination of watershed activities, skill development & information systems
- Integrated Water Management
- Rice-Based Cropping Systems in Command Areas : Improve Cropping Intensity and Production
- Stabilized conservation farming in catchments/areas presently under shifting cultivation and Conservation Farming in Home gardens
- Community-based Fish Farming
- Agro-based Enterprises – value addition
- Farmer Companies for Organized Production and Competitive Marketing
- Non-Production Incentives for Conservation : e.g.: Micro-Hydropower Generation Coupled with Catchment Conservation
- Special Activities/Programs for Farm Women.

Figure 2: Puwakpitiya sub-watershed – Land use – Baseline – 1994

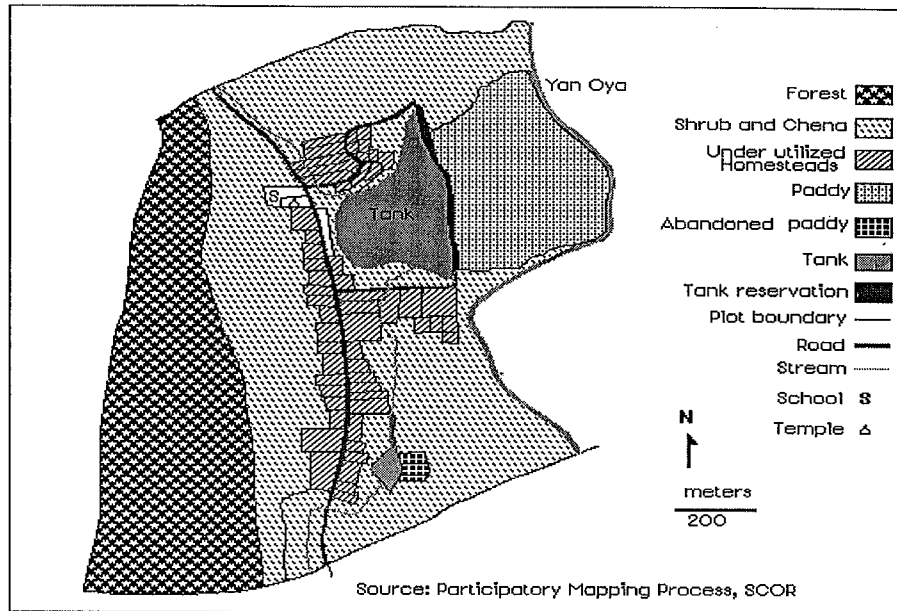


Figure 3: Puwakpitiya sub-watershed – Land use – Future vision

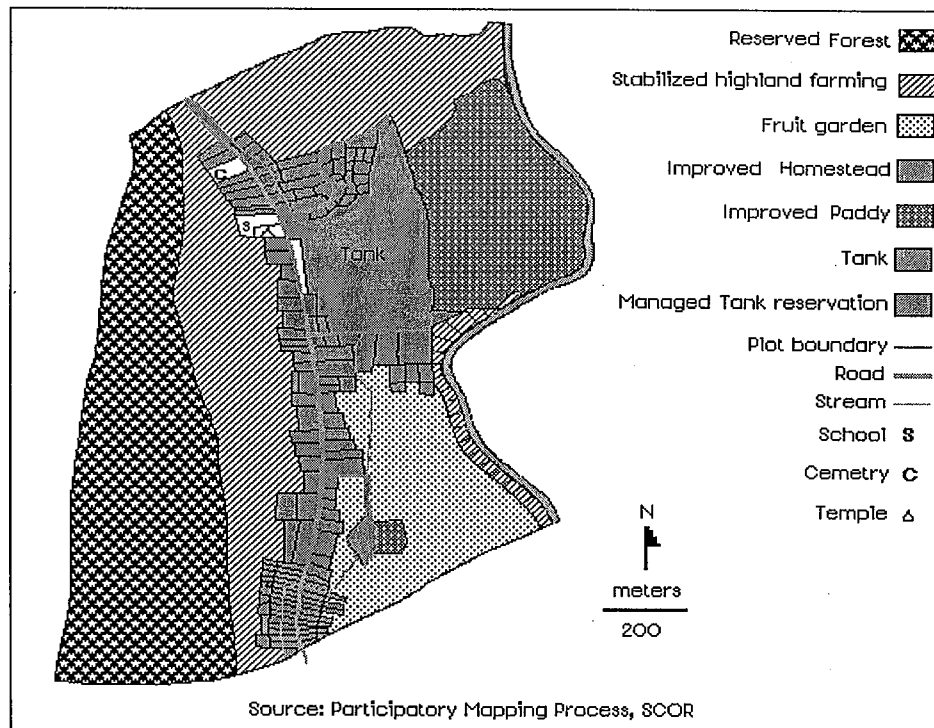


Figure 4: Puwakpitiya sub-watershed – Land use – 1997

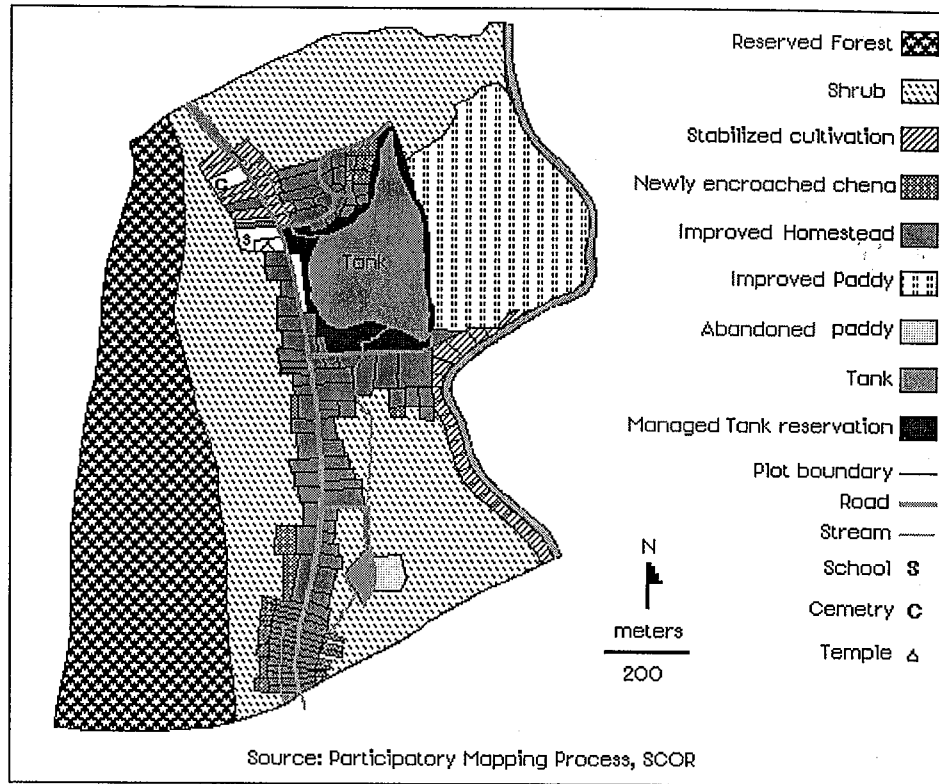


Table 1: Performance in summary by strategic and performance indicators

Indicator	Unit/No	Target Up to 30 Sept. 1998	Total To date
1. Targeted hectares under improved production and protection techniques,	Ha	18,202	14,606
2. Value of targeted investment by the resource users in environmentally sound production practices.	\$(M)	1.0	1.73
3. Targeted land area covered by agreements between GSL and user groups (Extent now under protection and production practices expecting user rights)	Ha.	522	503
4. Farm households using improved environmental techniques	#	12,689	12,615
5. No. of policy/procedures, organisational changes exacted and adopted	#	6	3
6. Number of user organisations conferred with legal status and powers	#	50	85
7. User groups organised/assisted to take joint responsibility for management of land and water resources	#	67	44
8. Number of new commercial activities supported by linking to markets	#	160	138
9. Land leasing/usufruct agreements issued for establishments and functioning of production companies and commercial activities	#	5	2
10. Training opportunities provided to representatives of resource user groups, NGOs and other private sector organisations in participatory natural resources management	#	17,919	17,231
11. Number of officials trained in local level planning, user groups formation, support and collaboration	#	420	430
12. Number of NGOs and private sector agencies providing technical, managerial and commercial information to user groups	#	15	27
13. Research studies completed on natural resources issues	#	25	19

Source: SCOR Progress Report, 2nd quarter 1998(July 1998)

Table 2: Land use– Puwakpitiya

BASELINE STATUS – 1994

Category	Extent (ha)
Forest	39.8
Shrub and chena (Slash And Burn)	73.6
Under utilized homesteads	14.3
Paddy	16.9
Abandoned paddy	0.55
Tanks	8.32
Tank reservation	0.88
School, Temple and Cemetery	0.89
Yan oya (River)	1.31
Roads	1.3
Total	157.9

LAND USE – STATUS – 1997

Category	Extent (ha)
Reserved forest	39.83
Shrub	55.34
Stabilized cultivation	6.31
Newly encroached chena	6.22
Improved homesteads	14.36
Improved paddy	16.9
Tanks	8.32
Managed tank reservation	6.6
Abandoned paddy	0.56
School, Temple and Cemetery	0.89
Yan oya	1.31
Roads	1.3
Total	157.9

LAND USE - FUTURE VISION

Category	Extent (ha)
Reserved forest	39.8
Stabilized highland farming	44.1
Fruit garden	17.5
Improved homesteads	20.6
Improved paddy	17.46
Tanks	8.3
Managed tank reservation	6.6
School, Temple and Cemetery	0.9
Yan oya	1.31
Roads	1.33
Total	157.9

NATIONAL WATER CONFERENCE

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RESEARCH PAPERS PRESENTED

Session No.11 5 November 1998 11:30 a.m.

Social and Traditional Aspects of Water Management

Paper No.27

van der Molen, Irna

Water Resource Management in the Dry Zone of Sri Lanka: Institutional Roots Under Water ?

Paper No.130

Athukorale, Kusum

Weerakoon, Padma

Women's Participation in Irrigated Agriculture and Farmer Organizations: Implications for the Future.

Paper No.131

Fernando, Vijita

Women's Role in Water Management

Paper No.132

Karunaratne, T.D.N.

Ayurvedic View of Water

**Water resource management in the dry zone of Sri Lanka
Institutional roots under water?**

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Water resource management in the dry zone of Sri Lanka

Institutional roots under water?

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Abstract

This paper discusses the water resource problems in the dry zone of Sri Lanka from an organisational perspective. The problems of water resource management can be analysed at 3 different levels of analysis: (a) at the level of water scarcity and water quality as such; (b) at the level of physical infrastructure of irrigation works and agrowells, tubewells and dugwells; and (c) at the level of organisation and management of irrigation and water supply. This research focuses on the third level of analysis: organisation and management of water resources.

In this paper I will argue that - due to conventional interpretations of highly popular concepts such as land tenure arrangements, gender, participation and equity - many policies, strategies, interventions and procedures are to a large extent standardised. At first view, even the more experimental projects, such as the experiments with regard to farmer companies, have not demonstrated a thorough understanding of the way in which those concepts are manifest at local level. Due to the prevailing explanations of those concepts, the sustainability of policies and interventions is only partial.

I will therefore argue that, by means of a more detailed study of currently existing and indigenous forms of water management paying attention to issues of land ownership and land tenure, gender, equity and participation, one can make those policies, strategies, interventions and procedures more tailored to the particular situation at local level. Similarly, one can improve achievement of particular objectives and subsequently enhance sustainability with a view to gender, participation and equity, and equally important, the acceptance from (different groups of) water users.

1. Problem description

From an organisational perspective, a distinction can be made with regard to organisational / management problems (a) at the village level, (b) at the level of interaction between village-based organisations / institutions and governmental organisations, and (c) at the level of interaction between farmer organisations and donor organisations related to rehabilitation interventions¹ and (d) at the policy level.

- a. *At village level*, one can observe problems related to (equal) access to and participation in decision making, to effectivity and legitimacy of decision-making, and to conflict management.
- b. *At the level of interaction between village-based organisations and governmental organisations* problems were found related to responsibilities for maintenance and small rehabilitation works and to conflict management, in terms of limited access to means for resolving conflicts
- c. Further, *at the level of interaction between farmer organisations and donor organisations* one can observe problems related to the implementation of water conservation and ecological sustainability through the cultivation of other field crops (OFCs). Further, problems were observed with regard to access to and benefits from project interventions.
- d. Finally, problems at the *policy level* are related to the large demand of water users for the allocation of water for different purposes, the distribution of responsibilities and mandates among a large number of organisations, and the lack of coherency in legislation, acts and ordinances with regard to water rights and water allocation.

¹A more detailed description of the problems can be found in:

Molen, I. van der; *The blessings of the rains: sustainable agriculture, self-sufficiency and different perspectives on water management in the dry zone of Sri Lanka*; paper for the CERES Seminar "Acts of Man or Nature", 22-24 October 1998 in Bergen, the Netherlands.

