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AGRICULTURE IN THE PEASANT SECTOR OF SRI LANKA

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8 On Substituting Political and Administrative will for Foreign Exchange: The Potential for Water Management in the Dry Zone*

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I. PERSPECTIVE AND SCOPE

The world food shortage, the world fertilizer and agrochemicals shortage, world inflation, and the extremity of Sri Lanka's foreign exchange crisis combine to make a case for reviewing the classical green revolution strategy for increasing food output. The difficulties and costs of importing fertilizers and agrochemicals force and demand a reappraisal of the potential of domestic resources and of a strategy of greater self-reliance. In any such reappraisal, two inputs can easily be ignored: the first is water; the second is political and administrative will. Neither is imported; neither has any foreign exchange component. But, I shall argue, these two have a high degree of complementarity as inputs into dry zone irrigation and they have a substantial potential for increasing food production and thereby reducing imports. If they are not exploited, let it not be because that potential is unknown or is not recognised by political leaders and administrators. An attempt to open up and explore a range of questions concerning water management in general and in the dry zone in particular has been made in an earlier paper [Chambers, 1974]. The purpose now is to concentrate on a narrower band of topics and to try to derive practical prescriptions from that analysis. This narrower band is those aspects of dry zone irrigation where there is most potential for increasing food production and thereby saving foreign exchange through a combination of water management and political and administrative will. This limits the discussion to irrigation on which water distribution is mediated through a bureaucracy, that is to say, to major irrigation. Minor irrigation, though important in terms of area and production, is managed by communities normally without any bureaucratic or external political intervention. The crop mainly considered is paddy since in the short and medium term this is likely to be the principal irrigated crop in the dry zone. Current work on growing other crops on dry zone irrigation, and especially alternative crops to paddy in *yala*,[1] has very considerable long-term importance. But in a situation of crisis one must go for the immediate chance which in this case is increasing the production of paddy.

A basic premise is that water in the dry zone is generally more limiting than land. This has two aspects. First, there is land suitable for irrigation for which irrigation water is not available under current levels of water management. For example, the UNDP/FAO Final Report on the Mahaweli Ganga Project states:

> "The surveys of the Scheme have revealed that soils suitable for irrigation extend over an area of about 1.5 million acres. The water resources available after full development (about 5.6 million acre feet per year) would however only be enough for year-round irrigation for about 0.9 million acres. In other words, the limiting factor is the availability of water and not of land" (pp. 55-56).

Opinions canvassed from a number of knowledgeable people also suggest that under existing tanks there are often considerable areas suitable either for asweddumisation or for other forms of irrigation but for which irrigation water has not yet been available. Second, lack of water prevents the cultivation of land which has already been asweddumised, especially

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1. For a glossary of terms and definitions see Appendix 8.1.

in *yala*. It is theoretically possible to get three crops a year off the same land if water is adequate, but given the climatic, physical resource endowment and institutional conditions in Sri Lanka two per year seems the most that can be attempted. It is no surprise that a survey conducted in *maha* 1961/2 and *yala* 1962 showed that lack of water was more commonly given as a reason for not cultivating asweddumised paddy lands than any other factor that was considered (see Table 8.1).

TABLE 8.1

ASWEDDUMISED PADDY LANDS — REASONS FOR NOT CULTIVATING THE EXTENTS WHICH WERE NOT SOWN WITH PADDY

(expressed as percentages of the total areas not sown and rounded to whole percentages)

	Maha 1961/2	*Yala* 1962
Lack of water	39	66
Intentional fallow	19	6
Lack of funds	11	2
Disputed title	2	1
Salvinia/water hyacinth	1	0
Influx of salt water	2	1
Lack of labour	1	0
Miscellaneous reasons not specified including flooding	35	23
Total acreage not irrigated	198,613	560,180

Notes : These figures refer to the island as a whole, and not just to major irrigation in the dry zone.
0 — less than 0.5.

Source : Department of Census and Statistics, 1965, p. 32.

