MANAGING THE VILLAGE ENVIRONMENT

M.P. Moore

Gamini Wickremesinghe

Occasional Publication No.16 December 1978

AGRARIAN RESEARCH AND TRAINING INSTITUTE

MANAGING THE VILLAGE ENVIRONMENT

M.P.MOORE

GAMINI WICKREMESINGHE

OCCASIONAL PUBLICATION No: 16. DECEMBER, 1978.

AGRARIAN RESEARCH & TRAINING INSTITUTE
114, WIJERAMA MAWATHA , COLOMBO--7.

F O R E W O R D

As a part of a major research project on "The Productive Labour Absorption in the Small Farmer Sector in Sri Lanka" this paper has been prepared surfacing some of the issues that have emerged in studying three selected villages in the Southern Coastal plain.

Adverse effects of deforestation, improper maintenance of the village irrigation infra-structure, absence of dialogue between the technically qualified officers working at village level and the farmers who can help such officers with their first hadd knowledge of the locality, as perceived in the selected villages, are stressed as factors contributing to the bad management of the environment, particularly the agricultural environment in the village setting. The need for relatively formal village based institutions with proper government backing is focussed as a pre-condition for an institutional set-up for effective environmental management.

The paper offers some guidelines that are worth considering in an over-all plan of action intended for the preservation of the village environment.

This report was written by Mr. M.P.Moore, Research Fellow, Institute of Development Studies, University of Sussex, U.K., who was attached to the Agrarian Research and Training Institute for a period of over two years on a research assignment and Mr. G.Wickremasinghe, Research and Training Officer, Agrarian Research and Training Institute.

T.B.SUBASINGHE,
DIRECTOR.

AUTHORS' INTRODUCTION

This report is a summary of one aspect of a research project which the authors have been undertaking for the last two years in three villages * in Galle and Matara districts. The issues raised here will be discussed much more fully in a later publication. The Director of the Agrarian Research and Training Institute, Mr.T.B. Subasinghe, encouraged us to produce this separate report in the hope that it would be sufficiently brief to engage the attentions of those interested in the subject but too busy to read lengthy papers.

The research project from which this report emerges was focused on issues of employment generation within the small farm sector. At the early stages of the research little thought was given to what we here call environmental issues. Neither the districts nor the villages were chosen for fieldwork with these kinds of issues in mind. In that sense, the three villages may be said to have been randomly chosen. All the other evidence available to us suggests that these villages are not unusual. The same kinds of situations and conditions are widespread throughout rural Sri Lanka, although they manifest themselves differently according to specific local conditions - climate, topography, vegetation, cropping pattern, etc.

The terms 'environment' and 'evvironmental managemnt' are currently rather fashionable. That should not detract from their usefulness and importance. When we use the term we are concerned essentially with soil, water and vegetation , i.e. with the agricultural environment. We examine this mainly from the point of view of the paddy farmer.

The research on which this report is based was supported by the Agrarian Research and Training Inatitute, and the Economic and Social Committee for Overseas Research, Ministry of Overseas Development, U.K. Invaluable field assistance was provided by W.A.Hemachandra, V.Samson, W.M.Wijepala and P.M.Wimalasiri.

M.P.MOORE
G.WICKREMESINGHE

*- The Villages are pseudonymously named:
Weligalagoda, Wattegama and Polpitiya.

THE SETTING

Each of the three study villages is located on the coastal plain at the southwest corner of Sri Lanka. This plain is an undulating landscape, with paddy fields in the valleys and a wide variety of tree crops on the highland. In the areas where the villages are located the hill tops rarely exceed three hundred feet. All lie within the wet zone. From the Point of view of farming Galle and Matara do not offer great potentialities. Average paddy yields are lower here than in any of the other twenty administrative districts in the island. One of the reasons is that relatively dense cloud cover restricts sunlight. Another is the recurrence of flood. The low hills retain little of the heavy monsoon downpour. The paddy fields in the valleys are frequently inundated. Along the coast there are large tracts of low-lying paddy land/marsh which are often water-logged for long periods of time. Compared to most of the other parts of the Island there are only limited possibilities of controlling water for paddy cultivation. The districts have few irrigation projects of any nature, and no large-scale projects, at all.

The village of Weligalagoda is located on an undulating plateau of poor sandy soil. Most of the village was under jungle a few decades ago, and was only cleared, for cultivation and house-sites, during World War two. No jungle remains. The main highland crop is cinnamon, which is grown as a bush. Cinnamon is grown because it is something of a 'last resort' crop which can tolerate poor soil better than alternative highland crops like tea, rubber and coconut. Because of its position on a plateau, the village drains fairly quickly and suffers relatively little from inundation of its paddy fields. This does however occur in the surrounding villages into which the Weligalagoda paddy fields drain. Apart from one concrete anicut, the *pitawanas* (channels) at the sides of the paddy *yayas* (tracts) serve all irrigation and drainage purposes.

Wettegama comprises part of a long narrow valley and its flanking ridges. Other villages are located above and below it in the same valley, all sharing the services of the main *ela* (stream) for drainage and irrigation. A number of concrete anicuts have been constructed along the *ela* in order to divert water into the paddy fields. At the turn of the century the surrounding hills were under jungle. In the early decades they were cleared for estates mainly tea, and also formerly a substantial area for rubber. No jungle remains and almost all available highland is planted with tea, including villagers' smallholdings.