Considering the long history of irrigation works in Sri Lanka, many administrative and legal changes which took place during this century, and the organisational and managerial problems in relation to water resource management, the question arises to what extent indigenous forms of water resource management can contribute to sustainability of the water resource management system. The main research question is therefore:

What are the conditions and circumstances required under which the integration of the indigenous forms of water resource management in relevant development practices actually can contribute to more sustainability of the water resource management system?

In the process of data collection and analysis of the water resource management systems at local level, many of the indigenous and currently prevailing forms of water resource management proved to be strongly related to the concepts of land ownership and land tenure arrangements, gender, participation, and equity. In this way, those concepts proved to be key concepts in the explanation of the sustainability of (interventions in) the current water resource management system.

In section 2, I will briefly explain the methodology and techniques of data collection, which were used. Section 3 will focus on land ownership and tenure arrangements, section 4 on gender, section 5 on equity, and section 6 on participation. In section 7, I will elaborate on the difficulties in finding a balance between, on the one hand, objectives of gender equality in decision making, participation of the water users, and equity, and on the other hand, the objectives of efficiency of decision making and compliance with rules and decisions.

Finally, in section 8, I will make some recommendations for project staff and policy makers. Basic assumption is that a more in-depth understanding of the concepts discussed, can contribute to a more sustainable system of water resource management at local level and to more acceptance by all groups of water users. Similarly, dissemination of the knowledge regarding those concepts at local level can contribute to strategies and policies at provincial or national level. E.g. in the policies with regard to irrigation management transfer and in the discussion about the role of farmer companies, farmer organisations and other 'appropriate local organisations' which may hold water entitlements on behalf of their members.

2. Methodology and data collection

The research strategy is based on a combination of literature study, multi-site case study at the field, historical records and ethnography. The choice for this research strategy is based upon the type of questions (descriptive, explanatory and exploratory), and its focus on contemporary processes and processes in the past. Data collection took place during two periods until now: the start of maha season 1997 (September – December '97) and during the yala season of 1998 (April – August '98) and was conducted in three case study areas in Anuradhapura district (Nallamudawa; Padikkaramaduwa; and Walpola).

2.1 Data Collection

Data collection techniques used in those areas were:

- a. Documentation, such as the minutes of meetings, administrative documents, studies, legislation, acts and ordinances evaluations, articles, etc.
- b. Archival reports, such as organisational records, maps, graphs, meteorological data, GIS maps, statistics from surveys already performed; historical information with regard to the particular tanks.
- c. interviews, including semi-structured interviews and in-depth interviews, and structured interviews (community profiles, tank profiles)
- d. direct observation and participatory observation (participatory observation was done by joining women in agricultural activities (e.g. transplanting onions); in collecting water; in the bathing 'ritual' and in shramadana (cleaning the bund by removing all the weeds and bushes)
- e. PRA techniques, such as participatory mapping and drawing of trend lines; transect walks, group discussion.

2.2 Perspective

The problems are analysed from an actor (water user and farmer) perspective at the village-level², and concentrates not only on those *actors*, but also on the interaction between those actors and organisational *structures* and the *processes* taking place on this level. Similarly, this actor perspective at village level is also taken as departing point in the analysis of the impact of the economic, socio-cultural, political and judicial contexts on the water resource management system (actors, structures and processes).

2.3 Selection and characteristics of the case study area

Data collection has been conducted in part of the dry zone of Sri Lanka, in the Anuradhapura district. This district is characterised by relative low annual rainfall, and a large amount of small and medium-scale water reservoirs, the tanks. It must be emphasised that the management arrangements on organisational level are closely related to the physical and geographical characteristics of the irrigation systems and the cultivation patterns in this area, and can only partly be generalised to irrigation systems with other physical and geographical characteristics. Those characteristics are:

- small-scale irrigation systems (tanks with a command area smaller than 200 acres) in the dry zone
- dominated by paddy cultivation and chena cultivation,
- being part of a cascade, and
- receiving water only from rainfall and runoff from the catchment area.

3. Land ownership and land tenure arrangements

Land ownership and land tenure arrangements occupy a central position when looking at water resource management, for it determines not only which plots are eligible for receiving water during droughts, but it is also strongly related to the concepts which will be discussed in the subsequent sections: gender, equity and participation. In other words: it sets the scene.

3.1 Spatial dimensions of land distribution and cultivation

The lands that were used for cultivation in the case study areas can be divided in purana wela, akkara wela, highland, chena fields and home gardens.

The lands irrigated by water from the tanks can be divided in lands under purana wela, and under akkara wela. The original settlers of the villagers often used the command area that is referred to as '*purana wela*'. This is the part under the tank, which is usually located close to the tank bund and which is most easy to irrigate due to its location and geological characteristics. At present, the command area of most tanks has expanded and consists of both '*purana wela*' and '*akkara wela*', which is the area situated next to or under purana wela. Although akkara wela (or even purana wela) cannot be cultivated each season due to a shortage of water, it does fulfil the increased demand for paddy lands in the command area of the tank. In the case study areas, both purana wela and akkara wela were mainly used for paddy cultivation³. In practice, water from the (minor) tanks is allocated to paddy lands in purana wela and akkara wela only.

Highlands are those lands close to the tank, but which are not located in the command area of the tank. These highlands can be used for paddy cultivation if rainfall is sufficient, or when provided by other sources of water (agrowells, runoff, drainage water).

² When talking about the "*village level*", I actually refer to the local level geographically demarcated by the boundaries of the command areas of those tanks for which the farmer organisation is responsible. One could also argue to call it the "level of the Farmer Organisation", but this is likely to cause more confusion by referring to actors instead of geographically boundaries.

³ In one of the case study areas an exception could be observed. Other field crops (OFCs) were cultivated under the system of bethma and rotational distribution in purana wela during yala season 1998. The farmers explained that this situation was quite rare. Usually, the water level in the tanks was not sufficient for cultivation at all during the yala season.

Chena fields are encroached state lands, used for slash and burn cultivation, and sometimes with the characteristic of shifting cultivation. The crops which are grown in these chena fields are described as other field crops such as vegetables, pulses, or spices, and to a small extent fruits. Those fields can be located at quite a distance from the homes, and are not in the command area of the tanks. Due to the growing scarcity of lands available for chena cultivation (due to an increase of population), the shifting nature of chena cultivation has diminished considerably over the past 50 years. Some people have built agrowells in the close neighbourhood of their chena fields and are thereby in a far more favourable position for cultivation during both the yala and maha season than others.

Finally, *home gardens* or *homesteads* are those plots with ownership or leasehold certificates situated around the houses. Those gardens can be used for cultivation of paddy (rainfed or with water from agrowell); OFCs and fruits.

The most important food supply for home consumption and marketing is located in both the command area of the tank (paddy), and chena fields (OFCs). Especially land ownership or leasehold of paddy lands in the command area proves to be crucial for constructs of participation and equity, as will be argued in sections 4, 5 and 6.

3.2 *Legal forms of land ownership in the case study areas*

The relation between land and water rights is explained in Agrarian Service Act of 1979. In addition to public lands (Crown Lands), there are different forms of land ownership:

1. Freehold ownership ('siinakker'): this includes a certificate for the landowner, and freehold lands can be sold and distributed among children as people wish.
2. Freehold ownership under pimbure: the total area in purana wela is called pimbure, because it is registered with one certificate only, stating each plot and name of the farmer. On the basis of the certificate, which is kept in the District Secretariat, people can ask for a separate freehold certificate for their part and then they are able to sell.
3. 99 years of leasehold ownership ('badu'), usually in Akkarawela. Legally these plots are leased, and cannot be sold, but in reality they are being sold. The name will then be changed in the certificate and registration. Some members of the Provincial Councils as well as members of the 'Samate Committee' (Peace Board) have the legal authority to act as a 'judge', acknowledging this change.
4. District Land Officer's Permit: 99 years of leasehold in other area than Purana wela and Akkara wela; There are statements in the DLO regulations about the transference of an annual permit in DLO permit, when someone fulfils all regulations.
5. Annual Permit: for home gardens only further away from the house. These permits are issued by the Divisional Secretary and should be renewed every year. In one of the case study areas, it was mentioned that the people who used to have annual permit now have a DLO certificate under the Land Development Ordinance. If someone with a DLO permit cultivates his part on a regular basis (every year), a special procedure can be followed under the Jayabumi campaign to transfer the DLO permit to freehold ownership;
6. Chena lands: encroached public lands, not registered, practised widely in all villages

The legal form of land ownership is, in the view of farmers, important from 3 different angles:

- a. First of all, when looking at the different legal forms of land ownership, the legal insecurity of cultivating state lands (either in forest reserves or Crown Lands) proved to be relevant for the cultivation of highlands or newly developed land in the command area of the tank. In response to this, some projects tried to enhance land consolidation, the transfer of those lands to the actual cultivators by the provision of certificates or permit.

- b. Unlike highlands and newly developed lands, the illegal character of chena cultivation is not considered to be problematic. Although this form of cultivation takes place on encroached state owned lands, only a few rare cases were found where governmental authorities filed a case against a cultivator or where he / she was fined for this encroachment. In the case study areas (Anuradhapura district) there were no reliable data on the exact areas and quantity of encroached lands for chena cultivation. The figures available are estimates.
- c. Thirdly, the legal form of land ownership proved to be important in view of the stretch of time of land ownership. In some of the case study areas, long term (99 years) ownership or leasehold provides more 'rights' to participate in decision making than short term tenure or leasehold (DLO and annual permits). Additionally, the type of ownership is closely related to the spatial dimensions, as can be seen from the overview above.
- d. Finally, different procedures apply for the sale, purchase, registration and inheritance of land when looking at the various forms of ownership. This is especially relevant in the division of land ownership among men and women (sons and daughters) and in sharing arrangements.

3.3 *Traditional practices of land distribution and sharing*

A number of practices can be distinguished in response to scarcity of resources, being the scarcity of land and the opportunity to get a fair share of yield from the land, scarcity of water, scarcity of financial, and scarcity of human resources. *Thattumaruru* and *kattimaru* are practices to distribute the right to cultivation of land among a small group of shareholders, thereby keeping the plot as entity within the group or family. *Bethma* is a response to scarcity of water, whereas traditional and more modern forms of *ande-tenancy* are practised in response to the scarcity of financial and human resources.

Thattumaruru refers to rights to cultivate a piece of paddy land in a sharing arrangement "among two or more persons in annual rotation. Instead of physically dividing the land, the persons with cultivation rights (henceforth shareholders) take turns to cultivate the land each year. [...] The purpose behind the adoption of this principle is [...] to prevent the sub-division of plots into units which are inconveniently small"⁴.

Kattimaru refers to the sub-division of land "at the death (or retirement) of its owner, but each heir inherits, instead of permanent ownership rights to a particular plot, the right to cultivate in turn each of the plots into which the 'estate' has been divided. [...] The logic behind this principle is that of equalisation of chances of good or bad harvests in an environment where the relative value of different fields varies from year to year according to such factors as soil quality, water supply and the incidence of attacks of wild animals and pests"⁵.

Ande tenancy refers to a practice where someone cultivates a plot of land belonging to someone else. The owner pays for the initial expenses, such as seed paddy, fertilisers, pesticides and weedicides and tractor charges. In return, succeeding the harvest, the yield is divided among the owner and tenant. This form of *ande tenancy* is mainly applied when the landowner is not able, for some reason or another, to cultivate the plot him or herself during a particular season (lack of human resources due to other duties and activities, sickness, pregnancy or young children to be taken care of). A slightly different version of *ande-tenancy* is further applied by salesmen (*muduladi*'s) in response to the lack of financial resources of farmers to pay the initial expenses before cultivation. In such a case the farmer might be able to obtain money for these expenses or the fertilisers, pesticides etc. directly from the *muduladi* and start cultivation on his/her own plot. The expenses paid for by the *muduladi* will be deducted from the yield, and given back to the *muduladi*, the remaining of the yield will be divided by two, of which one half goes to the farmer, and the other half to the *muduladi*.

⁴ See: Moore, M.P. and G. Wickremasinghe; *Thattumaruru – Kattimaru systems of land tenure*; Research Study Series No. 26, July 1978; Agrarian Research and Training Institute, Colombo, p. 2-3

⁵ *ibid.*

Bethma refers to the temporary redistribution of plots of land among the shareholders (being the paddy landowners) in part of the command area of the tank, when insufficient water is available for cultivation of the entire command area, or for cultivation of the entire purana wela. This might be practised in combination with rotational distribution and for the cultivation of either paddy or OFCs.

Whereas only *ande-tenancy* is still frequently applied and *bethma* only very rarely (depending on the water level in the tank), *Thattumaru* and *kattimaru* practices have almost disappeared in the case study areas. Some of the respondents indicated to expect a revival of those practices because of the fast reduction in the size of lands which can be attributed to the distribution of lands among the children. The traditional water resource management system, which used to be based on the leadership of the *vel vidane* will be discussed in section 7. Further, *attam* and *shramadana* are equally important, but are not elaborated here because these practices are not directly related to sharing arrangements of land.