This survey was not however, limited to major irrigation. But considering major irrigation on its own, it is striking that the *yala* acreages targeted for *yala* 1974 (258,000) were only two thirds of those targeted for *maha* 1973/4 (392,000), while the actual acreages harvested in *yala* are much more vulnerable to shortfalls resulting from water shortages than those in *maha*, accentuating the differences in effective acreages cultivated in the two seasons. On major irrigation, then, as on other irrigation, water is more limiting than land. The implication of this is that the productivity of water should largely supersede the productivity of land as a criterion and that efforts should be directed towards increasing returns per unit of water rather than per unit of land. This requires, however, a shift of outlook which is not easy, the less so because of the biases of the discipline of agricultural economics, originating as it has done in temperate climates where land is a proxy for water (because water derives from rain so that more land automatically means more water). But it is an important shift because it enables one's thinking to be directed to that resource which is more constraining; in short, in the dry zone it is more realistic and more useful in determining policy to consider returns to water than returns to land.

The setting in which this premise is to be applied is one in which there is a direct substitution for imports in every bushel of paddy (or other locally consumed foodstuff) produced. The level of imports varies and the food gap (between either actual or desirable consumption on the one hand and domestic production on the other) is difficult to determine accurately. The amount of paddy which would have to be grown locally in order to achieve self-sufficiency is a matter for debate, being sensitive to the level of the rice ration, the cost of subsidised rice, the off-ration price, the supplies and costs of wheat and other foodstuffs, purchasing power, the size and structure of the population, and the level of domestic paddy production. It is further complicated by the probability that self-sufficiency would recede as it was approached because increased consumption would result from increases in the rice ration and/or increases in the supply of subsidised rice. However, several different calculations converge on 90 million bushels of paddy per annum as being the order of magnitude of present and immediate future consumption as against domestic production which for most of the past six years has been on a plateau of between 63 and 67 million bushels.[2] This suggests 25 million bushels as

2. But the reported production of 1969/70 was 76 million bushels.

the rough size of the gap. The significant point is that the gap is so large that unless there were spectacular increases in paddy production, those resulting from improved water management could—initially at least—all be expected to substitute directly for imported rice and therefore for foreign exchange.

The additional paddy production resulting from the Mahaweli Ganga project will not close this gap. My best information is that if implementation of the first two stages is unimpeded, additional paddy production by 1980 at current standards of water management might be of the order of 8 million bushels per annum, plus other food crops grown on highland during *yala*. This additional paddy would close only one third of the gap, and by then population increases will have substantially increased total demand. In this context, Mahaweli Ganga looks more like a long-term holding operation which may prevent the gap widening rather than a means of closing it.

Against this background we can now examine the potential of major irrigation in the dry zone. The orders of magnitude can be taken from the target acreages for *maha* 1973/4 and *yala* 1974. These were, for the dry zone districts:

1,000 acres

	Maha	*Yala*	*Total*
Major	392	258	650
Minor	227	82	309
Rainfed	285	43	328
Total	904	383	1,287

Source : Ministry of Agriculture & Lands, 1973

From the figures officially reported, in *maha* 1971/2 and *yala* 1972 taken together, the dry zone districts produced about 61 percent of the national total for paddy (38 million out of 63 million bushels). For the latest seasons for which data are available—*yala* 1973 and *maha* 1973/4—the dry zone districts produced 64 percent of the national total. If these levels can be taken as typical, then the dry zone is responsible for rather more than three-fifths of the island's production. The breakdown of dry zone production by major and minor irrigation and rainfed is known only for *maha* 1973/4. In that season major irrigation accounted for 50 percent of total dry zone production as against 21 percent for minor. That 50 percent constituted 35 percent of the national total for the season. On the basis of these rather limited figures, a provisional conclusion is that about one third of the paddy produced in Sri Lanka comes from major irrigation in the dry zone. It is with raising this one third (lying very probably within the range of 20 to 25 million bushels) without using foreign exchange that we are concerned.[3]

II. POTENTIAL AND IMPERATIVES

Water issues on major irrigation in the dry zone area at present are permissive. This has two aspects.

The first is that more water is issued from tanks into channels and from channels into *yayas* than is technically or practically needed for cultivation. On-field duties have been reported as high as 16 acre-feet per acre in Uda Walawe and 18 acre-feet per acre in Gal Oya. In both these projects water issues are constrained by the canal capacities more than by water management for sparing use of water: in Uda Walawe it has been common practice for water to be issued into the right bank canal at 30 percent (the safety limit) above designed capacity, while in Gal Oya the reduced capacity of the main canal is the limiting factor having a capacity

3. The main argument of this paper does not depend on the accuracy of these estimates. They are made only in order to get some idea of orders of magnitude.

of only 700 to 750 cusecs after twenty years without maintenance compared with a designed capacity for 1,145 cusecs. In major irrigation schemes, more generally, issues of 3 to 5 acre-feet per acre for *maha* are common, as against reasonable field requirements of nil (relying entirely on rainfall) to 3 acre-feet per acre. Wherever there are alternative uses for the water saved and water issues are larger than technically or practically needed, there is a production imperative for examining the possibility of a system of more sparing issues.