Polpitiya is centred around a very shallow valley containing a broad paddy *yaya*. This *yaya* runs down almost to sea level where it touches the banks of the *Nilwala Ganga* (river) just before it runs into the sea at *Matara*. Most of the village highland is only a few feet above the level of the paddy fields and is planted with coconut. To the interior the highland rises and is planted with cinnamon. Polpitiya is at the margins of the wet zone, touching on the intermediate and dry zones, where small village irrigation tanks are common. At the head of the *Polpitiya yaya* there is a tank of about forty acres which is in turn fed from a much larger tank about a mile away. There is a fairly large network of channels and anicuts to distribute this tank water. At the lower end of the yaya where the drainage water runs into the river, there is a network of anicuts. The river at this point is tidal, and at high tide the saline river water flows into the lower lying paddy fields if the anicuts are not closed. This stock of irrigation and drainage structures - tank, channels and anicuts has to be operated and maintained to make paddy cultivation possible. When properly operated these structures provide a relatively secure supply of water to the paddy farmer. Paddy cultivation is less risky than in most of the low country wet zone villages, and , for this reason, Polpitiya is among the small number of villages in the region where many of the farmers regularly transplant their paddy rather than simply broadcasting it.

Each of these three villages occupies a unique place in the physical environment. Each has its own set of problems related to environmental

management, or , more accurately, one very characteristic problem. In *Weligalagoda* the problem relates to the deforestation of the highland. In Wattegama it is the relationship between villagers and the government civil engineering staff who have done a considerable amount of work in the sphere of irrigation and drainage. In *Polpitiya* it is the mismanagement of irrigation and drainage structures. Without resorting to a discription of the problems in each village we have identified a few main themes related to environmental management at village level which are pervasive, important, and in need of attention. Each is discussed in a separate section below , with concrete evidence from the village case studies.

VEGETATION COVER ON THE HIGHLAND

It is appropriate that we should begin with this issue since deforestation is, from the overall national point of view, by far the most serious and urgent environmental problem. The question has been widely aired in the mass media , and information about the adverse effects of deforestation on the natural environment is now widely available. This problem is discussed in relation to the specific environment of *Weligalagoda*.

The problems caused by deforestation are especially servere in *Welligalagoda* for two main reasons. The first is that the generally sandy soil is thus easily loosened, washed waway and leached of minerals by heavy rain. When the jungle was cleared in the 1940's there emerged a rich top-soil formed of decayed organic matter. The Yams planted in this soil were known for their sweetness in the *Ambalangoda* town, five miles away.The top-soil was soon washed away, leaving only infertile sand. It is because this sand is so infertile that most of the villagers have planted cinnamon on their highland plots; little else will grow. But the cinnamonn has its price. As a destroyer of soils it is equalled among the amain cash crops only by poorly maintained tea. The cinnamon bush gives the soil very little protection against rainfall. The land between the cinnamon bushes has to be clean-weeded, normally twice a year, if the crop is to be good. The soil is thus left fully exposed. When the cinnamon is cut for peeling the leaves and twigs are lopped and left on the ground. This provides some useful mulch and soil cover,. Unfortunately, the practice of collecting these leaves and selling them for distillation into cinnamon leaf oil is becoming increasinghly common.

The exposure of the soil to rain has a number of adverse consequences. On the highland itself the anti-erosion devices such as contour drains tend rather quickly to get filled with sand. This is something of a disincentive to those who make an effort to arrest the process, and the soil conservation is generally neglected. Between spells of rainfall

which runs off rapidly, the highland tends to dry out quickly. For this reason few of the households are able to grow vegetable crops on their highland plots, especially those who live at the higher elevations. Scarcity of water and the sandy soil that has been thoroughly leached of minerals and organic matter , and is thus of very low fertility render even the vegetable cultivation an imposibility. Older villagers remember clearly that, before the clearing of the jungle, the land was much more fertile and the problem of periodic water shortage was less serious.

The consequences of rapid run-off from the highland are most evident in the paddy fields. In the first place, they rapidly fill with water after heavy rain. The adverse effects are relatively little felt in *Weligalagoda* compared to the villages downstream, which may be flooded for several days after heavy rain. Water runs-off rapidly from the low-lying paddy tracts, situated almost at sea-level, on both sides of Weligalagoda. In the village itself heavy rainfall has two main adverse consequences. Substantial quantities of sand are washed off the highland and deposited in heaps in the paddy fields. The paddy fields, specially the higher ones, are already mainly sand , with a very thin top-soil of a more fertile clayey mixture. Fertilisers are easily leached out from such soils, and overall fertility is low. Some of the land is totally unsuitable for paddy at all. Average yields are very low less than twenty bushels per acre in each cultivation season. After depositing yet more sand in the paddy fields as it leaves the highland, the retreating water gathers force as it rushes down the *pitawanas* alongside the paddy fields. The *Pitawanas* may overflow or be breached by the force of water. The water then often strips the scarce and valuable clayey top soil off the paddy fields, sometimes taking fertiliser, paddy seed and young plants as well. This top soil is eventually deposited in the low-lying paddy tracts which already have adequate, if not surplus, stock of organic material.