4. Gender⁶

Farming activities include cleaning the plots and the small field bunds, ploughing, construction of small bunds if required, levelling, sowing, applying fertiliser, spraying of pesticides and weedicides, weeding, applying water and releasing water, threshing, cutting or plucking and winnowing. In the 3 case study areas, men are involved in all activities, whereas women are involved in all activities except for ploughing and usually threshing. There are four different types of farming: paddy cultivation, chena cultivation, and highland cultivation and home garden cultivation. A number of changes took place over the past 50 years in relation to the participation of women in cultivation. Those are:

1. Women participate more in paddy cultivation;
2. Women participate more in chena cultivation;
3. Women participate more as hire labourers.

Those changes have been induced by *physical characteristics* of the landscape, such as more open space instead of jungle (safety and accessibility), by *social changes*, such as the gradual disappearance of *attam*, less objections by women themselves and the wish to be more involved in cultivation or by *economic motives*, such as the higher level of income required or wished for; and the higher degree of efficiency through joint participation. Because women are now more involved in paddy and chena cultivation, their participation in applying water to the fields has increased as well, and their knowledge about the timing of applying water within a cultivation season is quite high.

Due to the higher degree of participation of women as hire labourer and in chena and paddy cultivation, they contribute more to the household in terms of income and food supply. From the first findings, it seems that the role of women in decision making and their bargaining power on household level has increased, by the expansion of their activities in cultivation (especially when looking at their say in expenditure decisions)⁷. Given the high participation rate of women in cultivation and their interests in the decisions for the management and use of water resources, it is necessary to identify their position in access to resources (especially land), and their participation in decision making on supra-household level (farmer organisation).

4.1 Gender and land ownership

Although sons and daughters have equal legal rights to inheritance, in reality, most lands are registered on the names of the men, instead of the women. Further, land ownership of women is especially land ownership of home gardens, rather than paddy lands (with the exception of women in *diga* marriages and widows). The main reason for the limited land ownership by women is the fact that most marriages are *diga*

⁶ More detailed information on gender and water management can be found in 2 papers, written on behalf of the IIMI / IWMI: (i) Molen, I. van der; *Gender and the flow of water: gender considerations in water resource management; 2 case studies*; internal paper IIMI; Colombo, December 1997; and (ii) Molen, I. van der; *Gender and the continuous flow of water: gender and water management; 3 case studies*; draft; IWMI, Colombo; August 1998.

⁷ Although of course, other factors such as the higher level of education can also be expected to play a significant role

marriages, in which case sons (living in with his parents) are more likely to inherit than daughters (living in with her parents in law). There are some subtle practices further obstructing land ownership by women:

- a. Registration of land ownership on the name of the head of the family in case of land consolidation⁸;
- b. transfer of land ownership to the husband after marriage for reasons of representation and mobility;
- c. formal obstructions to divide leasehold among children;
- d. the sequence of rights to inherit leasehold lands (wife, eldest son, then second eldest child (either son or daughter); if there is no son, the second right goes to the eldest daughter, etc);
- e. the requirement of permission by other right holders if the legal owner wants to surpass the first right-holder to inheritance and pass it on to another family member 'lower in rank'.

4.2 *Gender and membership of farmer organisations*

Although there are no formal limitations for women to apply for membership of the Farmer Organisations, in all villages it was found that, in reality, membership by women can be found mainly amongst widows or women in a bina marriage. In one of the villages, one of the criteria for membership used to be ownership of paddy land under one of the three tanks, a major constraint for female membership. Although this criteria was lifted in 1996, it has not yet resulted in a high participation of women in the FO since then. Further, 2 sets of criteria were used: one general set of criteria according to which women have as much opportunity to become a member as men, and one set of criteria with some small differences applying to women, putting them in a disadvantaged position as (potential) members of the FO.

A more positive situation could be observed in another village, where minor tank rehabilitation projects proved to have a positive effect on female membership of and participation in the farmer organisation. For the purpose of providing every villager with the opportunity to participate in the implementation of the project (and thereby earning food packages or income during a drought period of several years), the opportunity was offered to non-members to apply for temporary membership. The only criteria used for this form of membership, was being resident of the village. The impact of this was considerable: not only the total number of members of the FO increased significantly, but at present (2 years later), there is still a significantly higher number of women being member of the Farmer Organisation than before those interventions (WFP and FFHCB).

4.3 *Gender and opportunities to become an office bearer in the farmer organisation*

Similarly, some observations could be made with regard to the opportunity of women to become an office bearer in the farmer organisation. Formally, there is no restriction for women to become an office bearer of the FO. Nonetheless, in reality, only men have the chance of becoming *yaya* representative, *vel vidane*, or office bearer, such as chairman, secretary or treasurer. The main reason mentioned for this is the limited mobility of women. Besides this reason, a number of 'silent' criteria were identified, which obstruct the opportunities for women to obtain a position in the FO, such as:

- experience in leadership functions;
- the ability to sacrifice a lot of time;
- ownership of paddy lands (preferably);
- the 'capability' to deal with government officers and represent others, and
- the ability to speak in public.

⁸ One example of this is a case of 'successful' land consolidation, whereby land is automatically registered on the name of the head of the household (the man), thereby denying women not only of:

1. land ownership, but also of
2. membership of the farmer organisation and thereby
3. participation in supra-household decision making for cultivation and irrigation;
4. access to benefits from the farmer organisation; and
5. participation in future project activities implemented in co-operation with the farmer organisation

Although women are in many cases perfectly able of dealing with government officers and in some cases also have proven their capabilities in speaking in public, it is not considered as appropriate for women to do so, and therefore applied as criteria or reason as why not to select women. As stated by a female Grama Nilidhari:

“Usually, ladies in official functions are rejected or condemned by their society. Even when women go to the kanna meeting it is because someone of the family has to attend the meeting.”

Thus whereas women are highly involved in cultivation, and have the primary responsibility in collecting water for domestic purposes, they are to a high extent excluded from the participation in decision making with regard to water resources, which primarily takes place within the farmer organisation. Many of the aspects and ‘silent’ criteria and customs go back to the social relations and the traditional customs and system of water resource management.

Nonetheless, those social relations and the water resource management system have been subject to many changes over time, and at present, women contribute considerably to cultivation and application of water to the fields. Therefore, it is necessary to reflect on ways to increase their access to decision making in the water resource management system. Gender-based activities in projects should be far more inventive than training in improved techniques of home gardening, watering techniques for the home gardens, and ‘cooking lessons’ to enhance the nutritional values of meals.

Two projects were mentioned to demonstrate how indirectly, through the creation of the opportunity of temporary membership of the farmer organisation, the participation of women can be increased, even though it might have not been the conscious intention of the project formulators.

5. Participation

The case studies, which were conducted with the purpose to identify indigenous forms of water management, revealed also the differences in participation between different groups of villagers. Participation is explained in terms of:

- Participation in the farmer organisation or similar organisations as member
- Participation in the farmer organisation or similar organisations as office bearer
- Participation in the meetings of the farmer organisation
- Participation in meetings of donor organisations
- Participation in implementation of project intervention

The opportunities for participation were reflected in:

1. Criteria for membership: whereas paddy land ownership used to be one of the criteria in the past, at present most farmer organisations apply just two criteria: (a) land ownership / cultivation of lands as tenant or labourer or (b) being resident of the village. Many respondents assumed however that only landowners or cultivators could apply for membership, even though although it is not strictly applied anymore in formal terms.
2. Criteria to become an office bearer of the organisation range from: (a) being a male, active, honest and literate descendent from one of the original settler-families, with freehold or ancestral paddy land ownership under purana wela, and residence in the command area (most rigid) to (b) being a male member of the farmer organisation with leasehold ownership of paddy lands (either akkara wela or purana wela) and residence in the command area. In general, and tenants or cultivators of highlands or chena lands, women (even though they own paddy lands) and non-residents are not considered for positions as office bearers in the farmer organisation.

3. Procedures for the appointment or selection of committee members of the farmer organisation: The criteria used for the appointment or selection of farmer committee members are less rigid but also less transparent. In many cases the personal preferences of office bearers or other members of the committee are more important than particular characteristics of the nominee.
4. Time and place of meetings were especially relevant for women to decide whether or not to participate. Meetings held in the late afternoon and early evening were usually not attended by women, who used to take care of the children, to prepare meals or to perform other domestic tasks during those hours.
5. The opportunity and right to express one's opinion during the meetings: this proved to be strongly related to the gender of participants, but sometimes also to the type of land ownership (no freehold or leasehold paddy lands in the command area of the tank).
6. Procedures for discussion and decision-making preceding, during, and succeeding the meetings. The procedures for discussion and decision-making at the kanna meetings were rather standardised and pre-discussed by the office bearers and the committee. Likewise, decisions regarding water allocation, rotational distribution, individual requests, conflict management, and the co-operation with other organisations were usually not discussed during those meetings, but equally important in looking at the opportunities for participation.
7. Opportunities to obtain information about decisions taken by the organisation, which is especially important in terms of the opportunities to protest or to influence the processes of decision-making at a later stage.
8. Finally, criteria for participation in the meetings and interventions of donor organisations are often related to being resident of the village and membership of the farmer organisation. Eventhough the last criteria might not be a formal criterion, many projects use the farmer organisation and its shareholders list as institutional infrastructure for the collection of information, the distribution of benefits, for communication with the farmers or for implementation of the physical works.

This overview demonstrates that (paddy) land ownership in combination with membership of the farmer organisation provides the best opportunities for participation in decision making and management of water resources.

6. Equity

The farmers indicated to prefer some degree of equity in participation in and benefits from the system, but one should understand this per definition as the degree of influence in relation to the quantity of land. Equity can be understood from 4 other perspectives as well:

- Equity between villagers and 'outsiders'; this is especially relevant in equal access to information about obtaining benefits from participation in particular activities
- Equity between landowners under purana wela and landowners under akkara wela. In some cases land ownership under purana wela was found to be a 'silent' criteria to become the chairman of the FO.
- Equity between paddy landowners, paddy cultivators (tenants) & owners of home gardens/ highlands for membership of and benefits from the FO. Additionally, it is relevant in obtaining benefits from those donor project organisations, which use the institutional infrastructure of the farmer organisation.
- Equity between men and women in access to land ownership and positions in the farmer organisation.

Thus, an original settler with only a small plot of land might enjoy more 'silent' rights (e.g. the chance in becoming an office bearer with its privileges), than a later settler, or someone who married into the village with a larger plot of land. This (lack of) equity is visible when looking at participation in decision-making and access to benefits of the farmer organisation or donor organisations such as access to loans, fertilisers, pesticides, distribution of plants, participation in training opportunities, etc. The equity between 'original' villagers and 'outsiders'

7. Authority and respected leadership versus standard democratic procedures

When looking at the institutional structures for decision making with regard to cultivation and irrigation, one of the most frequent complaints by the farmers was the lack of authority, resulting in limited effectivity and efficiency of the organisation and management of the water resource. This complaint was expressed when comparing the system of farmer organisations with the traditional system of the vel vidane.

- a. The farmer organisation is characterised by a more or less standard organisational structure, standardised procedures and formal requirements, a pre-formulated agenda for discussions during cultivation (kanna) meetings, and frequent elections. Participation in decision-making takes place only during the meetings of the FO. On an informal level, decision making is also based on ad hoc discussions with individual members at any time.
- b. The vel vidane system on the other hand, was based on respect, experience and authority, compliance with decisions and rules, but also characterised by limited transparency and standardisation of the decision-making⁹ procedures. Further, the access to participation in decision making was restricted to male paddy landowners only. Participation in decision-making took mainly place at two moments: either preceding the kanna meetings in consultation of the farmers by the vel vidane, or during the kanna meetings. Further, similar to the situation applying under the system with farmer organisations, on an informal level, decision making was also based on ad hoc discussions with individual farmers at any time

Although the characteristics of the farmer organisation seem to provide more opportunities to participation and equity in decision making, one should be aware that the vel vidane system was widely practised in a period that the number of families in a village was still very low (sometimes only 4 families), whereas every family had paddy lands in the command area of the tank. Additionally, in those periods, the participation of women in cultivation was still limited.

Considering those changes, and the observations made with regard to gender, participation and equity, the challenge is therefore to develop measures for stimulation of long-term leadership, enhancement of legitimacy, enhancement of respect, and stimulation of authority. This can however only be effective in combination with enhanced participation, equity, transparency and accountability. Additionally, in those areas where the vel vidane is still in function, project staff and policy makers should carefully consider the advantages of maintaining this system and to facilitate changes in view of land tenure arrangements, gender, participation and equity where desirable.

7. Recommendations for project, policy makers and future research

Based on the previous observations, a number of recommendations can be made.

1. First and above all, it is important to put more efforts into the identification and research of particular situations at local level with regard to land ownership and traditional forms of water resource management, gender, participation and equity. In paying attention to social dimensions, spatial dimensions, and changes over time, special attention is required to identify customs, and silent 'rules' or 'criteria', which have an impact on the system, as demonstrated in this paper.
2. Further it is important to review and rethink current and new policies in terms of institutional structures and mechanisms, and their impact on land tenure arrangements, gender, participation, equity and decision making at local level.
3. Finally, in the design and formulation of concrete project interventions, flexibility and creativity should be the key words. By formulating interventions, which are tailored to a specific situation, sustainability can be enhanced. This however requires implementation of the first recommendation: more efforts into the identification and research of a particular situation at local level.