The second aspect is the cluster of questions which includes the time period over which issues take place, the amounts of water issues to *yayas*, and staggered cultivation. The periods of issue are in practice rather long and are quite often extended beyond agreed dates because of pressure from farmers who have crops which still need water beyond the agreed terminal date. The questions of staggered cultivation which are involved here have a fascinating complexity in which the observer can become entwined and even immobilised (for a case of partial immobilisation, see Chambers, 1974, 33-44). We must recognise that shortening the period of issue from a tank and reducing staggering can have harmful as well as beneficial effects. In particular, reduction of staggering may accentuate scarcities of traction power and of labour, penalising the smaller, poorer cultivators. The point which matters most, however, is that quite independently of such scarcities, staggered cultivation may be an unavoidable consequence of permissive issues. This occurs when there are liberal issues from the channel to those *yayas* near the top-end as a result of which the arrival of water at the lower-end is delayed, sometimes (as on Walawe Right Bank) by over a month, sometimes (as in parts of Gal Oya) never arriving at all. Consequently, the extent to which traction power and labour constraints exist may never be put to the test. In such circumstances there is an imperative for more sparing issues to top-end *yayas* in order to enable (a) earlier, more reliable and more timely cultivation (with its associated higher yields) at the tail-end, and (b) where possible the cultivation of larger acreages at the tail-end.

The case for more sparing issues from a tank into its channels and from the channels into the *yayas* can now be examined in relation to the strategies for water management and cultivation for the two main seasons.

(1) The Yala Strategy

The water strategy for *yala* is simple. As much water as possible from *maha* is saved in the tank; cultivation is timed to benefit from the *yala* rains, such as they are (a mean of 11 inches for 12 Dry Zone rainfall stations);[4] the acreage to be cultivated is nicely judged against the water available, the anticipated levels of water management, and perceived rainfall probabilities; and then water issues take place. In practice the areas cultivated are sometimes too large for the water available, leading to failure or partial failure of the crop. Under a lax water management regime, water issues can be expected to be liberal at first only to become tighter as water becomes scarcer. The high risks involved under current management practices is suggested by the fact that a five year average of reported yields from dry zone districts (including minor and rainfed paddy) showed only a negligibly higher yield (49.4 bushels per acre) in *yala* than that (48.9 bushels per acre) in *maha* in spite of the higher yield potential of the climatic conditions in *yala*.

There are persuasive arguments for improving *yala* in two ways. The first is by supplementing surface irrigation water by exploiting ground-water, as advocated by Madduma Bandara (1973, 1974). This could remove much of the risk from *yala* and also enable additional areas to be cultivated in that season. The second is, where soils are suitable, growing crops which are more water-sparing than paddy (see Jayasekera, 1973; Ranatunga and Izumi, 1974). Both these approaches appear important and to have considerable potential. But we may note that neither weakens the case for tighter water management in *yala*. To the contrary, they strengthen it. In the case of the use of ground-water, careful control measures may be desirable to limit or prevent the use of surface irrigation water on land for which

4. For the table on which this is based see Chambers, 1974, p. 12. Kurunegala has been excluded from the calculation which led to 11 inches on the grounds that its rainfall regime, with a mean of over 33 inches in *yala*, is not typical of the dry zone. 11 inches is a rounding of 10.87 inches.

ground-water is available. In the case of crops other than paddy, much closer water management will be required anyway in order to avoid either drowning or desiccating the crop. Moreover, these two approaches are longer-term whereas improved water management for paddy could be implemented more quickly.

In the meantime, the need remains to reduce the risk and if possible increase the acreage in *yala*. These ends may be achieved by administratively inducing an earlier crisis in *yala* thus reducing the risks of partial or total crop loss later and/or making it possible to cultivate a larger area. The imperative in *yala* is for even more stringent and carefully controlled issues than at present.