It would not be possible to restore the situation completely to that of the early stages. The basic problem is that the highland

ought not, from the technical point of view, be used for anything other than forestry, with perhaps some pasture and restricted vegetable cultivation. The soil is too fragile to be exposed to the tropical rain and sun. But hundreds of people have their homes there, and there is no alternative for them or for the thousands of others in the immediate locality who live on similar land recently cleared from the jungle. A partial reversal of the deforestation is however possible. There are substantial areas of highland which are either totally waste or planted with cinnamon but in a state of neglect. The benefits of putting such land under controlled forestry would include reduced soil-erosion, less rapid run-off of heavy rain, and a more steady supply of water to the paddy fields. In addition controlled forestry could provide a steady supply of firewood to the villagers and - equally importantly, green manure for the paddy fields, which are desperately short of organic matter. The addition of green leaves, grass , etc., would both improve the fertility of the soil directly and help prevent the rapid leaching of chemical fertilisers through the top soil.

Paddy cultivation in fact stands to benefit in four main ways from partial re-afforestation of the highland; the supply of green manure, the reduction of soil erosion on the highland , less flood from the more water-retentive forest-covered highland, a more steady supply of water from small streams during periods of drought. The series of droughts experienced in the first half of the 1970's has served to highlight the fact that in many wet zone villages like *Weligalagoda* the problems of periodic water shortage can no longer be ignored. The rain water is not being retained in the highlands for gradual release into the paddy fields in between spells of rain. Paddy crops are affected by lack of water. Field preparation cannot be done in time and it is impossible to control the weeds which during periods of drought may compete with the paddy plants particularly the high yielding short-stemmed varieties.It is no longer possible to assume that, just because a village is in the wet zone, the question of irrigation does not arise.

Problems arising from deforestation do not dominate the other two villages as *Weligalagoda*, but both suffer nevertheless. Much of the tea in the

hills around *Wattegama* is relatively poorly maintained. Like cinnamon in Weligalagoda, it provides little soil cover, and thus exposes the hills to large-scale soil erosion, rapid run-off and drying-out in periods when there is no rain. Several streams which formerly flowed from the hills have dried up in recent decades. This does not affect the paddy farmers seriously because they have an alternative sourcee of irrigation water in the *ela* (stream) running through the village. However, as we shall see below, it is becoming difficult to lift water from the ela to all the paddy fields, especially those near the highland. This is partly because , due to lack of careful maintenance, much of the soil, stones and debris washed off the eroded tea land has been allowed to choke the drainage ditches at the foot of the hills, and from there has been washed into the paddy fields. Thus, the level of the paddy fields nearest the highland and furthest from the stream has been raised.

Most of the highland in *Polpitiya* is covered with coconuts. Like rubber this is a relatively benign highland crop from the ecological point of view. The tree leaves provide one level of cover for the soil, protecting it from rain and sun while the weeds and grass which grow between the trees provide yet another. The soil may not absorb and retain moisture to the same degree as it happens in any uncleared jungle, but it is much superior to tea and cinnamon. Soil erosion problems are very limited. Unfortunately, coconut does not thrive on the slopes and tops of some of the hills to the north of the village. The soil is infertile and quickly dries out. Cinnamon is grown there, the *'last - resort'* crop, and the consequences are much the same as in *Weligalagoda*. Rain runs off very rapidly and the streams which drain these hills have, by the force of rushing water, eroded their beds very deeply. The sides gradually crumble, to the extent that nearby roads and culverts have to be strengthened. If floods occur in the paddy fields it is usually because water from these streams has run off with such force that it has breached the large bund of the *Pitawana* into which they drain.

MAINTENANCE OF IRRIGATION INFRASTRUCTURE

Just as the deforestation problem always comes to the forefront of ecologists concerns with Sri Lanka's environment, so the problem of maintenance gets pride of place in any discussion of mind irrigation. It is widely felt that the problem is currently reaching a crisis point in many areas of the island, after years of neglect. The kinds of problems are in fact few in number. The same situations recur constantly. The main ones are ; small irrigation tanks and drainage channels which are not de-silted or cleared of *salvinia* (a floating weed) ; theft or damage of equipment at anicuts (i.e. the planks) and sluices (i.e. sluice-gate mahhinery) ; failure to mend breaches in bunds ; failure to organise effective water management programmes.

Our study villages all suffer from this kind of problems. The seriousness depends on the extent to which paddy farmers depend on common tanks, channels and anicuts for water supply. *Weligalagoda*, with its very rudimentary structures, is the least affected. The most important element in the water distribution system is the field-side *pitawanas*, and most of these are cleared by individual cultivators of the adjacent plots. Conversely, Polpitiya is the most dependent on common water supply structures, and the worst-affected for lack of maintenance.

In order to find a time when the water supply system in Polpitiya was well-managed we have to go back some considerable length of time, to the days when this was the responsibility of the *Vel Vidane*, the government-appointed irrigation Headman. The farmers believe that in those days things were generally well-managed, and that they have gradually deteriorated since the *Vel Vidane* was replaced by a Cultivation Committee elected from among the farmers in 1958.