⁹ The tasks of the vel vidane have changed over time, and are now more limited to operation & maintenance and less to decision making. This change was especially visible for those tanks where both the FO and a vel vidane or yaya representative were responsible.

Sharing arrangements for cultivation

4. The still existing knowledge about traditional forms of cultivation and irrigation (sharing arrangements and temporary redistribution of lands) demonstrate a potential for local solutions in response to scarcity of resources. The actual application of bethma in 2 of the case study areas in the yala season of 1998 shows that a very infrequent occurrence of those practices does not necessarily mean that they have been abandoned. Depending on the situation, such practices prove to re-emerge at local level. Not acknowledging this, or lack of awareness might result in contradictory policies and interventions, taking away this flexibility at local level.

Gender

5. It is necessary to reflect on ways to increase the access of women to decision making in the water resource management system. This would require reflection on the rules and regulations applying for land ownership, and ways to bend the 'silent' obstacles for obtaining or inheritance of land, land consolidation procedures, acknowledgement of the position of women as 'head of the household' and creating bank accounts with access restricted to women only, temporary membership opportunities of farmer organisations, representation opportunities in the meetings, stimulation (or obligation) of female members in the farmer organisation committee and in peace boards at local level as footboard for the acceptance of women as office bearers, and stimulation of the education level of women¹⁰.

Participation and equity

6. Since most farmer organisations exclude part of the population (most women, tenants and hire labourers, chena cultivators, non-cultivators) either in decision making or in the benefits provided through the farmer organisation, it would be recommendable that project staff and policy makers identify different (preferably existing) organisational structures and the opportunities for adjustment of the access to farmer organisations in such a way, that for the purpose of the projects, a minimum of people is excluded from participation and access to benefits of the project or policies.

Measures for enhancement of authority, respect and legitimacy

7. To stimulate long-term leadership and respect for the chairman of the farmer organisation, procedures for election should contain the possibility of long-term leadership (no maximum period); but one can also think of support in terms of training; acknowledgement of his/her potential role as mediator between villagers and governmental organisations.
8. More opportunities for membership, participation and equal access to benefits by different groups will increase the legitimacy of decision-making of the farmer organisation among all groups. This includes 'outsiders', families without paddy land ownership, and female cultivators. This requires more in-depth knowledge about the customs and 'silent' criteria applying for membership and office bearers.
9. Procedures to limit the possibilities for corruption, political influences and personal gains can – if effective - be expected to contribute to the respect for the chairman / yaya representative or vel vidane. To do so, clear procedures are required, facilitating the replacement of those office bearers whose functioning is criticised by members, and providing members with more facilities to put forward their complaints to a different organisation than the farmer organisation itself. Further, the criteria for distribution of benefits should be transparent to all members, and office bearers should be held accountable for the distribution of those benefits, e.g. in the kanna meetings.
10. The authority of the farmer organisation can be enhanced by more strict and equal enforcement of the rules and fines as decided upon in the kanna meetings after the first efforts for mediation have proven unsuccessful. Further, policy makers should consider providing farmer organisations with procedures to provide a small group with the authority to take decisions against the will of a few individual farmers in periods of droughts, if those decisions serve the common interest.

¹⁰ first findings showed a correlation between the level of education of women as compared to the level of education of their husband and the occurrence of bina marriages. However the sample was too small to make a scientifically sound statement on this.

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List of abbreviations

DO	Divisional Officer
FO	Farmer Organisation
IIMI	International Irrigation Management Organisation
IWMI	International Water Management Organisation (formerly known as IIMI)
OFC	Other field crop

Glossary

Ande tenants	tenants who cultivate a plot of land belonging to someone else. The owner pays for the initial expenses, such as seed paddy, fertilisers, pesticides and weedicides and tractor charges. In return, succeeding the harvest, the yield is divided among the owner and tenant. A slightly different version of ande-tenancy is further applied by salesmen (muduladi's) for poor farmers: if a farmer has not enough money to pay the initial expenses, he can obtain money for these expenses from the muduladi and start cultivation on his/her own plot. The expenses paid for by the muduladi will be deducted from the yield, and given back to the Muduladi, the remaining of the yield will be divided by two, of which one half goes to the farmer, and the other half to the Muduladi.
Attam	reciprocal exchange of labour without financial rewards, usually performed in small groups
Bethma	temporary redistribution of paddy lands under the tank, during droughts or dry seasons, usually providing each landowner with a fixed and small quantity of land to cultivate during that season
Chena cultivation	slash and burn cultivation, sometimes also shifting cultivation
Kanna meeting	meeting of all farmers / members of the farmer organisation at the start of the cultivation season for formulation of the cultivation calendar, crops, water distribution, duties, tasks and fines, etc.
Kattimaru	rotational distribution of lands
Maha season	wet season
Shramadana	voluntary or (more often) obligatory joint activities for the maintenance of common goods, applied for cleaning of roads, bunds and temples.
T(h)attumaru	rotational distribution of lands
Vel vidane	traditional irrigation headman on village level
Wewa	tank / water reservoir for irrigation purposes
Yala season	dry season
Yaya	paddy field
Yaya representative	similar to the vel vidane, but in practice mainly operational tasks, less decision-making tasks; often functioning in addition to the farmer organisation

WOMEN'S PARTICIPATION IN IRRIGATED AGRICULTURE AND FARMER ORGANISATIONS - IMPLICATIONS FOR THE FUTURE

Kusum Athukorala and Padma Weerakoon

A. Introduction

After the 1980's when participatory irrigation management became established as a state policy in Sri Lanka, O&M of the tertiary systems were handed over in many schemes to newly formed Farmer Organizations (FOs). IMT related studies frequently remark on poor participation of women in FO activity (Athukorala and Zwartveen 1994, Zwartveen 1994 Athukorala 1996).

In 1993-96, as part of the IIMI Gender Program, Sri Lanka Gender Case Studies in gender and irrigation (SLGC) a study examining linkages between gender and irrigation was initiated in three irrigation systems in Sri Lanka. Two were in major irrigation systems based on dry zone reservoir systems in the North Central Province (NCP) and the third, in the highlands of the Central Province (CP) was a wet zone anicut system. The main objective of this study was to document and analyze gender roles in irrigated agriculture and irrigation management.

Field data collection for the study started in three systems, Rajangane (RG) and Kalankuttiya in Mahaweli System " H" (KL) in the NCP and Gampola Raja Ela (GRE) in CP in at the beginning of the Maha season in October 1993, and continued until the end of the Yala season in 1995. The selection of these particular systems and subsystems were influenced by the IIMI Monitoring and Evaluation (M&E) Study which was already being carried out in the same systems.

The main crop in RG was paddy in both seasons. In KL while Maha cultivation was predominantly paddy, the most profitable source of income for the families was OFC cultivation, mainly chillie in Yala even though water was made available only for cultivation on a bethma basis. In GRE cultivation was possible in the two Maha seasons observed as the system was closed in Yala for rehabilitation. Limited cultivation was carried out in water logged fields and by accessing a small stream. In GRE the irrigated land area is very small and thus irrigated agriculture is not seen as a substantial income source for the community.

The three systems were then at different stages of IMT. RG had undergone already undergone rehabilitation and turnover through the Major Irrigation Systems Project (MIRP) project; GRE was undergoing rehabilitation and was being turned over to FOs under the National Irrigation Rehabilitation Project (NIRP) project while in KL, one of the elected subsystems D3 305 was selected as a pilot canal for the proposed Mahaweli restructuring project. Within GRE, the two sites selected were Ulapane and Thambiligala, in KL it was D2305 and D3 305 in Galnewa block and in RG, tracts 9 and 11.

SLGC was primarily designed to explore gender relations in irrigated agriculture in Sri Lanka which had hitherto been a grey area. Therefore the study was specifically designed to collect qualitative and not quantitative data. Data was collected by using participant observation and structured and semi-structured interviews. Quantitative data collected regarding income and expenditure including agricultural expenditure was later entered into formats and a database which was designed subsequently. The four major areas of research under which data was gathered are -

- 1) access and control over resources
- 2) farmer organizations
- 3) gender ideology
- 4) Gender division of labour

In every system, the sample selection of 30 households selected using PRA techniques including wealth ranking, representing different socio-economic categories.. Of the thirty households selected for study in each system 25 were landholders and 5 landless families. This group of landless poor were include in the study to ensure capture of data from the marginalized, landless families who are rarely observed in IMT studies due to being landless, who nevertheless contribute to the productivity of the system as well as subsist mainly on earnings in the system.

This group of 90 families were systematically monitored by the researchers throughout the four agricultural seasons covered by the study. Each family was visited once a week on a regular basis though there were occasional gaps. The number of respondent families had decreased at the end of the study due to families shifting out of the system and death of respondents.

In addition to the experiences of the longterm Sri Lanka Gender Case Study Program (SLGC) this paper makes reference to field observations from past and ongoing field experiences of studies carried out in Sri Lankan irrigation systems specifically field work carried out in the small tanks, INMAS systems of Huruluwewa and Ridiyagama in NCP and Southern Province (SP). Other field studies cited in this paper except Kome (1997) and Van der Molen (1997) did not focus particularly on gendered participation: however a 1992 study on cost effective rehabilitation strategies (ADRC/ECL 1992) did carry out a parallel survey of women in irrigation systems in 7 major systems.

The focus of this paper is the gendered participation in irrigated agriculture and on the the relatively limited involvement of women in Farmer Organizations (FOs) and discuss this discrepancy in terms of potential implications for the success of Participatory Irrigation Management policies, and the future well-being of women and their families.

B. What is Participatory Management ?

Participatory Irrigation Management has within the past decade assumed a key role in the rehabilitation, operation and maintenance of irrigation systems in Sri Lanka and is presently seen as the interaction of stakeholders with line agencies related to irrigated agriculture for the enhancement of operationalization and productivity with enhanced decision making powers being devolved on the users. It is expected that this would result in the optimizing of irrigation efficiency as well as agricultural productivity.

Therefore it is of paramount importance that the FOs should

- facilitate adequate representation for not some but all the stakeholders in FOs;**
- provide a forum whereby their needs could be represented;**
- act as a conduit for a two-way exchange of information;**
- provide a supportive environment whereby optimum participation creates community empowerment and**
- become a means for achieving sustainable development.**

By and large, the success of a participatory management program depends on the ability of the farmer organizations (FOs) to mobilize stakeholders to carry out relevant functions and fulfil the above listed expectations. Participatory management implies that all stakeholders have equitable access to the decision making fora.

The persons who live off irrigated agriculture in a system are not only landholders but also include leaseholders both legal and illegal, encroachers, traditional and non traditional 'ande' sharecroppers. All these groups are stakeholders in so far as they are dependent on irrigated water and cultivate irrigated land as sole or significant part of their livelihood strategies as well as contributing to the productivity of the systems.

C. Who are the stakeholders in irrigation systems?

If FOs are to assume all the functions and roles that they are expected to assume, one crucial issue to be considered is the need to optimize stakeholder participation which then brings us to the question - who should be represented through FOs ?. There are various possibilities:

Legal landholders. One problem encountered with granting FO membership status to legal landholders, is the problem of lands belonging to absentee landlords. These are worked either through sharecropping arrangements or leasing. The sharecroppers and leaseholders may not be involved in O&M activities organized by the FO. Field observations in 1998 in Mahaweli System H recorded the concerns of the FO office bearers about the impact of non participation of absentee landholders (who they have termed “ sancharake saha teppal govi” - postal and touring farmers - due to their means of operating their holdings) on O&M of tertiary systems. The number of landholders in all systems under study is more than those actually resident. Eg. In D3 305, in Galnewa Block Mahaweli system H a system studied under SLGC and recently revisited, the number of allottees was 116 and the number of resident farmers was 75.

In the sample studied for the SLGC the landownership pattern was as follows. In GRE the lands are sinakkara or own land with some being devala lands belonging to the Hanguranketha Devale worked on traditional ande rights. In RG the land allotments in Tract 9 and 11 were different; In Tract 11 the allotment was 2 1/2 acres paddy and 1/2 acre highland. in Tract 9 3 acres paddy and 1/2 acre highland are settled under the Land Development Ordinance. In KL the original allotments of one hectare of paddy and 1/2 hectare of highland are transferable to a single inheritor usually the spouse. In RG too usually the landowner male or female had named the spouse as the inheritor. In systems settled under LDO such as Ridiyagama and Huruluwewa, some of the lands which are held under LDO were legally transferable to three persons; where there were more than this number of siblings the holding was legally held intact but in fact the families had devised systems of cultivating similar to the traditional thattumaru to promote equitable use among siblings. (Table 3 Landownership in SLGC systems)

- 1) **Actual cultivators.** The group of actual cultivators includes at least some of the legal landholders (those who cultivate the land themselves), the second generation settlers who are leasing land from their parents, other leasees (both from within the system as well as from outside the system) and encroachers. It also includes those who assist the landholder in cultivating the fields, e.g. the family members, hired laborers and attam laborers. The responsibility for cultivation may also vary according to crop and system. In the Yala chillie cultivation in Kalankuttiya was seen as female labour intensive as against Maha paddy cultivation in the same system. (Table 1 and 2 Gender Tasks in irrigated agriculture - SLGC)
- 2) **Irrigators.** The group of irrigators includes landholder-cultivators, family members of the landholder, hired and attam laborers and friends or relatives who are asked to irrigate the plot.