(2) The Maha Strategy

Pursuing these lines of analysis it is a little surprising to find that it is the *maha* strategy which is more complex and important, although attention is usually focussed on *yala* as the time of greatest difficulty. In *maha* there is usually fairly abundant rain and no major problems in water issues and water management that can compare with those of *yala*. Yet, it is precisely at this time that water is wasted and options lost. This can be shown by considering the case of a dry zone tank with its present *maha* acreage. We can distinguish six categories of situation according to whether additional irrigable *maha* acreage is available under the tank, whether the tank spills in *maha*, and whether the spill water is wasted or used lower-down. The six categories with their associated prescriptions can be presented diagrammatically:

	CONDITION			PRESCRIPTION		
Case Number	*Extra maha land available beyond what is cultivated at present*	*Tank spills in maha*	*Marginal spill-water used lower-down*	*Raise maha acreage*	*Sparing use of water in Maha in order to Save more water for yala*	*Supply more water for use lower-down*
1	Yes	Yes	Yes	Yes	No	Yes
2	Yes	Yes	No	Yes	No	No
3	Yes	No	—	Yes	Yes	No
4	No	Yes	Yes	No	No	Yes
5	No	No	—	No	Yes	No
6	No	Yes	No	No	No	No

In five out of the six cases there is an argument for more sparing issues of water in *maha* in order to enable a larger *maha* acreage to be cultivated, and/or to save more water for *yala* and/or to increase the supply to tanks lower-down.

We may note in passing that where the choice lies between using the same water for additional *maha* cultivation or saving it for *yala*, the former is to be preferred on the grounds of a much higher productivity for that water. The order of magnitude [Chambers, 1974, pp. 26-32] with various qualifications, is a factor of four: that is to say, a given quantum of water available for additional *maha* cultivation will enable an area to be cultivated in *maha* which is very roughly four times as large as the area which that same water (after storage losses and with the lower *yala* rainfall, etc.) would be able to cultivate if saved for *yala*.

Returning to the *maha* strategy, the question has to be asked as to how common is the sixth category where there appears to be no strong argument for more sparing issues of water. This deserves to be investigated empirically. In the meantime, opinions canvassed suggest that there often is an additional acreage which could be cultivated under major tanks in *maha* if the water were available. In addition, cases where marginal spill water is used downstream may be quite common (e.g. with chains of tanks). But also limiting the frequency with which situations in the sixth category may obtain is the question of probability. Tanks may spill some years but not others but for any particular year it is not known in advance whether they will spill or not. A tank may be in the sixth category one year but in the fifth category another year. This means that the argument for sparing use of water may apply to many

situations in the sixth category up until the tank spills or at least up until it looks very probable that it will spill. The sixth category where the argument for sparing use of water does not apply is thus further reduced. There may be very few tanks in the sixth category for which probabilities of spilling in *maha* are high enough to justify permissive issues in the early stages of *maha*.

Let us, however, take this perhaps rather extreme case of a tank in the sixth category which has no additional *maha* acreage to be cultivated, the spill water of which runs into the sea, and which spills regularly, let us say nine *mahas* out of ten. Does any case for stricter water management remain? At this stage we must refer back to the earlier points about length of channel and timeliness. If the tank has a long channel and if permissive issues near the top seriously delay the arrival of water at the bottom, then there may still be a case for more stringent water issues to the *yayas* at the top-end to enable cultivation to be more timely at the tail-end.

It would be possible at this stage to be cautious and say that more information was required, surveys should be conducted, and so forth. Certainly there is much to be said for an early analysis of data on tanks to find out how many fall into which category and what, more precisely, the potential from tighter water issues may be. But in the meantime, paddy production is being foregone. And it is difficult to avoid the provisional conclusion that in most years most tanks in the dry zone are in the categories 1 to 5. If this is so, it means that he case for tightening water issues and/or for extending the *maha* acreage applies widely.

There is indeed a complementarity between tightening issues and cultivating an additional *maha* acreage. To ensure that water reaches the tail-end (where most additional acreage can be expected to be found) rotational issues or at least smaller issues may be necessary to the *yayas* at the top-end. In categories 1 and 2 where extra *maha* land is available and the tank spills, water may not reach the tail-end if there are permissive abstractions higher up, or the water which reaches the tail-end may be inadequate or late or both. If the capacity of the channel is a constraint, then the need for stringent issues will be even greater.

