Paper No. 3

VANATHAVILLU FARMER MANAGED IRRIGATION SYSTEM IN SRI LANKA : IMPLICATIONS FOR SUSTAINABLE USE OF GROUNDWATER

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ABSTRACT

The paper looks at the imperatives of sustainable groundwater utilization in the context of the virtual failure of the Vanathavillu FMIS located in the Puttalam district of Sri Lanka. The object in setting - up the FMIS was to utilize groundwater for the cultivation of subsidiary field crops to enhance farmer incomes and season proof households. Altogether 168 farmers were given 0.4 ha allotments in the FMIS. While the Irrigation Department was responsible for pump operation and maintenance the farmers were collectively responsible for on-farm water distribution and maintenance of the distribution network. Despite initial success the Vanathavillu FMIS has lost its momentum and the farmers have taken to the cultivation of permanent crops and rainfed field crops in place of irrigated agriculture. In the Vanathavillu FMIS sustainability has been undermined by technical, agricultural, institutional and organisational problems. For sustainable groundwater utilization changes have to be made in water management, crop agronomy, infrastructure availability and system management. There is a need to better integrate the FMIS into the regional economy. Issues of sustainability have to be viewed in the larger context of the macro policy environment.

INTRODUCTION

This study focusses on the imperatives of sustainable groundwater utilization taking into account the reasons for the virtual failure of the Vanathavillu Groundwater FMIS. Hence the study utilizes an inductive approach. In relation to Vanathavillu the term FMIS needs qualification. The system had been set-up with State intervention but the management responsibilities (land development through the cultivation of subsidiary crops, water distribution at the field level and maintenance of the distribution network in particular within each allotment) had devolved on the farmer community. However, from the very inception of the FMIS there had been total dependence on the State (represented by the Department of Irrigation) for the lifting of groundwater to meet the irrigation requirements of the farmers. Thus in the Vanathavillu FMIS the farmers had not performed a resource management function at the source.

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This study is based on data derived from the author's previous field work in Vanathavillu (Karunanayake, 1983) supported by a rapid appraisal of the system in March 1992 involving field observations as well as discussions with key informants from among both farmers and officials.

GEOGRAPHICAL SETTING

Vanathavillu FMIS is located in the Divisional Secretary's Division of Vanathavillu in the Puttalam District of Sri lanka (Fig 1). Climatically Vanathavillu lies in the Arid Zone of Sri Lankai. The average annual rainfall is below 1270 mm and there are about 200 non - rainy days in the year. The dry months of June to September are generally water deficient. The average annual temperature varies between 26o - 28oC.

The terrain of the region is flat to undulating. In general the soils consist of Red-Yellow Latasols. These soils are neutral to medium acid in reaction and are well suited to the cultivation of subsidiary food crops under irrigation.

Whereas most parts of the Island are underlain by a basement complex of metamorphic rocks, the Vanathavillu FMIS is located in the southern part of a 200 km long limestone belt stretching along the northern and northwestern coastal areas. The confined nature of the aquifer is found to create artesian conditions in Vanathavillu. Estimates of groundwater resources available vary between 5 - 20 million cubic metres per year (NARESA, 1991).

VANATHAVILLU FMIS

The Vanathavillu FMIS was set-up in 1968. Although 29 tube wells were sunk only 8 wells were ultimately developed owing to problems of salinity and low water yields (Fig 1). Of the production wells one was set aside for the exclusive purpose of providing water to the Vanathavillu town area. Overtime, the

Table I: Data on Production Wells

Well No	Diameter (cms)	Total Depth(m)	Depth to Water Level (m)	Yield l/p/s	Extent Irrigated(ha)
P9	20	124	25	23	14.4
W4	25.4	67	27	30	16.8
W5	25.4	131	32	23	17.2
W6	30.4	91	38	38	9.2

Source: Adapted from Project Report on Rehabilitation of Vanathavillu Ground Water Project : Office of the Irrigation Engineer, Puttalam (1990).