By far the most serious problem in *Polpitiya* lies in the mismanagement of the anicuts which are intended to keep salt water out of the paddy fields at high tide. To be effective these must be opened and closed regularly and on time; closed - before high tide to prevent the salt water encroaching on the paddy fields, and opened at low tide to release the water drained off from the fields.

It seems that after the abolition of the *Vel Vidane* system, those anicuts ceased to get the prompt and regular attention. Salt water began to render some of the paddy fields nearer the river uncultivable. They were abandoned. In consequence, there was no one to clear the drainage channels at this point, and less pressure for the anicute to be managed correctly. A vicious circle of decay set in. As fields were abandoned, less attention was paid to the anicuts and to the clearing of the drainage channels. The salt water encroached further and further, more land was abandoned, and ..... At present there are about sixty acres of land affected by salt. Most is totally abandoned . When the water level is low some holder farmers attempt to take a crop, but yields are poor, and complete crop failure often results. The effect of this encroachment of salt water is felt more widely. Because it has led to the neglect of drainage channels at the lower end of the *yaya*, it is difficult to get rid of excess water higher up after heavy rain. The channels have become shallow and choked with weeds. There is one area near the top of the yaya which was formerly well-drained but is now permanently water-logged. If the water is especially deep the land is not cultivated at all. Even when cultivated the yields are low.

Deteriorating drainage is not the only problem faced by the paddy farmers in *Polpitiya*. They are being '*squeezed*' by twin problems of worsening drainage and worsening system of supply of irrigation water. Under the *vel vidane* the irrigation tank at the head of the *yaya* was managed in much the same way as elsewhere; under his supervision the cultivators held a meeting before each season started, and agreed on the dates for release of water from the tank. Land preparation commenced at around the same time, making the best use of the tank water as it flowed from field to field. It seems that these established procedures have been gradually allowed to fall into dis-use under the cultivation Committee System. First the cultivators' meeting was abandoned. Later the Chairman of the Cultivation Committee or its Secretary continued to fix a programme for the release of water. But that too ceased eventually. After this it was said that water could only be obtained on the personal favour of the Cultivation Committee member who held the key to the sluice. Most cultivators ceased to rely on tank water. Partly as a result and partly

as a cause, the farmers began to get out of step with one another in the timing of their crop seasons. Thus, they do not even require water all at the same time, and do not constitute a very effective pressure group for better tank management. The old system, which is undoubtedly the best, can only be restored if the organisation and discipline is there to force all farmers back into a common cultivation schedule.

THE INTERVENTION OF THE STATE

Over a time scale of, say, the last thirty years, one of the most significant changes in the sphere of minor irrigation and drainage is the increasing direct involvement of government agencies. This involvement is mainly two fold. In the first place the *Vel vidane* who was formerly the local supervisory authority, has been replaced by the Cultivation Committees (later Cultivation Committees and Agricultural Productivity Committees, most recently Cultivation Officers) who are much more directly under the supervision of a government agency, the Department of Agrarian Services. Although, appointed and paid by the goverpment, the *Vel Vidane* was comparatively less under supervision, and was appointed from among the higher social strata in the village precisely in order that he would be able to exercise his authority locally by virtue of his social and economic standing, without recourse to the formal procedures and authority of a government official. Thus the lines of authority over small scale irrigation and drainage have in the first place become more formalised even if, until recently, ultimate local responsibility devolved on elected (later appointed) farmers' representatives. The second major change is that government agencies have become much more directly involved in construction work. Money has been made available for digging channels and constructing anicuts, etc,. In some cases the work has been done directly by government agencies, but the preferred formula has been for all the samll jobs to be contracted out to local institutions - Cultivation Committees, Agricultural Productivity Committees, Rural Development Societies or Cooperatives.

The greater involvement of the state in minor irrigation has undoubtedly brought positive benefits. A great many cultavators are enjoying the use of concrete anicuts . There is however another aide to the story, and it is on this which we now focus. The way in which the state becomes involved in minor irrigation and drainage works leads to three main kinds of problems. The first may be quickly summarised: too much of concrete structures. Concrete structurs, especially anicuts have often been constructed where they are not really needed, and in such a way that they are in fact of limited use. The clearest case may be