The general imperative here is that in most if not all dry zone conditions and in the interests of national food production, water issues from tanks into channels and from channels into *yayas* should be made more stringent and sparing in *maha;* that *maha* should, in short, be made more like *yala*.

III. IMPLICATIONS

We can now try to follow through some implications of these imperatives, which, to summarise, require more sparing issues of water from tanks into channels and from channels into *yayas* in order:

(i) to enable more timely and reliable cultivation in all seasons, especially at the tail-end;

(ii) to make *yala* cultivation more reliable and increase the acreage;

(iii) to extend in *maha* the acreage and/or to save more water for *yala* and/or to save more water to increase the spill to be used further downstream.

The central and crucial point is that implementing these imperatives will be unpopular with those cultivators who benefit from present permissiveness. Implementation would mean that those in top-end *yayas* who enjoy a relaxed *maha* might have to face shortages in *maha* which would make it more like *yala;* it would mean that those who at present can get away with planting a longer-duration paddy variety and then exercising pressure for an extended water issue to enable the crop to mature, would no longer be able to enjoy that advantage; it might mean in some cases that labour would have to be substituted for water in weeding; it would mean that intra-yaya friction and competition would be heightened, making it even more desirable that an equitable system of intra-yaya allocation be practised. It is important to recognise that the beneficiaries of more sparing issues are not the same people as those who lose. The losers are those (often politically vocal, perhaps) at the top-ends;

the gains are made by the tail-enders, the encroachers, new settlers on additional asweddumised acreages, those further downstream who benefit from the spill, and the national interest through the production of more food.

These questions are often treated as though they were purely technical. They are, in fact, the very stuff of politics and no useful purpose is served by treating them otherwise. A system for allocating water is as political as a system for allocating land. A major difference, however, is that it is a continuous and cyclical process and that water rights (how much is received by a *yaya*, how much by a cultivator) are not enshrined in legal documents in the same way as land rights, but are rather a matter for continuous negotiation and pressure moderated by established conventions. Any change in the system, as will be proposed in the final section, must first appraise the political costs and benefits and the likely support and resistance which the proposals can be expected to generate and encounter. In order to do this, we can usefully distinguish two levels:

— *intra-yaya*, referring to allocation within a *yaya* of the water received from the bureaucracy;
— ex-sluice allocations from the tank to the channel and *inter-yaya* allocations from the channel to different *yayas*.

(1) Intra-yaya allocations and attitudes

Inside the *yaya*, water control, issues and arbitration were once the concern of the *Vel Vidane* who exercised considerable authority (see Leach 1961 p. 28 for a description of his duties). The present system is in the process of being reviewed and revised, but still rests on Cultivation Committees (formerly elected, now appointed) and the *Govimandala Sevaka* or Administrative Secretary, who has had less power and less incentive than the *Vel Vidane* to intervene authoritatively in the allocation and management of water within the *yaya*. In looking to the future, it is important to try to appraise the attitudes of cultivators to alternative systems. An impression can be gained from the preliminary findings of the UCARTI[5] survey in *yala* 1973 and *maha* 1973/4 in Hambantota District and part of Moneragala District. A sample of paddy cultivators were asked to express their preference between three systems for controlling cultivation and the cultivation calendar (see Table 8.2 and its qualifying notes) and then to state their reasons for their preferences. Asked to choose between the *Vel Vidane* (which can be taken as a more authoritative and stricter system), the present system, and direct control by government with stringent rules, there was a high degree of variability, masked in the aggregates, between cultivation committees; and the aggregates were probably unrepresentative in exaggerating preference for the present system. However, there were 94 responses favouring a stricter system (choices 1 and 3) as against 68 favouring the present system. In another context, an ARTI case study also showed a preference for stricter management [Ellman and Ratnaweera, 1973]. So far as it goes, then, the evidence suggests that under major irrigation in the dry zone generally, a majority opinion would be likely to favour a stricter system within the *yaya*.

TABLE 8.2

RESPONSES TO THE QUESTION: "WHAT IS THE BEST METHOD FOR CONTROLLING THE CULTIVATION CALENDAR AND WATER DISTRIBUTION ?"