LOCATION

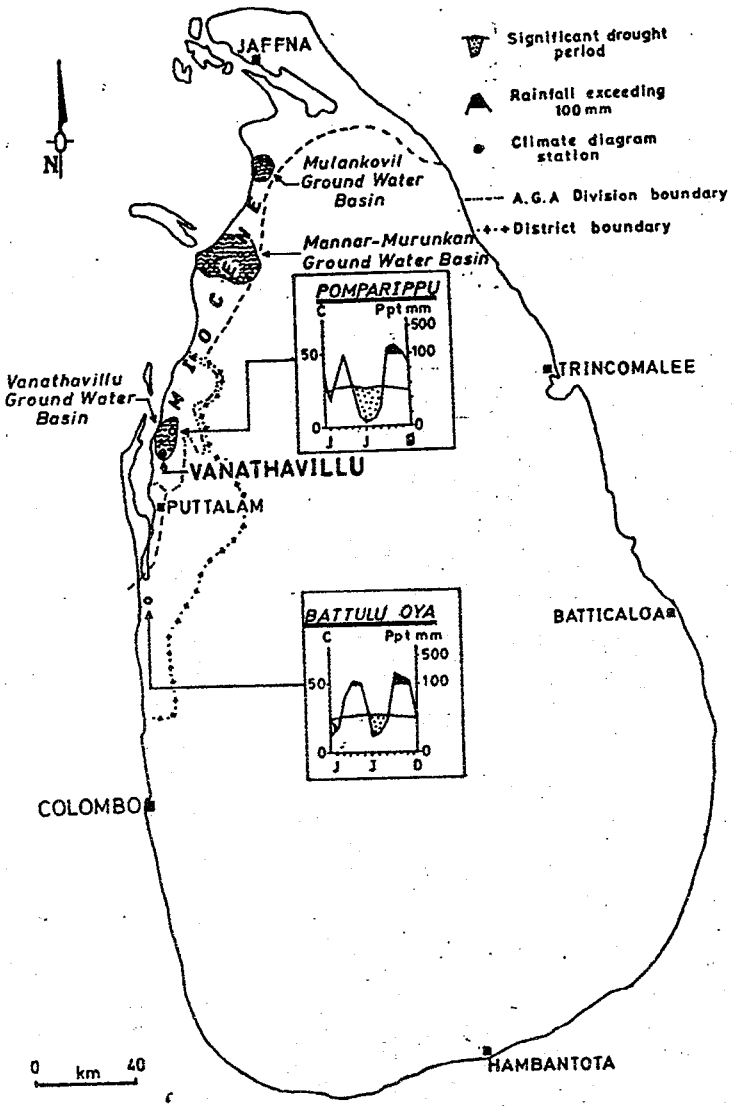

Fig: 1

DISTRIBUTION OF TUBE WELLS

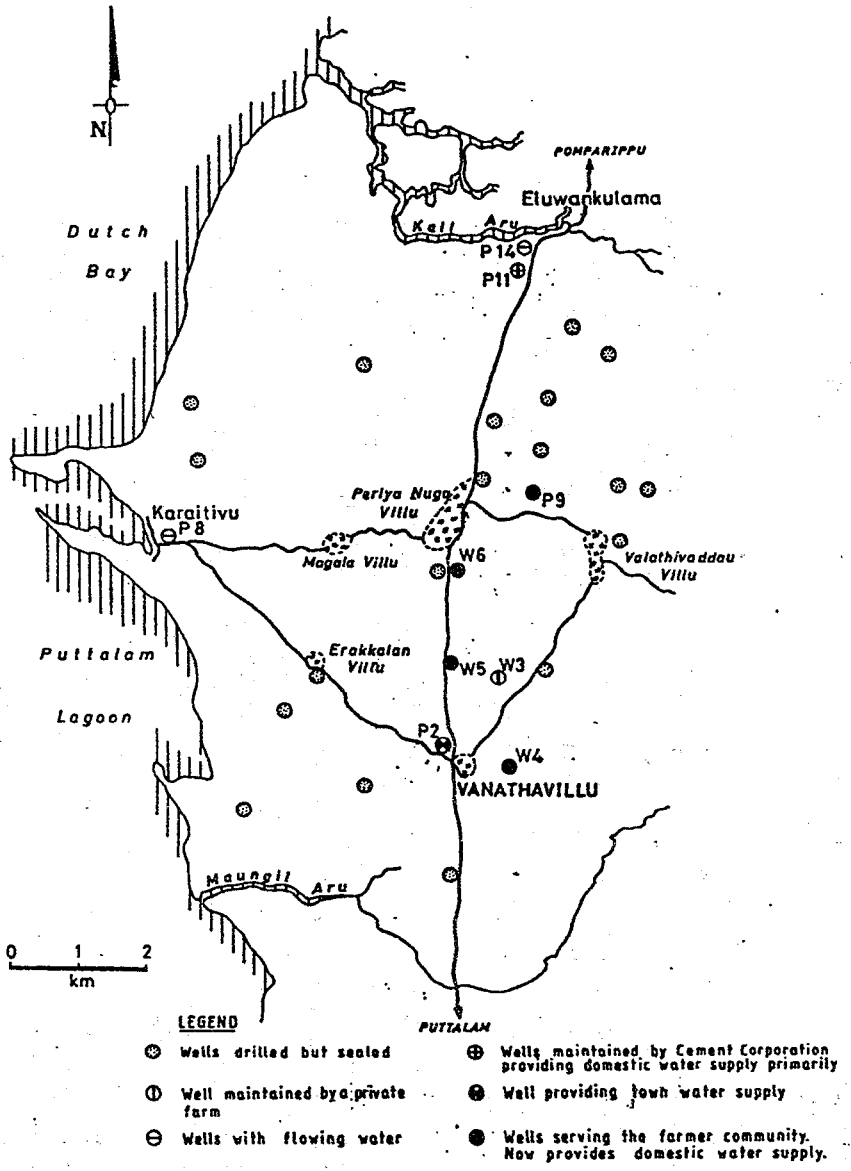

Fig: 2

number of production wells serving the farmer community has declined to four2 (Table 1). Marked salinity variations have been observed in these wells.

At the inception a total of 168 families was provided with irrigable land with each family receiving a 0.4 ha allotment. All original allottees were from nearby villages. The allottees were required to grow subsidiary field crops utilizing ground water for irrigation.

Each tubewell was equipped with a diesel engine powered pump to lift ground water. It was the responsibility of the Irrigation Department to operate and maintain the pumps. The cost of fuel was met by the Department of Irrigation. Pump operation was in the hands of casual operators of the Irrigation Department. Though a pilot scheme was launched to price irrigation water, this was resisted by the farmers who damaged the water meters installed for the purpose.

Irrigation water was led from the pumping station to the farmers' plots along pipelines buried underground and provided with control devices. The farmers were expected to mind the control stop taps with due concern for the irrigation requirements of others during pump operation. It was also their responsibility to attend to any minor maintenance work on the pipelines within their allotments. The method of irrigation was to hand irrigate the crops by first letting the water collect in four small tanks usually located within the four corners of each allotment. The water was delivered to the farmers fields twice daily.

Eventhough the Vanathavillu FMIS had seen some success initially, it has lost its momentum for reasons discussed below. At present there is no groundwater irrigated agriculture. Instead farmers have taken to the cultivation of permanent crops in their allotments. To a limited extent subsidiary field crops are grown during the rainy season. Consequently the Vanathavillu FMIS functions in a state of interia. No irrigation water is provided to the farmers but water for domestic use is provided on a restricted schedule. The Irrigation Department has had to depend on the decentralized budget3 and the Integrated Rural Development Programme for funds to meet the cost of fuel. In 1990 the expenditure on fuel was Rs 315,000/- (US$ 7500).