found in *Wattegama*, Here many of the paddy fields are irrigated from the ela (stream) running through the valley, Formerly water level was raised by the construction of small temporary anicuts made of wood, banana trunks and banana leaves. These temporary structures were made by the farmers themselves. Twenty or more such anicuts were made in *Wattegama* alone. They seem to have been fairly effective. They are cheap and easy to construct, and very flexible: the locations can be altered from season to season, and the timing of construction may be arranged to suit the group of farmers concerned. However, such anicuts are no longer in use. They have been replaced starting just before World War Two, with five large concrete anicuts. The change has not been a great success. Three of the concrete anicuts are not actually operational, having been partly or completely destroyed by floods. One at least was deliberately damaged by farmers whose fields got innundated because of the anicut. Since there are only a few concrete anicuts, each serves a large area, and, since they work by inundation, they put nearer fields deeply under water before the water reaches the furthest fields. Thus, unlike the old temporary wooden anicuts, they create enemies as well as friends. Even if not deliberately damaged concrete anicuts in *Wattegama* and elsewhere are often broked by the force of flood water. This is difficult to avoid in an environment where heavy flooding is frequent. A temporary wooden anicut may be washed away at no great cost. If a concrete anicut is broken, not only is a great deal of money wasted, but it may take years before it is replaced, and in the meantime farmers must resort to the old system. The dispensability of the majority of concrete anicuts in our sample villages is illustrated by the fact that scarcely any of them are used as they were intended. The main reason for this is that the planks used for blocking the water are missing in almost every case. The planks were supposed to be protected by a Cultivation Committee member when not in use. Their disappearance reflects a number of factors : the weakness of the Cultivatio- Committee / Agricultural Productivity Committee system which has recently been abolished - the fact that these are valuable pieces of wood and thus prime targets for petty thieves; and the fact that cultivators can manage with out them, and therefore, make little effort either to safeguard them or agitate for their replacement. In their place are banana trunks and leaves, and they seem to do the work well enough in many cases.

The obvious question which arises from this analysis is why concrete anicuts were ever constructed in the first place. Three interested parties are involved, and each seems to have seperate but quite understandable motives. Even if not wildly enthusiastic about concrete anicuts , farmers at least give such proposals some support . Permanent anicuts do after all hold out the promise of being more effective than temporary wooden structures, and do save a certain amount of work in re-building temporary anicuts each season, . More positive benefits appear to accrue to those who actually obtain contracts to do the work, Malpractices of the contractors might have resulted in poor work, and thus the collapse of structures as a result of floods. The third party involved is the government. It appears that the aims of, and procedures adopted by the government agencies have some bias towards concrete structures. In the first place the results are clearly visible. In the second place they are relatively neat and self-contained little projects, and easier to undertake than, for example larger-scale earthworks. In the third place, they provide some outlet for the civil engineering skills of the staff of the departments concerned. These skills are construction skills; the staff are not trained to put questions of management to the forefront. None of these kinds of pressures discusse above is very powerful taken alone. Combined together, they result in a marked emphasis on one particular kind of project, which is expensive in terms of cash and scarce cement, and often not directed at the most urgent need.

Our second main point about the effect of state involvement in mminor irrigation follows on closely from the last paragraph. It is basically that the mechanisms for project identification do not permit the right kind of dialogue between the technically - qualified government officers and the farmers who have vitally-important local knowledge. Both sides have something useful to say about whether new tanks, channels or anicuts are needed, and where exactly they should be located. Unfortunately, the dialogue seems often not to occur for several reasons, One is the lack of effective farmers' organisations for generating and discussing ideas. Another is a feeling that farmers are to be faulted for not bringing forward proposals which have unanimous support. Such expectations are often unrealistic. If the *Pitawana* on one side of a paddy yaya is to be deepened and straightened then it will be most advantageous to X and Y;

if the same job is done on the other side then P and Q will be benefitted more. One farmer may want an anicut here, and another may find it useful a hundred yards downstream. A channel may need to be widened in the general interest, but one can never expect to get the support of the cultivator who stands to lose a two-foot strip along the edge of his field in consequence. Conflicts of interest between individuals are inherent in paddy farming, especially in matters related to water control. Villagers do know a great deal about their locality. They can often tell, for example, where is the centre of gravity of flood water, and thus where anicuts should or should not be placed if they are not to face destruction. It appears that, disillusioned by contradictory ideas, among villagers, technical officers tend to reject villagers' views entirely. On occasion they (the officers) can be completely overruled by politicians and forced to undertake projects which run counter to their own professional judgement. For example, very close to *Wattegama*, the Territorial Civil Engineering Organisation was recently obliged by political pressure to construct a highland irrigation tank which is so little needed that , more than a year after its formal opening, no attempt has been made to connect it by channels to the paddy fields. The officials tend to react, quite naturally, by holding in contempt the views of laymen, and ostentatiously denying any responsibility for irrigation structures once the construction work is complete. To quote: " *Once the job is finished we hand over the keys to the APC Chairman, and from then on it is NOTHING TO DO WITH US*", This helps explain why structures which are little used continue to be constructed. The institutions concerned with the two stages are almost completely cut off one from another.

It is unrealistic to expect that this kind of situation can be easily remedied. Farmers will always complain that they know more than the T.O. as to how the job should have been done. If however more formal consultations were held with meetings of local farmers before projects were finalised, a great deal of benefit could have come. By finding out why different farmers held conflicting views the Technical Officer could get much insight into alternative proposals , and thus be in a better position to decide between them. On the other side, if the farmers were obliged to make some contribution, in money or labour, to

all irrigation or drainage projects from which they stood to benefit, then they would perhaps be less free with suggestions and give more thought to the balance between the costs and the benefits of different suggestions.