	Yala 1973		*Maha* 1973/4		
	Major	*Minor*	*Major*	*Minor*	*Total*
1. Vel Vidane	11	12	28	15	66
2. The present system	10	17	20	21	68
3. Direct control by government with stringent rules	3	12	6	7	28
4. Any other	—	—	2	2	4
5. No response/don't know	—	3	7	7	17
Total number of responses	24	44	63	52	183

5. University of Cambridge and Agrarian Research & Training Institute.

Notes :

1. Investigators were instructed to read out the alternatives and ask the cultivator-respondents to choose one only.
2. It is thought that the present system was preferred strongly in two areas—Kachchigala and Methigatwala — because some minor irrigation had recently been replaced by liberal water issues from the Uda Walawe project.

Source: UCARTI Survey of cultivators in the Southeast dry zone.

The reasons given for the preferences expressed are very revealing. They have not been broken down according to the preferences expressed for system, so they may refer either to the *Vel Vidane*, or to the present system, or to direct control by government with stringent rules. What they reveal, however, are what cultivators value in the system which they prefer. Totals are given in Table 8.3.

TABLE 8.3

REASONS GIVEN FOR CHOICE OF SYSTEM TO CONTROL THE CULTIVATION CALENDAR AND WATER DISTRIBUTION

(Listed in order of frequency of response)

Position in sequence on questionnaire	*Translation of Sinhalese version of the choice*	*Total number of choices*		
		Yala 1973	*Maha* 1973/4	*Total*
4	Water control will be better ..	39	44	83
1	Less corruption	34	46	80
3	Less wastage of water ..	35	34	69
2	Faster decision-taking	20	29	49
5	Maintenance of canals will be better	20 (sic)	29 (sic)	49 (sic)
8	Avoids the concentration of power on a single person or group	10	18	28
10	Cultivators will have a better opportunity to participate in decision-taking	11	13	24
7	Can cultivate more fields ..	4	4	8
9	Less work	2	2	4
11	Any other	4	25	29
	No response	2	12	14

Notes
1. Investigators were instructed not to read the list out to cultivator-respondents, but to ask them the reasons for their choice of system and to continue to ask if there were additional reasons until no more were given. Investigators ticked multiple responses, which were treated as of equal weight and which are summed here.
2. The entire sample of cultivators was not covered; most but not all of those who responded in *yala* were also asked the same questions in *maha*.

Source : UCARTI Survey of cultivators in the Southeast dry zone.

These scores may be slightly misleading in the extent to which the two choices "avoiding the concentration of power on a single person and group" and "cultivators will have a better opportunity to participate in decision-making" receive low scores. It may often have been difficult for investigators (who were meant not to read the list out to respondents) to know whether or not to tick these items following, say, an entry for "less corruption". Nevertheless, what stands out from these results is that better water control, less water wastage, and less corruption come high, and that such technical matters as faster decision-making and better canal maintenance also score substantially. It seems justified to conclude that these cultivators were much less concerned with whether a system was participatory or authoritarian and much more concerned that it should be honest, impartial, prompt and efficient.

To provide such a service is a problem in micro-political engineering. There appears to be both a need and a readiness on the part of cultivators to accept a water headman of some sort at the level of the *yaya*. Ideally such a person should be locally respected, should have intimate knowledge of the *yaya*, and should have a reputation for independent judgement. As in the past, he would most sensibly be a person with interests in the *yaya*. While this may

introduce bias, at least it should also ensure that he will be present when needed. As far as possible, too, he should be independent of local factions and interests. In practice, however, one has to accept that these ideals cannot always or perhaps even often be achieved. What does seem most important is that he should be vested with sufficient incentive, respect and power to be able effectively to allocate water and to arbitrate in and settle disputes within the *yaya*. The great variability in the attitudes of cultivators to current water management systems revealed in the UCARTI survey suggests that much depends on the individual personality of the Administrative Secretary. Very great care should be taken in the selection of such people.

(2) Ex-sluice and Inter-yaya Allocations

It is with ex-sluice and inter-yaya allocations and issues that we come to the most difficult questions. The decisions about ex-sluice and inter-yaya allocations are largely made by people in bureaucracies who also implement them. A person unlocks a padlock and raises or lowers a sluice which determines the amount of water flowing out of a tank, or raises or lowers boards which determine the amount of water which flows from a channel into a *yaya*. The client groups—the cultivators in each *yaya*—are often in competition with one another for the water. It is perfectly rational for water-users individually and in groups to try to increase their supply of water, since more water reduces the risks of drying out and crop damage or loss, makes cultivation easier, reduces weeding requirements, and may reduce interpersonal friction within a *yaya*. It is perfectly understandable and to be expected that *yaya* groups will bring pressure to bear on the water bureaucracy to give them more, and that they should use whatever means—pleading, political pressure, presents, bribery, physical threat, blackmail, assault—which lie in their power to induce them to issue more water. It is also understandable that they should resort to physical measures—poaching water from their neighbours, illicit tapping of channels, blocking other people's channels—to achieve the same end.