FACTORS UNDERMINING SUSTAINABILITY

Technical

Among factors undermining the sustainability of the Vanathavillu FMIS the technical problems contributing to the inefficiency of the irrigation system are most evident. Over the

years, the cost of fuel has risen, while the pumps have become obsolete. Repairs have been difficult because of the problems and delays in obtaining spare parts. This has been further complicated by the fact that there are no agents for the particular brand(s) of pumps installed. Therefore, the system has lacked in resiliency to deal with contingency situations. The need to overhaul the water lifting system after a given time span had not been built into project planning.

There have also been problems relating to the layout of the distribution system. Some allotments are found to be at distances of 2 - 4 km from the pumping points. There are also allotments that are located on relatively high ground. With the decreasing efficiency of the pumps it has become difficult to pump water at the required pressure to reach the tail ends of the system or the allotments on relatively higher ground. Pump pressure tests had not been performed on a regular basis at least in the recent past.

Agricultural

Sustainability of the Vanathavillu FMIS has also been undermined by agricultural problems. Although a minor agricultural research station had been set - up at Eluwankulam it had not had the capacity to carry out adaptive research to benefit the farmers on problems such as moisture stress, effect of salinity on crop yields, irrigation requirements of crops etc.

Irrigation schedules based on time length of application rather than on moisture stress had also affected crop performance. Furthermore, irrigation efficiencies had been retarded by poor water management which resulted in wasteful utilization of water. High salinity had been a problem faced by some Vanathavillu farmers.