- 3) Providers of labor for maintenance. Among the people that provide labor for maintenance are the legal landholders and their family members, leasees and their families, and agricultural laborers.
- 4) Farm managers - decisionmakers which would include some landholders, leasees, family members of landholders and ande sharecroppers.

This list of potential membership criteria already shows that there are a large number of different people involved in the tasks and responsibilities related to irrigation, irrigated agriculture and irrigation management. The landholder is not necessarily the cultivator; actual cultivation is often done by combining the skills, experience and labor of a number of people; the task of irrigating may be done by someone who is not the landholder; the task of maintaining the canals and decisions regarding these tasks are often not concentrated in one person.

This brings us to the question of studying whether there is any way of deciding which of these tasks or qualifications is more important with respect to participatory management and involvement in FOs? Who should FOs represent and whom do they represent? Which stakeholders should they facilitate and which group would have access to the FO?

In reality, the problem of FO membership and representation is often solved at the local level. Various arrangements arise, based on the judgement of the leadership and the communities involved. In some FOs, for example, leasees and tenants, the operators of land irrespective of tenurial rights are invited to participate in FO meetings. Some are allowed to join not as full members but in a form of 'associate membership', where they have the right to attend meetings, to participate in discussions and to receive information. Associate members in some instances are denied the right to vote in some systems.

In most FOs, membership criteria evolve in a way that is acceptable to most people concerned. In GRE, RG and KL the participation was limited to landholders with a few occasions of representation by members of the family. In KL it was noted that even when women attended FO meetings as representative of the husband, there was a tendency to note the husband's name thereby presenting a skewed perspective on participation. A letter from the landholder may be necessary for the representative to be present at the FO meetings.

A recent field visit to Ridiyagama reveals that the IMD field staff has made innovative changes in FO representation in response to the needs of a system which has a high ratio of tenant farmers, both those with ande rights and leaseholders. In an adjustment of membership criteria in order to facilitate the needs of stakeholders, the IMD has made arrangements to facilitate the representation of tenant farmers, especially holders of traditional ande rights in the FOs while

ensuring that their attendance at meetings cannot be construed as impacting negatively on the rights of the legal landholder.

What is striking, however, is that whatever the actual criteria for membership that are being applied or adhered to, women are rarely considered as potential members of FOs by the agencies involved as institutional partners of participatory management. Although currently gender desegregated data on landownership and FO membership is not available with line agencies, all previous studies in IMT have observed that in most FOs, participation of women generally is very low. Is it that female landowners are rare in irrigation systems? Is it that FO participation is defined as participation in the meetings and not in O&M? Are women not eligible to become members, even if they are landholders in their own right according to the criteria defining FO membership? Or is it that they are not particularly interested in participating in FOs?

Legal landholders. There are no reliable data available in Sri Lanka about the number of female landholders in irrigation systems as compared to the number of male landholders. An estimate would be that the percentage of female landholders is somewhere between 20 - 40%. Many of those female landholders in the systems studied for SLGC are not allottees but widows, who have inherited the land from their husbands. However in System H there are also a number of women who had been allocated land at the original time of settlement. In the KL field site,% of all legal landholders are women, but the percentage of female FO members is much lower, especially when 'membership' is taken to mean active participation. (Table 3 landownership in SLGC)

Actual cultivators. What is the role played in irrigated agriculture by men or women? The traditional concepts of labour participation, with its strong connotation of religio-agro rituals have now given way before the forces of commercialism and modernization. Within the past decade in particular, women's participation in certain tasks hitherto constrained due to the perception of ritual pollution has been gradually changing in non-traditional areas as land preparation and threshing. In 1992 women in Minneriya were observed to be breaking the taboo on entering the threshing ground and rare instances of females ploughing both with tractor and buffalo were noted. Currently the involvement of women is noted as being extended over the traditional boundaries and involve breaking of century old gender norms especially in settlement schemes.

“Women have a particular role in the water sector.... as participants in certain stages of paddy farming (principally transplanting, weeding, and harvesting, but also other stages) (ADB 1994).

There are regional differences in the nature and degree of men's and women's participation in irrigated farming. While the traditional gender tasks defining gender ideology are yet in place in GRE where women engage in only transplanting and infilling

with some input into actual irrigation, the forces of modernization and economic necessity are seen as propelling communities to change in KL and RG.

Their actual involvement in agriculture related activities is also a function of the socio-economic position of the household. Tables 1 and 2 give an aggregate picture of the gender division of labor in the SLGC study sample. The tables show that in the Dry Zone systems, there is hardly any gender division of labor anymore, almost all tasks can be done by both men and women. The observed exception is the subtask of plowing within land preparation which is still seen as a predominantly male task and transplanting which is still a predominantly female task. Most women interviewed for SLGC agree that tasks which involve bending the back for a long period of time such as transplanting are not favoured by men. The harvesting and gathering of sheaves is shared while transporting to the threshing ground is usually a male task due to the weights of the bundles.

In cultivating OFCs, the involvement of women is higher than in paddy cultivation, since women are believed to be better in cultivating crops which need more intensive attention such as chillies, tomatoes and onions. In KL, the female participation in Yala is seen as very high in all tasks as chillie is the predominant crop for the seasons and this is a female labour intensive cultivation (Table 2) Even such tasks as spraying pesticides for OFCs is sometimes carried out in KL by women. This is usually in the face of societal disapproval and their own husbands' prohibition as they want to save the expenditure incurred on wage labour as well their confidence in their own ability to do a thorough job.

“ Women do not spray agro chemicals. But Seelawathie is some woman, though old. She works like a man.”

(comment on Seelawathie, woman farmer, KL, SLGC field diaries)

In the past in traditional villages women did not enter the threshing ground until the paddy had been measured as it was feared that pollutive nature of women may affect the harvest (Leach 1971). More older and conservative farmers in KL recalled the fact that in their traditional purana village homes, women were even forbidden to walk through the ripening paddy fields which was seen as a male domain The entry of women to the threshing ground is now seen as being ignored mainly but not solely by female headed households and female landowners. Traditional gender ideology in this instance is perceived as being eroded by financial constraints experienced by farming communities.

“ When there are economic difficulties people try whatever they can to keep themselves alive and therefore women are also allowed to get themselves involved in the work of the threshing floor.”

(Ariyapala, male farmer in KL, SLGC field diaries)

There are a number of households in KL and RG where the actual farmers are women whose husbands are involved in other activities, sometimes outside the

system. Some are recognized as almost solely responsible for all farming and irrigation activities and decisions and as the better farmer by the community. As female landowners, they express a keen interest in the water management and agency decisions. There are many such examples to be observed in the SLGC. Yet, even some of these women have limited their participation in Fos. Sometimes even where there is actual participation, the record keeping system within FOs make it particularly difficult to establish female participation eg. by going through records such as Minute books. In KL it was found that in one instance, even when women attended as their husbands' representative, it would be the man's name which would be recorded in the attendance list.

It is seen that in the every system researched the nature of gender tasks for which labour is hired is a very reliable indicator of gender norms. The use of female family labour in non traditional tasks for work in own land is not seen as a major contravention of norms. But in the use of hired labour both the contractor and contractee is seen to approximate to the norms subscribed to in that system. In RG and KL gangs of 'contract women' work on land preparation including non traditional tasks such as building bunds. In GRE the only tasks that women engage in as hired labour is transplanting and infilling, in keeping with the traditional gender ideology prevalent in the system.

Irrigators. In Gampola Raja Ela, the Wet Zone System, there are very few women involved in the task of irrigating. This may be true for many small anicut systems in other parts of the country. Traditionally, irrigation is conceived as a male task as it is part of irrigated agriculture long seen as a male domain. However, in Rajangane and System H, there are many examples of women being involved extensively in the task of irrigating. There are even cases of women doing night irrigation in the Dry Zone systems especially KL though women would usually try to trade rotations in order to avoid going out at night. Women's involvement in irrigation is seen as higher in KL and that too for chillie cultivation in Yala(Table 1 and 2)

Apparently here, the task of irrigating has lost its solely male connotation. Husband and wife may go together to irrigate their fields, or sometimes they go separately depending on the work load. In some households, irrigating has become the sole responsibility of either the man or the woman. One FC representative in RG was observed to have handed over his allotted task of water distribution at FC level to his wife and daughter.

In RG as well as in KL, women appear to be concerned than their husbands about the adequacy and equity of water deliveries and are knowledgeable about rotations and water delivery. They share the task of irrigating and even if they do not themselves irrigate, women often go to the fields to monitor the flow of water to the field and to make sure that they receive the proper amount. A remarkable feature of women irrigators is that while ensuring their access to water, they often express concern about their neighbours in the field getting sufficient water. This is seen as a

concern growing out of their social networking process as poor women access the generosity of the wealthier neighbours in troubled times and it is the women as housewives who have to handle such requests for attention.

.Providers of labor for maintenance. In Gampola Raja Ela, either male landholders or male laborers carry out the canal maintenance tasks. Women never engage in maintenance of canals. In Rajangane and Kalankuttiya, maintenance is seen as a joint responsibility, and is often carried out by women, men and children together. Richer households and leaseholders may hire laborers, and some households also arrange for attam labor to carry out maintenance tasks.

Farm managers/decision makers

Especially among the wealthier farmer families, women are seen to play a significant role in the management of agricultural and agriculture related enterprises. In rich and middle income families it is also observed that joint decision making is more common. Households in which either men or women are solely responsible; households in which most decisions pertaining to irrigated farming are taken jointly by husbands, wives and sometimes adult children.

In all socio-economic groups, women are seen to play a key role especially in the domain of financial management and decision making in irrigated agriculture. Women are seen to be active in financial accounting for domestic and production purposes, in arranging giving and taking loans within the community, though not in negotiating with banks. They are foremost in organizing and mobilizing savings and often maintain secret savings which are made available to the family in times of crisis. They take the lead especially in settlement schemes of accessing agri-financing and mobilizing labour using their social networks. (Table 1 and 2) Their characteristic involvement in this area of irrigated agriculture make them an important asset to FOs. This is recognized in the 1994 ADB Strategic Framework.

“Nevertheless there seems to be acceptance that women may have a particular ability in administration, financial matters and organisation, and that they could have an effective role in CBOs, farmer organisation, etc”

D. Why is it that women are not more involved in FOs?

When the present functioning of FOs is examined, it is often noted by researchers and line agency officers that the participation of women stakeholders is seen to be limited. However it must be admitted that recent studies indicate that the participation of men in FOs is poor too (SLGC data, HARTI/IIMI 1997)

This paper seeks to examine the reasons for limited female participation in FOs by posing the following commonly asked questions and some possible answers.

1. Women are not involved because they are not interested.

Limited participation at kanna meetings and FO meetings are often recorded and construed as the lack of interest of women in FO activities. If women are not eager to participate, it is because they may perceive the FO as not functioning properly or adequately serving their needs. This is moreover a factor which may affect male and female non-participation.

Else it could be that they have more effective means of receiving the same benefits without actual participation. For example they may not feel the need to actually participate if they feel that they can receive the same information through a family member, relation, FC representative or neighbour and if their needs could be thus represented.

Women are seen to favour presenting their needs directly to decision makers in the irrigation line agencies, even without attending FO meetings because they seem to prefer this mode of contact and one to one interaction. It is observed report that women members of the family present complaints to line agencies in cases even when it is not a female headed household. It is felt that they may wish to win sympathy or that they are more articulate in presenting their case and prefer one to one interaction. There is marked reluctance to present their needs in the formal setting of the DCO meeting.

They are seen to be interested in the decisions taken at FO meetings in order to understand how it impinges on their respective households. Even when their husbands or male representatives do not volunteer information, women are seen to be keen on having full details. (The degree of interest is higher in RG and KL where the sole livelihood is irrigated agriculture than in GRE where irrigated agriculture is not the most important part of the household economy).

2. Women are not involved in FOs because of the lack of time.

This is certainly true of women as they are seen to put in longer hours of work because of their responsibilities in agricultural production as well as domestic tasks. Consequently the decision to attend meetings becomes more difficult for women than men. Especially for female heads of households, the difficulty is compounded by the need to obtain information and present their problems. When the anticipated benefits are high, women are seen to make an effort, at the expense of other activities to attend FO meetings .

Those women who attend meetings are somewhat critical of the manner in which the meetings are conducted. They find the duration of the meetings too long, the discussions are protracted unnecessarily etc. Also most representatives are male.

Sometimes they object to the often rough and argumentative atmosphere in which they are not comfortable and cannot present their case adequately. Then the perceived benefits of the meeting may not be seen as sufficient to outweigh the losses incurred in participating.

3. Women cannot afford the economic loss involved in participation in the FO meetings.

This is true for a number of women, especially female heads of households. But it also holds true for many men as well. The cost of participation may be too high to bear especially for the poorer stakeholders. It is seen that many FO office bearers have at least a relatively higher than average level of income and are often drawn from the village elite. Even when a poorer farmer is elected to office because of his ability he finds it difficult to carry on as he has to incur expenses which he can ill afford.