This assumption leads us directly on to our third point about the involvement of the state in small-scale irrigation and drainage : that the culttivators have become excessively dependent on the state for regular maintenance work. A very large proportion of all the complaints made by farmers could in fact easily be remedied by farmers themselves without a great deal of effort but with, of course, a certain amount of organisation. This applies to such matters as clearing channels, clearing tanks of the *salvinia* weed, straightening channels and replacing and safeguarding the planks on samll anicuts. Most of these jobs require very little labour and indeed some of them were formerly done by the cultivators under the supervision of the *Vel Vidane*. However, by responding to demands the state has assumed responsibility for much regular maintenance work. Since the farmers' organisations have been in disarray, there has in many cases been no effective local institution to organise the work even when money has been available, and thus a great deal of regular maintenance has been neglected. Farmers often prefer to leave the job undone in the hope that it will eventually be done for them.

DISPUTE AND CONFLICT

It was pointed out elsewhere that disagreement between farmers over minor irrigation and drainage works is inevitable, and is the natural result of the pursuit of individual interest. Farmers are behaving quite rationally. Harmony is a very rare thing and it is better to design farmers' insitutions and the procedures for official-farmer interaction in such a way as to allow for disagreement. Almost the same analysis applies in the case of cultivation disputes. Cultivation generally, but especially paddy cultivation , is characterised by high levels of inter-dependence and interaction among cultivators. The opportunities for disputes to arise are numerous. To the outsider many of these disputes appear petty . But not so to the cultivator. The issue merits the attention of the government because on the evidence of our case studies, it appears that the lack of appropriate local institutions to settle disputes and enforce justice has adverse effects on agriculture. Let us quote a few examples from *polpitiya*. The irrigation system apart from being poorly managed, has lost a great deal of its effectiveness in the last year or so because the village tank is no longer being replenished from the larger feeder tank. The reason is that digging for gems in the bed of the main tank has become a big business, and the gemmers make sure that the sluice is kept open to keep water at a low level. The farmers are helpless without strong outside support. Many of the field channels have become so narrow as to lose much of their effectiveness. This is because farmers with adjacent fields encroach little by little on the channel in order to enlarge their own fields, the whole farming community eventually suffers. One affluent farmer regularly diverts all flood water away from his field and directly through that of his helpless neighbours, seriously damaging their paddy in the proces. Another one blocks a drainage channel at certain times in order to divert the silt-laden waters on to his own low-lying field, thus raising its level. Not only does this result in flood damage to neighbouring fields which still have standing paddy, but it blocks another important drainage channel.

A common feature of all such disputes is that from the villagers perspective they would have been quickly and fairly resolved under the Vel Vidane system. One of the Vel Vidane's main functions was to arbitrate and enforce judgements in such matters as this, and to enforce certain rules about, for example, the width of field channels, which would have prevented some of these disputes from arising at all. For all practical purposes no such authority now exists and might generally rules.

Our analysis on the issues detailed so far has brought out the weakness and inadequacies of the social institutions for environmental management at the village level. In the villages we have studied there exists a very considerable technical potential for increasing employment and output in paddy cultivation, but that potential cannot be exploited under present institutional arrangements. It is primarily a matter of lack of organisation. Most of the work required can be done by manual labour and simple tools. A certain amount of capital is required- but that does not seem to be very scarce. Over recent decades a considerable amount of capital has been sunk in minor irrigation and drainage works in our sample villages, mainly in the form of concrete structures. The rate of return on this capital investment has generally been very low.

To diagnose the problem as being lack of appropriate institutions and organisations is fairly easy. To describe exactly what is lacking and what changes are needed is less easy. Most difficult of all is actually to effect any change, for, as we shall see, the problems are very deeply embedded in patterns of rural social organisations and of government-villager relationships. It will be fairly easy to conclude that many of the problems and trends we identify are irreversible, and that the potential for better management of the village environment is thus very limited. However, before sinking too deeply into pessimism let us try to explain how better environmental management at village level is related to the social organisation . In our analysis above we have implicitly identified four functions related to environmental management whose effective performance is dependent on the creation of the appropriate kind of social institutions. We will discuss them in the ascending order of complexity.

(i) The simplest problem is the creation of an effective forum for the exchange of views on irrigation and drainage projects between technical officers responsible for construction and the local villagers. The main purposes should be to give the technical officers more insight into local physical and social factors affecting their decisions and to make them more aware of the problems of managing structures once they are built . For reasons given above, it is likely that villagers will give many contr-

adictory opinions. Yet, a great deal can be learned from these very contradictions . Rather than try to filter out these contradictions by consulting only a small number of farmer representatives, it may generally be better to discuss the issues at public meetings, combined with the necessary on-site inspections. It is a matter of changing procedures to make the technical officer and the farmer less remote from one another.