It is also not surprising that water control staff, in these circumstances, weigh up the situation and, in the absence of countervailing incentives, decide to choose a quiet and perhaps modestly profitable life. The simplest course for them is to follow the policy of, to quote one observer: "You open the sluice and you go to sleep". No restrictions except those which are technically unassailable are exercised except where special inducements have been offered. Water is run into the channels at overload capacity until there is no more water. Water is issued to *yayas* at the maximum that the gates will take. Such practices make for a peaceful existence for water control staff but are disastrous for the national drive for food production.

It is important here not to be unfair to the Executive Engineers, Technical Assistants, Watchers and others who are involved. They have nothing to gain and much to lose from adopting a policy of strict issues, of giving people less than they demand. For if they do that, they expose themselves to political risk which may damage their careers. To make it rational for them to take and enforce the unpopular measures which are in the national interest they must feel and be assured of political support from a high level which will override and overrule local political interests.

An anecdote from another country illustrates what may be involved. One of the most junior members of an irrigation hierarchy was struck by a political leader for refusing to issue more water through a channel than his instructions permitted. The irrigation organisation took the case to court. The case was withdrawn only after the political leader had publicly apologised to the junior member of the irrigation hierarchy. The two points to note in this episode are first, that the junior staff member stood his ground in the face of what might in many circumstances have appeared a superior political authority; and second that he was supported by his organisation in the face of what must have been quite intense political pressure at the local level. These two essential actions can only have been possible because:

(i) the organisation had strong internal discipline;
(ii) the organisation was confident of high-level political support.

These are, indeed, the two essential and complementary measures which are required if water issues are to be tightened and made more sparing, as they have to be in order to secure the benefits of stricter water management. It has to be made rational for the lowest and intermediate levels in the Territorial Civil Engineering Organisation (TCEO) which is at present responsible for administering water issues on major irrigation to do what is unpopular. This means a change in procedures and style. Within the organisation this requires:

- stricter discipline;
- closer supervision;
- clear and specific instructions, preferably in writing, about water issues;
- support for subordinates by superiors in the face of local pressures.

What is required is not so much an organisation of technicians as an organisation with a quasi-military or quasi-police character in which staff are more concerned about the rewards and sanctions which come from their organisations than they are about the rewards and sanctions which come from their clients.

Such discipline, supervision, clear instructions and support within the organisation would be useless if it were not consistently backed at the highest political level. In the early stages, such backing would have to be public and visible, for example, in explicitly and emphatically supporting staff in a number of local situations in which they were carrying out unpopular measures which were, however, in the national interest.

IV. PRESCRIPTIONS

For the sake of a quiet life one might at this point like the rational staff who distribute irrigation water and abstain from pursuing the argument through to unpopular conclusions. But if the argument is correct so far, that would be a dereliction of responsibility. For in the face of an exceedingly bleak economic prospect it seems that there is a rather extraordinary opportunity for a major component of a strategy for increasing food production to rely almost entirely on domestic resources.

The suggestions which follow are designed to open up the debate. Not all the measures are inter-dependent. Not all are of equal importance. But they are based upon the arguments and evidence presented above, although to avoid long-windedness the reasoning underlying them will not always be made explicit. The suggestions can be grouped under four headings:

- land use;
- yaya-level organisation;
- higher organisation;
- political.

(1) Land Use

(a) **Legalise encroachments** and incorporate them into the recognised irrigation system. Abandon the word "encroacher" and substitute "pioneer". It makes little or no sense to penalise those who through their initiative have increased food production. All pioneers should be eligible to attend and vote at water meetings, be entitled to loans, and in other respects be on an equal legal and institutional footing with other cultivators.

(b) **Encourage further pioneering** following technical appraisals premised on tighter and more effective water management, including, where necessary, rotational issues to enable more water to reach further down channels. These appraisals might use aerial photographs and existing soil surveys. This pioneering would be mainly or entirely to increase the *maha* acreage.