4. Husbands or other men (neighbours, sons, relatives) are able and willing to represent women landholders at meetings; therefore they do not need to attend FO meetings.

This is true of most cases though Kalankuttiya has several significant instances of female landholders preferring to represent their case themselves. Especially women with younger children to look after may opt for this because their heavy domestic work load. Also older women landholders who experience difficulties in getting about may prefer to send sons to represent them. In most cases, female landholders are allowed by the FO to be thus represented.

However husbands and male representatives are not always seen to adequately report back to women landholders; and women thus represented cannot adequately participate the discussions of issues that affect their lives. During the time D2305 was being handed over as a pilot for the Mahaweli Restructuring program in 1995, the SLGC undertook a rapid assessment of men and women's perception of the implications of the event. Women were shown to have a poorer awareness of the institutional changes and the impact on the community. In a PRA carried out in D2 305 and D3 305 in 1998 the level of awareness of men about the implications of the Mahaweli restructuring project was seen to be clearer and derived from their interaction with the agency officers and FOs; women were more dependent on informal contacts and were not so well informed as the men.

This marginalisation of a significant group from direct decisionmaking and the subsequent lack of information may have a negative impact on the management of the whole system. From the FO point of view, it faces the disadvantage in not being able to tap the knowledge and experience of women stakeholders who are

experienced farmers. From the agency point of view, key management decisions are not reaching a substantial group of stakeholders or are distorted in the process.

5. Women are not interested in taking up office in Fos.

Very few women are seen to have taken up office in FOs at all compared to their involvement in other village level organisations such as savings and credit groups and funderal assistance societies. However they seem more ready to take up the responsibilities of FC representative rather than at the higher level of the DCO. This may be due to the fact that they feel they can balance it with their household and agricultural responsibilities as it does not entail travel to System level meetings outside the vicinity.

Also the involvement of women in FOs is noted to have been higher in certain irrigation systems due to a combination of other variables. It was also observed during field surveys in 1992 and 1993 that in Huruluwewa, where the IMD project manager followed a policy of actively encouraging female involvement in FOs, a higher degree of participation was recorded with instances of women taking on office even at DC level in the FOs. Van Der Molen cites the case of Indigahawewa in NCP as another exception in having high female participation (16%) in the cascade she studied (1997). But there is no reason given for this increased level of participation other than the men are too busy to attend FO meetings in comparison to the other villages studied in the same cascade.

Weerasinghe observes that the female participation observed in 1995-97 in an IFAD funded rehabilitation of a tank in Galweeragollewa, Medawachchiya and in the functioning of the FO to be very high and that this FO was led by female office bearers. Here it is noted that the educational status of the women is high and there is high male outmigration in the village.

The same high levels of participation of female officebearers is noted in Ridiyagama in 1998 where there are currently 5 female office bearers in DCOs. Those women officer bearers interviewed in Huruluwewa in 1995 and 1998 (Athukorala 1995, Seneviratne 1998) and Ridiyagama in 1998 (Athukorala 1998) cite the encouragement recieved by the IMD Project Manager as the sole reason for taking up office.

But it is also noteworthy that all these women who were seen as involved as office bearers have had higher than average educational status in the systems; in some cases they have had a previous history of participation in community organisations or political organisations. All have have high status within the village, having built up social capital through maintaining good interpersonal relationships with the community. They are generally older women whose families are grown up thus releasing them from at least part of their domestic tasks connected with younger

children and whose economic status is relatively high, releasing them from the necessity of engaging in wage labour.

6. Women feel diffident about actively participating in male dominated FO forums.

The prevailing gender ideology as it relates to irrigated agriculture especially paddy cultivation has influenced the participation of women in FOs. Somehow irrigation and agriculture related meetings continue to be seen as a male domain. Women usually tend to go together for FO meetings and refrain from participation if there are no other women participants.

“ Since the meeting hall is close to my home I will first send my son to check if there are a lot of women attending. I will only go if there is at least one other women. If not I will try to persuade some other woman from the village to go along with me”

(Karunawathie, female landholder KL)

Many women feel uncomfortable in the sometimes aggressive atmosphere in which FO meetings are conducted. Sometimes FO meetings are held in the night and women generally find this culturally unacceptable. The FO of Tract 9 RG was termed the “ Re Samithiye” (Night Society) due to its habit of scheduling meetings for the night. A woman who attends an FO meeting may yet ask her male neighbour to speak up on her behalf and present her case. It is seen that women participate in a much more active manner in other organisations such as savings and credit groups and funeral assistance societies.

Again men are seen to perceive FO activities especially as office bearer as an enhancement of their social status and a contribution to the community. They tend to use the term “ samaje sewa” to describe their FO involvement. Even when their husbands are involved as FO representatives women tend to focus more on the practicalities of the situation and the advantages that such an involvement may bring. For instance they see that it would create an opportunity for interaction with the line agency officers and thereby improve their access to services. A series of interviews with FO officer bearers and their wives carried out in 1994-95 for the SLGC highlights this difference in perceptions of men and women to involvement in FOs. The women interviewed repeatedly stressed the opportunity to interact with agency staff and thereby improve their access to obtain services as a main inducement to take on office in the FOs. In all the systems studied the positive or negative perception of the spouse regarding FO activity was a decisive factor in undertaking office in the FOs.

E. What are the constraints to female participation in FOs ?

When the functioning of participatory management systems is studied we need to define the following factors which are seen to influence female participation in FOs -

- a. Sociocultural perception of women's roles**
- b. perception of line agency decisionmakers**

Both the above factors combine to place constraints on the participation of women in FOs. Line agencies often tend to assume that stakeholders, farmers, users are all men and work on these parameters. It is rarely that an attempt is made to bring about the conditions which enhance female participation in FOs by explicitly encouraging and creating conditions which would facilitate this process.

This approach is strongly dictated by the fact that the establishments of FOs have been in many instances been undertaken as part of irrigation rehabilitation project. (ADRC/ECL 1992; Kome 1997) In all the three SLGC systems participatory management had been introduced as part of the package for system rehabilitation. Line agencies also tend to overlook female landholders from training programs etc on the assumption again that most of these irrigation related training would be more useful for men and that women are not and would not be interested in obtaining these training as they do not irrigate. Both these assumptions are seen as needing to be reviewed according to available SLGC field data. Women in KL who are intensively involved in OFC cultivation have stated interest in learning more about disease recognition and more effective pesticides usage. But this type of training has not been available and even if it was may not be made available for women. None of the women in KL who were so intensively involved in irrigated agriculture were ever involved in a farmer training.

This situation is due to the entrenched assumption that irrigation is primarily a male field of operation. This seems to be an instance where attitudes of line agencies merely reinforce a sociocultural norm which serves to operate as a barrier against female involvement in FOs. But in reality these norms are already been eroded and the community has Other such constraints are seen in the belief that the womens' place is in the home where reproductive activities are seen to be given prominence. Her contribution to agricultural production and her involvement in decisionmaking is sidelined.

Interventions designed for women in many irrigation centred development projects often seem to concentrate on income generation activities such as poultry keeping, sewing etc - (ADRC/ECL 1992) again emphasising their activities in the domestic sphere. Such attempts seem to be less mindful of the fact that women are already very busy and that they are intensely involved and also interested in improving the efficiency of their efforts within the field of irrigated agriculture.

1.Summary

What then is the real reason for the gap in women's participation in irrigation and Fos and what can be done to optimise participation.

The following are reasons why there should be an attempt to improve female involvement in FOs by creating a supportive environment

- It will lead to an improvement of efficiency by involving more stakeholders in decision making and improving their flow of information.

- It will by supporting the principle of equity and strengthen community empowerment leading to sustainable development.

The Aslong project in the Phillipines records how the participation in FOs of women who played a salient role in irrigated agriculture and managed the household budget was facilitated by the introduction of a proxy system (Cloud 1994) In 1996 the Mahaweli Authority of Sri Lanka had drafted a scheme where membership in Fos would be given to a male and female member of the family. This has not yet been operationalised.

If such attempts are made it may be useful to recognise the present constraints affecting women and plan accordingly. For instance in a system such as Kalankuttiya, any training which are specifically geared towards women should take into account their responsibilities within the cropping system. Women are more likely to have time for training after transplanting and before harvesting in Maha; in Yala, due to their intensive involvement in OFC cultivation they are less likely to be interested or have the time to spare.

Another reason which may be viewed as a constraint of any supportive policy changes possible in achieving gender equity is that no study has yet been carried out to examine the financial losses incurred if any, due to limited participation in FOs for men and women, emphasising on the differential impact on female headed households.

While the SLGC has very detailed data on FO participation and this paper presents anecdotal information from other systems as well, a extensive study on the impact of gender norms and their impact on irrigated agriculture and FO participation has not been undertaken by any organisation. Such a study should also take into account the demographic changes caused by the two below mentioned factors

- 1. High involvement of women in agriculture**
- 2. One fifth of the households in the country is female headed.**

The participation of women in the water sector as a whole is seen to have undergone changes nationally within the past decade. Societal and economic changes such as ME employment and the influx of female labour into the export promotion zones is seen to have changed status of women within the family. However within the rural sector, according to Census data 40% of the agricultural workers in Sri Lanka are women and more that 70% of this group work without pay or profit. Of the total enrollment in farmer pension schemes 23.5 % are women.

Casualties due to the Northern and Southern civil conflicts and may have impacted on the rise of female headed households to a point where one fifth is female headed. The percentage of female headed household has risen from 18.8 % in 1992 to 21.4% in 1994 - for the first quarter only. (Census and Statistics 1995, Athukorala1996) ..

Finally the above argues for the inclusion of gender analysis be considered in participatory management initiatives as a tool for promoting equity and efficiency in the irrigated agriculture sector. Gender is often misconstrued as focussing only on women's activities. Gender analysis is seen by its critics as a fashionable donor driven agenda which is not appropriate to the Sri Lankan culture. At the other extreme projects pay lip service to gender simply to qualify for donor funding.

It is emphasised that gender analysis is a tool which needs to view the differential needs of men and women within a culture specific and context specific approach. Gender sensitive approaches built on upto date situation analyses needs to be used as part of a local driven agenda in order to optimise participation of women in Farmer organisations.

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Table 1: Gender Participation in Irrigated Agriculture - Summary of Tasks Relating to Paddy

in Person-Days

Rajangana Tasks Performed	Maha Season				Yala Season			
	Female	%	Male	%	Female	%	Male	%
Preparation of land	107	5.0	2,019	95.0	199	10.6	1,683	89.4
Nursery preparation	37	73.4	14	26.6	32	76.0	10	24.0
Transplanting	311	56.3	242	43.7	12	5.4	209	94.6
Crop care	341	12.7	2,346	87.3	310	12.2	2,223	87.8
Irrigation	59	10.3	513	89.7	31	6.4	457	93.6
Harvesting	75	11.1	598	88.9	49	7.4	618	92.6
Marketing and sale of produce	44	28.8	108	71.2	19	16.1	97	83.9
Agri-financing and labor mobilization	5	10.7	42	89.3	2	5.8	36	94.2
Preparation of meals for helpers	128	100.0	-	-	104	98.6	2	1.4
Farmer organization activities	9	9.8	83	90.2	6	6.9	81	93.1
Supervision of labor	27	14.3	162	85.7	24	13.2	159	86.8

Kalankuttiya Tasks Performed	Maha Season				Yala Season			
	Female	%	Male	%	Female	%	Male	%
Preparation of land	336	17.1	1,631	82.9	85	14.6	499	85.4
Nursery preparation	45	69.0	20	31.0	19	72.5	7	27.5
Transplanting	427	71.4	171	28.6	27	28.1	69	71.9
Crop care	865	30.3	1,993	69.7	241	26.4	671	73.6
Irrigation	93	23.9	294	76.1	32	15.5	172	84.5
Harvesting	300	36.7	516	63.3	80	32.1	170	67.9
Marketing and sale of produce	21	12.7	147	87.3	9	11.3	67	88.7
Agri-financing and labor mobilization	34	37.3	57	62.7	10	25.2	28	74.8
Preparation of meals for helpers	187	95.4	9	4.6	52	96.3	2	3.7
Farmer organization activities	44	24.8	134	75.2	11	17.8	51	82.2
Supervision of labor	1	6.3	8	93.8	2	50.0	2	50.0

Gampola Raja Ela Tasks Performed	Maha Season				Yala Season			
	Female	%	Male	%	Female	%	Male	%
Preparation of land	3	0.3	893	99.7	3	0.8	350	99.2
Nursery preparation	13	13.1	87	86.9	12	26.1	34	73.9
Transplanting	581	84.3	108	15.7	168	79.4	44	20.6
Crop care	204	17.0	994	83.0	68	13.9	419	86.1
Irrigation	22	17.5	104	82.5	3	7.8	30	92.2
Harvesting	221	47.6	244	52.4	97	51.6	91	48.4
Marketing and sale of produce	137	33.3	274	66.7	60	38.0	97	62.0
Agri-financing and labor mobilization	13	12.0	95	88.0	2	9.1	20	90.9
Preparation of meals for helpers	151	100.0	-	-	49	100.0	-	-
Farmer organization activities	2	3.1	63	96.9	1	4.3	11	95.7
Supervision of labor	12	17.6	58	82.4	5	21.5	18	78.5