Hence a kind of agricultural involution has taken place whereby the farmers have lapsed into a system of agriculture comprising permanent tree crops supplemented by rainfed field crops in place of lift irrigated agriculture.

Institutional

The institutional delivery system for credit and inputs have been unsatisfactory. The situation has shown little improvement over the years. There are 05 sales outlets, 08 authorized dealers, a fertilizer and a fuel store in the Vanathavillu division (IRDP, 1990). The sales outlets primarily distribute consumer items on the ration. The institutional set- up is not geared to purchase farm produce. Although a rural bank is available for the division and had 1140 savings accounts in 1990 it does not provide credit facilities. The savings totalled Rs

106960/- (US$ 2547) i.e. Rs 94/- (or US$ 2.2 per holder). These figures indirectly reflect the poor savings capacity of the Vanathavillu farmers.

Another institutional problem but of a different kind is that the farmers have not been issued with title to their allotments in keeping with the State land policy based on lease in perpetuity. As such many farmers have had no permanent interest in their allotments. Indeed, there are allotments that have changed hands many times for the same reason.

Organisational

The failure to set - up viable pump committees and farmers organisations is particularly striking. There has been too much dependence on the irrigation bureaucracy and the farmers had shown little interest to capacitate themselves for the collective good. In general the farmer organisations have lacked in self reliance and failed to play an adequately participatory role in system management.

REHABILITATING VANATHAVILLU FMIS

Proposals to rehabilitate Vanathavillu FMIS is contained in a report titled Rehabilitation of Vanathavillu Groundwater Project prepared by the Office of the Irrigation Engineer, Puttalam (1990).

In regard to water use it is proposed that the existing diesel engines and pumps which are old and in need of frequent repairs be replaced with electrically operated submersible deep well pumps. These will be linked to the existing delivery system. The distribution network is to be rehabilitated by installing control devices such as valve gates, control stop taps and meters in place of those which are found to be demaged or unserviceable. The provision of a three phase supply of electricity is anticipated for the operation of the electric pumps.

A project management plan has been drawn up which places the Vanathavillu FMIS under the supervision of the Pradeshiya Sabha (Divisional Council). Each pump will have an operator (an employee of the Irrigation Department) and a project committee consisting of representatives of farmers served by a particular pump. The necessary technical inputs will be provided by the Irrigation and the Agricultural Departments.

A limitation of the proposed plan is that it does not address the issue of sustainable development of the system. Moreover, the potential for farmer management of the system is underplayed. Thus the role of the project committees is merely to " assist Pradeshiya Sabha in the smooth functioning of the Project."

IMPLICATIONS FOR SUSTAINABILITY

The most serious problem facing the Vanathavillu farmers had been the absence of a dependable water supply. The system was not geared to the swift repair of pumps. Consequently there were long delays in restoring the irrigation water supply when pumps failed. The plan to replace the water lifting system with new electrically operated submersible deep well pumps is a step in the right direction. But from a sustainability point of view it is equally important to see to the up-keep of the system by an anticipatory approach to repair and maintenance, where the more frequently needed spare parts are available ex-stock and pump testing is carried out as a matter of routine. It has been pointed out by Sne (1991) that pump performance tests enable to determine pump regimes and bring down operational costs. Furthermore, the need to overhaul the system once every 8 to 10 years appears to be necessary for sustainable groundwater utilization.

Hence, funds for pump operation and maintenance are a crucial issue from a long-term perspective. It has been previously mentioned that the farmers had been used to a system of free delivery of water at State expense. The plan of rehabilitation envisages the provision of a metered water supply which will cost the user Rs 14/- per unit of 222 litres (1 US $= Rs 42). In discussions with the farmers it emerged that they were not averse to a water levy provided there is a dependable supply of irrigation water. Volumetric pricing of water has the likelihood of inculcating disciplined water use.

In the long term there has also to be a change in pump ownership. At present the pumps are owned by the Irrigation Department. However, it would serve the interests of sustainability better if the pumps are owned and maintained by the pump committees. The State could subsidize the cost of the pump to the tune of 25 percent or more and the balance could be advanced as a loan to the pump committee through the formal banking system, recoverable within a specified time period. It is also important to 'socialize' pump use by transferring the technical know how of pump maintenance to the pump committees (or to their representatives).