(ii) It is rather less easy to suggest immediate practical steps to re-introduce into the cultivation environment, a modern replacement for the *Vel Vidane* in his role as organiser, judge and rule enforcement officer. It is very important to remember that, where the Vel - Vidane was effective, this was largely due to the fact that he was appointed from a a family enjoying considerable social status and economic standing. His authority derived from this as much as from his official position, and, where his social and economic standing was inadequate, he was often unable to perform his job effectively. For example, although the cultivators of *Polpitiya* recall the *Vel Videne* system with nostalgia and long for its rrvival, the people of *Wattegama* think very differently. In *Wattegama* the *Vel Vidanes* seemed to have been fully involved in local factional politics, while in *Polpltiya* they came from a small group who enjoyed higher social status. Even today this group command general respect. The *Polpitiya* situation is exceptional. One of the dominant social changes in recent decades has been the erosion of the social, economic and political standing of the kind of land owning families who generally dominated village life at the time of Independence. For this reason Vel Vidane system could not be re-introduced today. Lacking the resources of a high social and economic standing, any kind of equivalent would require to be supported by considerable official authority. Yet this is where the trap lies. If he is simply another government officer then he cannot replace the *Vel Vidane*, since the essence of the later post was local availability, local knowledge, non-formal procedures, and deep involvement in local affairs. These points have been taken into consideration in the appointment of the new Cultivation Officers to replace the Cultivation committees. The Cultivation Officers are local people

working in their own village and not transferable. This is all to the good. But as young political appointees the Cultivation Officers lack status in the eyes of many villagers, and at the same time they lack statutory authority.

Both our analysis and field observations suggest that the Cultivation Officers will not prove to be effective substitutes for the *Vel Vidane* in his role as judge and rule enforcer. When Rural Courts are re-established they may help fill some of the gap. But, however, simple their procedures may be, they remain courts. Many issues will seem too trivial to be taken to them i.e. a paddy farmers' grievance that his crop is being shaded by coconut trees on the adjoining highland. Further, many causes of dispute are not between individuals but between one individual and society. For example, if a farmer gradually encroaches on an irrigation channel, all others may suffer, but no individual may feel motivated to make the cause his own and go to the trouble and expense of a court case. There is no easy solution to this kind of problems. The *Vel Vidane* cannot be restored, government officers cannot, by the nature of their procedures and outlook, do a comparable job, and attempts to use farmers' organisations have failed. Until more effective farmers' organisation emerge, it is perhaps inevitable that more reliance be placed on formal legal channels for solving disputes.

(iii) Very much of what was said in the above two paragraphs also apply in the question of mobilising labour to maintain and, if necessary, construct new infrastructure at village level - channels, anicuts, tanks, contour drains etc., Two main problems emerge here , One is that cultivators have come to expect the government to do relatively simple jobs which do not really justify the expense and trouble of government involvement and subsidy. The other is the lack of local institutions to initiate and supervise such work. In seeking solutions it seems useful to separate the question of regular maintenance from that of new construction. In the case of regular maintenance the most promising line of approach is perhaps to follow in some respects the procedures usually followed under the Vel Vidane system. That is, to say, cultivators are individually charged with the maintenance of certain lengths of channels, and fined if the job is not done promptly. They are normally allotted the

channels which are nearest to their own fields in order to bring in self-interest as far as possible. The great advantage of such a system is that, once responsibilities have been made clear, the system should work fairly effectively provided that there is someone to keep a continuous check. This person should be the Cultivation Officer. To be effective he would require statutory authority to levy fines for non-performance, with appeal to Rural Courts available to both sides. Potentially less easy to manage are new construction projects or the - kind of irregular maintenance jobs , like de-silting a tank or clearing a large canal, which cannot by their nature be allocated among indivs iduals . It is here that large scale labour mobilisation is necessary. Many of the necessary procedures and mechanisms are already available: the problem lies in knitting them together effectively. There are already in existence the procedures and the resources for granting, via the Rural Development Department, food aid as an incentive to take part in such projects. What is lacking is adequate motive and organisation. Once again the Cultivation Officer is the appropriate local organising officer , The motive may have to come from a great deal more continuous administrative pressure. The experience so far does not suggest that tht undirected spontaneous enthusiasm of villagers would not be forthcoming , certainly not on a continuing basis. The basic problem appears to be that in the present-day village there is no authority powerful enough to organise villagers on a continuing basis. This is the result of many deeply-embedded social trends, especially the democratisation of political and social life and the partial disintegration of the village as a social unit. Community action is still possible but it requires greater back-up than before from government agencies. The government has become more deeply involved in minor irrigation and drainage work in recent decades, but mainly to provide funds and take over functions formerly undertaken by villagers. The kind of involvement now required is one involving less finance from government and more incentive and organisational support.

(iv) The final issue is the one where solutions seem the most remote. The issue is that, for effective environmental management, there have to exist institutions which can effect considerable alternations in the village landscape. at the same time considerably re-organising many lives.

Let us give a few examples. Re-afforestation is only possible if, in the first place, some institution has the authority to acquire unused or poorly-used highland and allocate it for forest. When the seedlings are planted they need to be protected. When they are grown then opportunities to fell firewood and collect green leaves for organic manure need to be allocated among households, and the exercise of these rights closely supervised lest the forest be stripped and destroyed.