Table 2: Gender Participation in Irrigated Agriculture - Summary of Tasks Relating to Chili

in Person-Days

Rajangana	Maha Season				Yala Season			
	Female	%	Male	%	Female	%	Male	%
Tasks Performed								
Preparation of land	-	-	8	100.0	-	-	4	100.0
Nursery preparation	0	65.8	0	34.2	1	40.0	2	60.0
Transplanting	1	7.1	7	92.9	1	66.7	1	33.3
Crop care	1	3.7	26	96.3	19	51.4	18	48.6
Irrigation	-	-	7	100.0	3	100.0	-	-
Harvesting	18	56.5	14	43.5	4	77.8	1	22.2
Marketing and sale of produce	0	8.3	3	91.7	1	24.9	2	75.1
Agri-financing and labor mobilization	-	NA	-	NA	-	-	0	100.0
Preparation of meals for helpers	-	NA	-	NA	0	100.0	-	-
Farmer organization activities	-	NA	-	NA	-	NA	-	NA
Supervision of labor	-	-	4	100.0	-	-	2	100.0

Kalankuttiya	Maha Season				Yala Season			
	Female	%	Male	%	Female	%	Male	%
Tasks Performed								
Preparation of land	93	35.9	166	64.1	196	32.3	410	67.7
Nursery preparation	9	50.7	9	49.3	44	35.6	79	64.4
Transplanting	73	69.1	33	30.9	219	56.9	166	43.1
Crop care	159	46.1	186	53.9	727	44.7	900	55.3
Irrigation	9	26.5	25	73.5	88	31.7	189	68.3
Harvesting	119	66.2	61	33.8	814	70.5	340	29.5
Marketing and sale of produce	2	11.6	15	88.4	25	15.7	136	84.3
Agri-financing and labor mobilization	5	52.6	5	47.4	12	28.1	29	71.9
Preparation of meals for helpers	2	100.0	-	-	25	83.5	5	16.5
Farmer organization activities	-	-	4	100.0	10	28.0	26	72.0
Supervision of labor	-	NA	-	NA	1	40.0	2	60.0

Women's Roles and Realities in Water Management

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Abstract

The emerging acceptance of the importance of the role of women in the water sector has thrown up the problems of mainly rural women accepting new responsibilities in addition to their reproductive and productive roles in the home and community. Pioneers in promoting the role of women have identified these and the need to solve them in their own context, taking into account the women's current roles, their place in the community vis-a-vis the men in their lives and the traditions and conventions which bind them and make them resistant to change, all of which need to be sensitively handled if women are to be treated not as a special interest group but as a mainstream group - as partners with reduced burdens.

Water is a woman's issue. In our part of the world the responsibility for water transport and the operation and maintenance of traditional water supply systems lies almost entirely with women. Water is also one of the main priorities for women because of its importance for family health and welfare.

Women are also the first victims of water scarcity. It is the women who suffer the extra burden when water systems fail to function. Water is one of the greatest users of a woman's time, spending as she does almost one quarter of her working day on fetching, carrying, using and managing water. It is also a user of her energy, leaving very little for her other manifold tasks.

Despite this close association, women have been the bit players in the water scene, with little access to better tools and techniques and less information on their use. A rural woman's mobility and participation are also generally hampered by traditional and cultural constraints. Thus women's needs and constraints tend to be neglected in project planning, especially when we come across the mainly male planners' limited understanding of the woman's roles and responsibilities. Traditional knowledge and management skills are almost always unrecognized with the result that a woman's position is weakened rather than strengthened by external projects.

This leaves our women in a truly ironic situation - theirs is the vital role in water in the home and the community, but they have little or no voice in the setting up and functioning of water systems. To use a cliché, they remain the fetchers and carriers of water.

It takes very little to realise that a woman's traditional role in the home of managing water systems and supply should logically extend to women setting up useful and functioning water systems. When new water supplies are built without knowledge and acknowledgement of this traditional role, women's tasks in public management of water are limited to physical work. Women keep standposts and drains clean, collect water fees, report problems about handpumps and so on. But they do not have recognized status or authority and are often in a subordinate position, having no voice in a matter so vital to the welfare of their families.

Fortunately, during the UN Decade and after, pioneering efforts by several people have provided a major breakthrough in achieving the involvement of women as part of mainstream concerns, including designing a learning environment, achieving sustainable and effectively used water systems through replicable methods and developing a framework of technical and social interventions acceptable to managers, technicians and Women in Development (WID) specialists.

There were several pioneers in this process - men and women of practical sensibility and a vision of the full roles ordinary women can play. Anne and Gilbert White did the now classic first study on water use practices in Africa, Anne White focussed on the importance of users' choice in community involvement supported by a national policy. Mary Elmendorf initiated the concept of women's participation at all levels as primary managers of water and stressed the importance of special training to make these roles effective to enable women to perform their roles more effectively. There were also women like Marilyn Carr of UNIFEM, Ma Yangsheng of UNICEF, Samiha El Katsha of the American University Social Research Centre in Cairo who helped in many ways to make women effective as managers of water systems. Thus towards the end of the UN Decade for Water, women began to emerge not as a special interest group in water and sanitation, but as a mainstream group - as partners with reduced burdens.

Over the years it has also emerged that though the role of the woman in water management is primarily one of providing and using water at the household and community level, a woman's contribution is not necessarily limited exclusively to these narrow confines. Women also have important roles as decision makers, planners, managers and research scientists in making water resource development and management possible. Though women's current and potential contribution in these major areas has been largely neglected, they do not appear to be mere pipe dreams any longer.

Many Sri Lankan NGOs working in projects in water, are gradually placing a strong emphasis on gender in their programmes and evolving individual gender orientations. Though these differ from one organisation to another, as a whole it means that it is realised that women and men must be equitably involved if a project is to be successful and sustainable. They are also aware of the cultural and historical context and the value systems of the society they are working in and that gender perceptions must be in tune with these.

For women to be successful as managers in a project, several broad issues relating to the situation of women in the country vis-a-vis the men must be taken into serious account.

I believe that despite the prominence achieved by Sri Lankan professional educated women, despite free education and the high literacy rates among women, the sad truth is that women in general occupy a subordinate position to men.

Thus one of the first prerequisites is that women generally and especially women in remote rural areas and in semi urban slum and shanty dwellings have to be brought into the mainstream of development.

We also need policies that satisfy strategic needs of women, not only their practical needs.

Democratic decision making processes in matters relating to both men and women need to be institutionalised.

My fringe involvement with a partner organisation of the World Bank pilot project CWSSP (Community Water Supply and Sanitation Project) has shown that it is counter productive to mobilise only women. Promoting a gender balanced approach through training at every level has been the mission of our Executive Director, a very balanced feminist! She has promoted this in dealings with policy makers and taken on an advocacy role at rural level among the women of our projects in the Ratnapura district.

Several gender awareness programmes were launched, first at national level to men and women who would introduce such programmes in their projects and, much more successfully at grassroots level - away from air conditioned conference rooms and magi boards - to the actual beneficiaries of our water projects.

It was indeed surprising - and wholly welcome - that at the first grassroots workshop there was a gender balance of men and women and among the men were young bachelors on the brink of marriage and older professional men of position in the village.

One of these was a retired principal of the school in the village. He was a keen participant and confided to the trainer that he had always believed in the full participation of women in any development project, but he could not articulate his ideas as traditionally a man in his position in the village should not express publicly that men and women were equal or that women could do things as well as the men!

It has also been the experience of many NGOs - the Decade Service, for one - that women's equal participation enhances such programmes. During the past decade and more there have been extremely successful social mobilisation programmes in the country in poverty alleviation, in rural banking, in volunteer health programmes which have exposed mainly rural women to new concepts. Their involvement in successful new ventures has made them open to the fulfillment of strategic needs, the concepts of gender and the potential for women as leaders. Many women's NGOs have found that developing leadership roles among women often leads to the development of the community in which they live and to the development of the NGO itself.

A CWSSP spokesman felt that there has been a clear indication that partner organisations have achieved some progress in a gender approach. But he also felt that there were several key elements that could be incorporated to achieve a more comprehensive gender approach. Here are some that may be tried towards this end:

- ensuring that at least half the number involved in a project is women in all stages of the project from planning to final evaluation. This will ensure an impact on long term sustainability.
- supporting gender sensitization and balancing by developing case studies of successful experiences from countries with similar situations as in Sri Lanka.
- taking the long term view that introducing a gender approach can address women's strategic needs which can, over time, improve the situation of women and not merely a practical which seeks to improve the present condition of women by providing water close to their homes.
- Compiling the experiences of NGOs to help formulate policy guidelines to support gender balanced development in future programmes.

At a recent (May 1998) Latin American workshop senior women decision makers participated on "Contribution of Women to the Planning and Management of Water Resources" in Mexico City. The workshop analysed the current and potential roles in sustainable water resources management and provided a forum to review experiences objectively to draw practical and operational lessons.

There were women from governments, the private sector, Universities, research institutions, national and international NGOs. Here are some of the practical and wholly relevant findings - to be published later as a book together with the background papers.

The situation of women cannot be improved in the foreseeable future by making statements at international conferences in support of women's involvement - there should be a platform for action.

Pay attention to the discriminations women face, just as you speak of their achievements, if their participation as managers is to increase.

Analyse objectively the technical, political and social issues in water resource management and the participation and contribution of all the actors.

Society has a role alongside the woman's pivotal role of guarding the environment - society as a whole must be concerned with it. Society has to be better educated to deal efficiently with the various water problems and has to be empowered to influence the decision making processes.

To increase the participation of women in balance with the participation of men, communication, training, education, transfer of information and interdisciplinary teams which could contribute to integrate water development are fundamental.

NGOs have a vital role to involve the overall population on water resources development programmes.

The situation of women without men also has to be faced. This is specially crucial to Sri Lanka where daily women are taking on new responsibilities with men migrating, dying in the war or in the emerging single parent families headed by women. These create new roles for women as administrators and producers, managers and users. It is imperative that women get the necessary technical training to plan and manage water supplies and facilities by themselves.

In our own context again we must face the truth that in spite of the proud political achievements by two of our women, women are barely visible in the seats of power, and invisible in the water sector. We have never had a woman Minister nor even a secretary in the line Ministry, nor as head or anywhere near the top position in the National Water Supply and Drainage Board (NWSDB), there is not a single woman in the newly created Water Resources Council, and just one woman somewhere near the top in the CWSSP. We are sadly short of women engineers in the country despite women in other professions as law and medicine overtaking the men in numbers. And sadly, there is no disaggregated data on women in the water sector.

But there are rays of sunshine emerging from NGOs. These may be faint now, but there is promise -

the health and environment programme of the Lanka Mahila Samiti in which at every level women were in charge, the Sarvodaya Women's Movement environment programme headed by a woman, the Water Supply and Sanitation Decade Service has a balance of both women's and mixed NGOs in its membership, a balance of men and women on its management and its Secretariat is directed by a woman for the past ten years, to mention some at random.

There is no gainsaying that properly educated and trained women are important assets to this sector, if less educated women are to fill a meaningful role. Case studies in other less developed countries show promising statistics in water studies - in Brazil for instance, the number of women studying water resources engineering has increased by 40 percent in the last decade. In Panama the number

of women studying civil engineering has increased from 2 percent in the early seventies to 47 percent at present. Analyses from Brazil have shown that more women are now joining water resource related careers as their own personal choice.

In Panama 37 percent of ministers, deputy ministers and heads of water issues related agencies are women. 43 percent of the academic staff in water sciences of the major universities are women. A similar percentage of women work as technicians and engineers in the government and private sector in the water field. Though still the number of women at decision making level is low, many Latin American countries have women as planners, supervisors, managers, researchers, operators and technicians. But of course, they are aware that there is a lot more to be done.

Empowerment of women is high on the current development agenda for women. Perhaps one of the best places to start an empowerment programme is water management, a sector which fundamentally affects the lives of women and men and where both need to be equitably and appropriately involved in determining all sector activities, remembering that women are not a homogeneous group, that however much we may not like them, caste and class differences do exist and need to be taken into account, that convention and tradition are very much a part of the lives of rural women, and taking the greatest care to prevent further overburdening of women which will automatically perpetuate and reinforce the traditional roles of women.

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මීට අවුරුදු 3000 - 4000 කට පමණ පෙර ආචාර්ය චරන, සුමුන, වාග්ගට ආදී ආයුර්වේද ජාතිවරුන් ජලය පිළිබඳ ව පහත ආකාරයට විස්තර කොට ඇත.

- X. ජලයේ ප්‍රභවය හා වර්ග ගුණ
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- X. පවිත්‍ර, අපවිත්‍ර ජල ලක්ෂණ හා ඒවා පිටිසිදු කර ගැනීමේ ක්‍රම
- X. නිරෝගිමත් දිරිස ජීවිතයක් සඳහා පුද්ගලයෙකු විසින් දිනපතා ජලය පානය කළ යුතු ආකාරය.