There appears to be no problem of groundwater availability in Vanathavillu in the short - term. To ensure sustainability over the long - term it is useful to develop a data base on groundwater behaviour with reference to availability, rechargeability, fluctuations and trends.

It is evident that sustainable groundwater utilization will also depend on the extent to which the pump committees are empowered to carry out their functions. Hitherto, farmer organizations in Vanathavillu had been participatory only to a limited degree (i.e. to the extent it placed demands on the irrigation and the political bureaucracy). The type of responsibilities that should devolve on the pump committees in respect of pump ownership, operation and maintenance have been mentioned. The pump committees should be backed by farmers organisations with wide ranging responsibilities to assist them - supervision of on - field water distribution, collection of water levies and conflict resolution. But to achieve this kind of transformation it is important that the farmers are in a position to capacitate themselves. Hence, the catalytic intervention of a social mobiliser is called for to bring about the needed attitudinal changes.

Sustainable groundwater utilization necessitates that greater attention be paid to crop agronomy with particular reference to water stress, salinity thresholds and cropping cycles. The agricultural research station at Eluwankulama has no links with the farmers. Discussions revealed a need for situation specific adaptive research. Another useful area of research is to formulate and field test rational irrigation schedules based on crop water stress, in place of time based applications.

It was noted that the farmers had reacted to irrigation failure by planting their allotments with drought resistant permanent crops. However, a consequence of this has been that some farmers have grown permanent crops over their entire allotment without considering the possibility of reverting to irrigated agriculture in the future. Hence, rationalisation of land use within each allotment is a necessary prerequisite to resume and to sustain groundwater irrigated agriculture.

Another issue that has to do with sustainable groundwater utilization in Vanathavillu is that of land ownership. The original beneficiaries had been allotted land in terms of the provisions of the Land Development Ordinance on perpetual lease but had not been issued with title deeds to the allotments. The present State policy is to confer conditional rights of ownership in terms of the Swarnabhoomi concept4. So far no Swarnabhoomi titles have been issued to Vanathavillu farmers. The matter is

complicated by the fact that many of the original allottees have sold or otherwise disposed of their land to the present occupants, though such transactions are not permitted by Law.

It was earlier mentioned that there were institutional limitations which constrained the performance of the Vanathavillu FMIS. Thus even at present the rural banking system is not geared to meet the credit needs of the farmers. Similar shortcomings in the provision of services have also been to the disadvantage of the farmers. In particular they have had to depend on informal rather than formal market networks. The implication, therefore, is that to ensure sustainability a FMIS should be an integral component of the prevailing regional economy. Hence, horizontal linkages have to be promoted with the rural and urban service centres of the larger region through the strengthening of appropriate (e.g. transport and market) linkages.

A final implication for sustainability is the need for a macro policy environment favouring rural development. It means that some of the problems undermining sustainability of FMISs such as Vanathavillu can only be resolved through macro policies which support the rural sector. Yet in Sri Lanka as in many developing countries the converse is true. Hence, these tendencies have to be reversed through both a rational macro policy environment and a committed political ideology favouring the rural sector.

CONCLUSIONS

This study has demonstrated that in the Vanathavillu FMIS sustainability has been undermined by technical, agricultural, organisational and institutional problems. For sustainable development not only should viable farmer organisations be set-up but important changes have also to be effected in water management, crop agronomy and research, infrastructure and the overall responsibility for system management. The need to access infrastructure requires that the Vanathavillu FMIS be better integrated into the regional economy. The point is made that issues of sustainability cannot be viewed in isolation but within the larger context of the macro policy environment. It is imperative that in some areas of system management (e.g. aquifer management, monitoring of tube well performance and agronomic research) State agencies play a continuing and supportive role.

ACKNOWLEDGEMENTS

Thanks are due to Mr L. Perera, G.A. Puttalam and Mr L. Mahanama, Divisional Secretary / Additional G.A. Vanathavillu for the assistance provided during field work and to Mr G.F. de Alwis for preparing the maps.

NOTES

1 The term Arid Zone is used in a relative sense. According to Koppen - Geiger Climatic Classification Sri Lanka belongs to Af and Aw types, where A refer to mean monthly temperatures over 18oC, f sufficient precipitation in all months and w dry season in winter.

2 One well is maintained by a private farm and the remaining two by the Cement Corporation.

3 Refers to the annual budgetary allocation form the Centre.

4 Issue of conditional title to land.

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