In *Weligalagoda* there is a site at the head of a yaya which is very suitable for the construction of a tank. Although giving some protective irrigation, the main benefit of the tank would be as a fish farm. Technically the situation is clear. Organisationally it is not so. About half a dozen cultivators would be displaced. Their loss would be little, as the land in question is very infertile and yields only, about twelve bushels of paddy per acre per season. They could perhaps be compensated by rights in the fish farm. If the tank is not to get quickly silted up, the owners of adjacent cinnamon land will have to carry out soil conservation measures on the land which will form the sides of the tank. If the potential tank site is to be fully exploited, one or two houses would be inundated and a cart track would have to be re-routed. From an economic and technical point of view the project appears promising, administratively it is a nightmare. No assistant Government Agent could be expected to tackle it. They have neither the time, the resources, the authority or the local knowledge needed. The same kinds of problems are met, on a smaller scale, in smaller projects. A *pitawana* may be too narrow and its bund too weak to do the job effectively. But, it is not easy to find a farmer who will voluntarily give up two feet of his paddy field to permit the job to be done properly. If forced, he may simply restore the status quo after the job has been done, and a great deal of money spent. Just such a case occurred recently in Weligalagoda.

These few examples illustrate some of the pre-conditions for effective environmental management at village level. The central issue is effective institutions, and there are two prime requirements for effectiveness; detailed local knowledge, and authority - actual as opposed to legal - to persuade and if necessary compel individuals to sacrifice immediate self - interest for the common good. The first requirement spells deep

involvement of villagers, the second strong support from the state. Any institutions effectively combining both of these characteristics would look very different from any of the rural institutions so far experienced.

Let us conclude this section with one very important observation. On the one had , because of population growth, land scarcity and deforestation, the village environment needs much more careful management today than in the past. In particular it requires aggressive measures to reverse, in so far as it is possible, the worst consequences of deforestation. On the other hand the pattern of social change is such as to lead to what might be termed the *'disintegration'* of the older social order based on paddy cultivation. Villagers follow a wider range of economic activities, and are increasingly influenced by the moral and political values prevailing in the wider national culture, rather than in the village itself. In practical terms this means that the village has lost much of its autonomy and ability to regulate itself: custom and the weight of moral pressure from other farmers or influential landlords are no longer adequate to ensure that every cultivator pulls his weight in channel clearing, keeps an informal eye on the sluice of the village tank as,he passes, or cuts his coconut trees if they begin to shade a neighbours paddy field: an irrigation dispute can no longer be informally adjudicated by a respected villager, but must either fester or go to the police or some formal institution. A great deal of the activity required for what we have broadly called *"environmental management"* no longer emerges semi-automatically from the pattern of everyday social activities. Instead, formal procedures must be adopted: a complaint made to the Cultivation Committee Chairman/ Cultivation Officer, or the police, and formal rulings given and enforced. All these things take time. And this is our main point. In this kind of environment where informal social regulation is being replaced by formal procedures, a great deal of extra time is needed, and, equally importantly, authority requires formal sanction. It is in large part for these reasons that elected and nominated farmers' institutions - Cultivation Committees and Agricultural Productivity Committees - have been ineffective. In the first place, the voluntary unpaid members, expecially the Chairman, were assigned an enormous range of duties which, if done properly, would often have amounted to full-time jobs. The second is that many simply did not

have the authority of government officials and clear support and backing from the relevant government agencies. Cultivators could afford to ignore them in so many cases, If their replacements are to be effective they require both authority and considerable resources of time.

CONCLUSION

(i) Even in the relatively poor agricultural environment of the low country wet zone there exists great potential for increasing agricultural output and employment through better environmental management.

(ii) Within the general area of environmental management there are three main issues which need to be tackled :

(a) Deforestation and the consequent problems of soil erosion and infertility and, even in the wet zone, seasonal water shortage.

(b) Lack of maintenance of existing irrigation and drainage infrastructure.

(c) Full exploitation of existing potential by new constructions in such areas as irrigation, drainage, soil conservation, roadways and fish farming.

(iii) The main constraint on better environmental management is in the sphere of organisation,

(iv) The present pattern of state involvement in environmental management, especially in minor irrigation and drainage, leads to a number of adverse consequences: poor project selection, excessive investment in concrete structures, and increasing dependence of farmers on the state even for relatively small maintenance jobs.

(v) In certain respects the old *Vel Vidane* system was more effective in environmental management than the various farmers' organisations which have replaced it. However, the effectiveness of the *Vel Vidane* system resulted from the place of the *Vel Vidane* in an older and more hierarchical social system. That system has changed substantially, and the Vel Vidane cannot be revived in its old form.

(vi) The design of effective institutions for environmental management is very difficult because the failure of recent experiments with farmers' institutions reflects basic social trends which make it very difficult for informal village - based institutions to be effective and authoritative.

(vii) New institutions for environmental management must reflect social changes by the adoption of relatively formal procedures and by having strong and overt government backing.

(viii) New procedures and institutions are required in five areas:

(a) More formal consultations between civil engineering staff and villagers could improve project selection in minor irrigation and drainage.

(b) Some provision must be made, perhaps through simple, cheap and easily available court procedures, for the solution of minor cultivation-related disputes,

(c) Responsibilities for maintaining irrigation and drainage infrastructure must be allocated among individual cultivators.

(d) Cultivation Officers must be given adequate authority to supervise and organise in such spheres as water releases from tanks and the mobilisation of village labour for agricultural construction projects.

(e) Thought should be given to the very thorny problem of setting up institutions capable of exercising authority over individual landowners in order to re-arrange village land use for the common good.