නූතන ජල පර්යේෂකයන්ට මෙම දත්ත ද උපයෝගී කර ගනිමින් පර්යේෂණ කළ හැක.

හැඳින්වීම.

අවුරුදු 3000 - 4000 පමණ පැරණි ආයුර්වේද ශාස්ත්‍රයේ, ප්‍රධාන ශ්‍රීර්ව වන වරක, සංහිතාව, සුශ්‍රූත සංහිතාව, අමිධාංග භෘද සංහිතාව, භාව ප්‍රකාශය වැනි ශ්‍රීර්වල ජලය ගැන ඉතා පැහැදිලි කරුණු ඉදිරිපත් කර ඇති අතර, **ජලයෙන්** තොරව මිනිසාට හෝ ශාකවලට ජීවත් විය නොහැකි බව පෙන්වා දී ඇත.

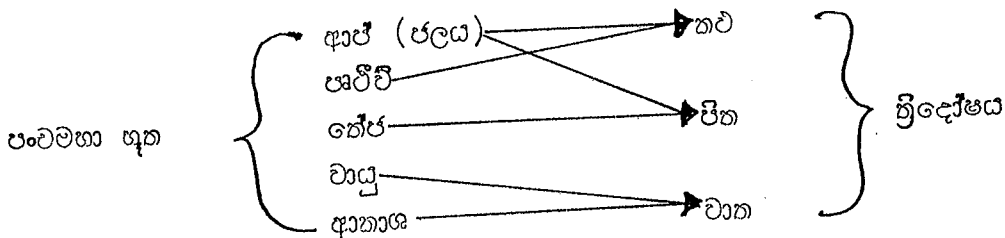
පංචමහා භූත.

ආයුර්වේද **සෘෂි** භෘෂිතයට අනුව ලෝකය නිර්මාණය වී ඇත්තේ පංචමහා භූත වලිනි. ඒවා පහත සඳහන් අන්දමට පෙන්වා දී ඇත.

- | | | | |
|-----|--------|------------|----------|
| 01. | ආප් | - (ජලය) | } පංචභූත |
| 02. | තේජ | - (ගින්න) | |
| 03. | පෘථිවි | - (පොළොව) | |
| 04. | වායු | - (වාතය) | |
| 05. | ආකාශ | - (අවකාශය) | |

ත්‍රිදෝෂ.

මෙම පංච මහා භූත වලින් ශරීරය ද නිර්මාණය වී ඇති අතර, එය **ත්‍රිදෝෂය** වශයෙන් ශරීරය තුළ දී ක්‍රියා කරයි. **ත්‍රිදෝෂය**, වාත දෝෂය, පිත්ත දෝෂය, තව දෝෂය යනුවෙන් හඳුන්වනු ලබයි.



එනම් ආයුර්වේද මත අනුව ශරීරයේ ප්‍රධාන සංඝටක තුනෙන් දෙකක් නිර්මාණය සඳහා ජලය අත්‍යවශ්‍ය වන්නේ ය. ඉන් පසුව ශරීරයේ සජීව ධාතු හා ඕපස් ද, මලද අනුපිලිවෙලින් නිර්මාණය වන්නේ ය. මේ අනුව ලෝකය නිර්මාණයේ දී මෙන්ම මිනිසා නිර්මාණයේදී ද ජලය ඉතා වැදගත් සාධකයක් බව ආයුර්වේදය පෙන්වා දී ඇත.

ජල කාම හා ශුභ :

පර්යාය කාම .

පානිය, සලිල, තීර, තිලාල, අම්බු, ආප, වාටි, කෝය, පයස්, පාඨ, උදන, ජීවන, අම්භ, අර්භ, අවෘත, සතරය.

ජලශුභ :

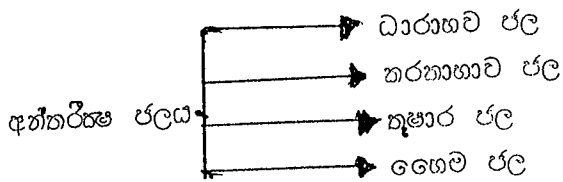
රසය අව්‍යන්තය, භීතලයි, ලසුයි, පැහැදිලියි, අවෘතය මෙන් ප්‍රාණීන්ගේ සතු දරයි. ඔලය වඩයි, භෘදයට තිතවත් ය, පවස තිවයි, තිත්ද තැනි කරයි, මධුරාදී රස වර්ග දනවන්නේ ජලය මගිනි.

ජල වර්ග .

ප්‍රධාන වර්ග දෙකකි.

1. අන්තරීක්ෂ ජලය (වර්ෂා ජලය)
2. භෞම ජලය (පාංශු ජලය)

අන්තරීක්ෂ ජලය නැවත කොටස් හතරකට බෙදා ඇත.



1. ධාරාභව ජලය.

පිරිසිදු වස්ත්‍රයකට, ගල් තලාවකට හෝ රත්, රිදී, තඹ, පළිඟු වැනි භාජනයකට ධාරා වශයෙන් ලබා ගත් වැසි දිය මේ නමින් හඳුන්වයි. මෙම ජලය ත්‍රිදෝෂය නැත. අව්‍යන්ත රසයි, පැහැදිලියි, රසායනයි, සෞම්‍යයි, ඔලනාරතය කෘප්තිය ඇති තෙණේ. පණ දරයි, චුද්ධිය ඇති කරයි.

ධාරාභව ජලය ද වර්ග දෙකකි.

- ගංගා ජලය
- සමුද්‍ර ජලය

ගංගා ජලය : වජ්‍ර මාසයේ දී මෙම වැස්ස ලැබෙයි. මෙම ජලය සෑම අතීන් ම හිතකරය.

සමුද්‍ර ජලය : ඝෘතයෙන් යන්ත වූ ලුණු රසයි. දෘෂ්ටියට හානි පවුණුවයි.

බලය පහ කෙරේ. පිලි ගදය. ත්‍රිදෝෂ කෝප කෙරේ. භූමි කාර්යයන් සඳහා ම අහිතකරය.

- II. කරකාහව ජල - අයිස් වර්ෂාවෙන් ලැබෙන ජලය
- III. කූෂාර ජල - අයනි වර්ෂාවෙන් ලැබෙන ජලය
- IV. ගෞම ජල - හිමාලයේ ඇති අයිස් දියවීමෙන් ගලා බසින ජලය

ගෝම ජලය.

මෙය ද ත්‍රිවිධාකාරය.

- I. ජාංගල ජලය - වනාන්තර වලින් හට ගන්නා ජල උල්පත් වලින් ලැබෙන ජලය
- II. අනුප ජලය - ශාක සහිත, පහත් බිම්, වගුරු බිම්වල ඇති ජලය.
- III. සාධාරණ ජලය - ලිං, ඇල, දොළ, ගංගා ආදියෙන් ලැබෙන ජලය.

පහත සඳහන් අන්දමට ද ජලය වර්ගීකරණය කොට ඇත.

- I. නදි ජල - හිමාලය තුළ වලින් ගලා බසිනා ගංගා ජලය
- II. උද්භිද ජල - දිය බුබුටු හා උල්පත් ජලය
- III. නිර්න්ධර ජල - දිය ඇලි වලින් ලැබෙන ජලය
- IV. සරෝවර ජල - පොතූණු හා විල්වල ජලය
- V. කඩාග ජල - වැව් ජලය
- VI. නූප ජල - ලිං ජලය
- VII. පල්වල ජල - මඩ වගුරු ජලය
- XIII. වීතිර ජල - පුත්‍ර වලවල් වලින් ලබා ගන්නා ජලය
- IX. කේදාරජල - තඹුරේ ඇති ජලය

පිරිසිදු ජලයේ ලක්ෂණ.

නිසිදු ගඳක් හෝ රසයක් නොමැති බව, සිසිල් බව, පවස නිවන බව, පැහැදිලි බව, සැහැල්ලු බව, හෘදයට හිතකර බව, පහු කිට ආදියෙන් තොර බව, හා රත් පිදි මැටි භාජනයක පිසූ ඇල්හාලේ බතට මෙම ජලය දමා තැබූ විට එම බත විවර්ණ වීමක් හෝ පිරිහුණු වීමක් නොවන්නේ නම් එය පිරිසිදු ජලය බව පරීක්ෂා කර බැලිය හැක.

අපිරිසිදු ජල ලක්ෂණ.

මෙලසුල් බව, පහුවන් කිටයන් සිටිනා බව, තොළ සෙවෙල් ආදියෙන් පුත්ත බව, කුණු ගඳ ඇති බව, විවර්ණත්වය, අප්‍රයත්න රස, සනත්වය වැඩි බව, මල වර්ග මිශ්‍රිත බව, අපිරිසිදු ස්ථානගත පිහිටීම, හිරු සඳු නිරණ නොමැටීම, එනෙතෙහිම වැසි මගින් පහිත වූ බවය.

මෙම ජලය පානය කිරීමෙන් සියලු දෝෂ කෝපනර, ආධිමාන, අතිශය, උදර, ජවර, නාස, මන්දාග්නි, අභිශ්‍යන්ද, නන්ඩු ආදී රෝග ඇති කෙරේ.

ජලය පිරිසිදු කිරීමේ ආයුර්වේදීය ක්‍රම.

- X. කැලැඹුණු බොර සහිත ජලය පැහැදිලි වනතෙක් නොසොල්වා තැබීම.
- X. දහවල් කාලය පූර්වා ලෝකයටත්, රාත්‍රී කාලය සඳුනිරන්තවලටත් නිරාවරණය කර තැබීම.
- X. ගින්නෙන් නතාර ගැනීම (ඝනරෙන් එකක් වනසේ)
- X. රත්, පිදි, සකඩ ගිනියම් කර ජලයෙහි ගිල්වීම.
- X. සන පිරිසිදු වස්ත්‍රයකින් පෙරා ගැනීම.
- X. අඹුරු, ගල්වැලි සහිත පෙරන වලින් පෙරීම.
- X. ඉගිණි ඇට දමා රැයක් තැබීම.
- X. දැසමත් මල්, පලොල් මල්, දොඹමල් දමා තැබීම.
- X. තෙලම් දඩු, මුතු, රත්රන්, ගෝමේද ආදිය ජලයට දමා තැබීම.

ජලජාත්‍ර. (ජලය පානය කරන භාජන)

ජල පානය සඳහා තඹ භාජනයක් භාවිතා කිරීම සුදුසුය. එය නොලද හොත් මැටි බඳුනක් යොදා ගත යුතුය. පළිඹූ, වීදුරු, වෛදුර්ථය මැනින් වලින් සැදූ භාජන ඉතාම හිතකර වන්නේය.

ජල පානයේ ගුණ.

හෝජනය මුලදී ජල පානය කල විට සිරුර කෘශ බව හා කුසගින්න නිවී යාම ද, හෝජනය මැදදී ජල පානයෙන් ගින්න දැල්වීම ද, හෝජනය අගදී ජල පානයෙන් සිරුරේ තර බව හා සෙම වැඩීම ද සිදුවේ.

අවධම ජල පානයේ ගුණ.

අරුණෝදය කාලයෙහි දී සොළොස් පලමත්(විලි 700 ක් 800) ක් පානය කිරීමෙන් සමස්ථ රෝග හා වයසට යාමෙන් ද මිදි එක් සිය වයරන් සැපයේ පිවත් විය හැකිය. ජීවගේම එයින් අර්ශස්, ග්‍රහණි, ශෝච, ජවර, උදර, කුෂ්ඨ, මේදෝ රෝග, මුත්‍ර සාත, රත්තපිත්ත ආදිය ද නසයි.

නූතන ජල පර්යේෂකයන්ට මෙම දත්ත ද උපයෝගී කර ගනිමින් පර්යේෂණ කළ හැක.

ආශ්‍රිත ග්‍රන්ථ නාමාවලිය.

1. චරිත සංගීතාව - චක්‍රපානිදන්ත දිවියා විසාකසාකය
පරි: ආචාර්ය යාදවර්ජිත්වර්මා - වෞතමිවා ප්‍රකාශන
වාරණයී - ඉන්දියා - 1992 පූත්‍ර/27
2. අජ්ඨාංග කෘදය සංගීතාව - අරුණදත්තවීතාව
පරි: තරිතඝාත්‍රී විරාජ් රී, ත්‍රිභූතදාය ඇතමිම්
වාරණයී - ඉන්දියා - 1992 පූත්‍ර/5
3. සුශ්‍රුත සංගීතාව - ශ්‍රී - ඩල්හනාචාර්ය
පරි: ආචාර්ය යාදවර්ජිත්වර්මා - වෞතමිවා ප්‍රකාශන
වාරණයී - ඉන්දියා - 1992 පූත්‍ර /3, 5, 45
4. භාව ප්‍රකාශය - ආචාර්ය භාව මිශ්‍ර
පරි: ආර්. බුද්ධදාය - ආපුර්වේද දෙපාර්තමේන්තුව - 1981
පූර්ව බණ්ඩය - 358 - 367
5. චරිත සංගීතා - ඉංග්‍රීසි පරිවර්තනය
අවිනාඡ් සුන්දරී තවිපත්ත - කල්කතා - 1890