(c) **Encourage the sons of cultivators near the top-ends of irrigation systems to pioneer settlement lower down** in order to establish family links which might moderate the conflicts of interest between topenders and tailenders.

(2) Yava-level Organisation

The crucial question is the selection of the headman who is to allocate water and to arbitrate in disputes. He should have the confidence of the cultivators but his selection should also be subject to moderation by an external impartial authority. There is no doubt that different systems would be used at different places at different times. One worth considering requires candidates for the post to make public election speeches to the assembled cultivators explaining how they would perform their duties, with an official committee also present. The choice would be made by election by the cultivators voting equally, but the committee would have a power of veto which, however, it would try not to use. In situations like this, various forms of sensible negotiation are possible to achieve a good outcome.

(3) Higher Organisation

(a) **Introduce strict supervision and discipline in the organisation which controls water issues.** An ideal might be to form a new organisation with staff drawn from those with the TCEO who have experience in water matters and from new recruitment. The senior officer in each district would be an executive engineer or a senior technical assistant. The senior officer in each district would be responsible to the Government Agent as the person best able to protect staff from partisan local political pressures. The Government Agent would be responsible to the Prime Minister for the resolute and impartial discharge of irrigation responsibilities.

If a new organisation could not be formed, the task would be more difficult. It would involve a change of style within one part of the TCEO while leaving the remainder unchanged.

(b) **Retain and strengthen water meetings.** The present system of water meetings chaired by the impartial Government Agent appears admirably suited to some of the needs of the situation. However, it is not normally concerned with determining the amounts of water that should be issued. As and when it is feasible, and subject to local conditions, Government Agents should try to extend discussion and guidance towards questions of volumes of water to be issued. Insofar as water meetings can understand and approve more stringent water issues, they should be encouraged to do so.

(c) **Create a representative working committee for each major irrigation tank.** The large attendances at water meetings reduce their usefulness for detailed decisions. Moreover, attendance may be haphazard and some interests may be under-represented. Further, quick decisions are needed in the course of a season. A working committee chosen to represent "irrigation constituencies", ensuring adequate representation to those at the tail-end has much to recommend it. Such a committee could work with the Government Agent or his representative and other staff in making the continuing series of decisions required for sparing water management. In any case where an Agricultural Productivity Committee is truly representative of irrigation constituency interests, it might be able to perform this function; but its many other responsibilities would probably reduce its effectiveness. An entirely separate body, *ad hoc* for each major irrigation system, appears to be indicated.

(d) **Maintain a stricter adherence to cultivation calendars and maintenance schedules.** Many questions are involved here, and an engineer's rigid adherence to pre-determined schedules may be as damaging as a politician's readiness to vary them. The Government Agent should be able to maintain a reasonable balance between these extremes.

(e) **Repair damaged control structures and improve communications.** These are the only measures which may involve foreign exchange. They are a high priority and antecedent to tightening water issues. **Without padlocks and gates, and their regular replacement as and when they are damaged, water control as envisaged is impossible.**

(f) **Prosecute infringements.** A distinction should be made between on the one hand those pioneers who have illegally brought additional land under cultivation, and who should in most cases be legalised and brought officially into the system; and on the other those who infringe the measures taken to regulate the water distribution system, who should be resolutely and quickly prosecuted. These are those who tap water at night, steal their neighbours' water, place obstructions in channels, and so on. Prosecution should be so prompt and effective that it ceases to be worthwhile to indulge in these practices.

V. POLITICAL

These measures would be ineffective without political support from the highest level. It is for this reason that it is suggested that Government Agents should be responsible direct to the Prime Minister for water management matters. The water reform proposed would be unpopular with some interest groups, notably those at the top-end, though it should be popular with those at the tail-ends. The implementation of the proposals would only be possible if the civil servants concerned saw it as more in their interests to do what was locally unpopular but in the national interest, than to capitulate to local pressures. Discipline within the organisation could provide only part of that incentive; the other part would have to be provided by a conviction that necessary but unpopular decisions and actions would receive support, in the face of opposition, from the highest political level.

VI. CONCLUSIONS

Other things being equal, the outcome of a resolutely sustained campaign for stricter water management in the major irrigation schemes in the dry zone should be higher yields per acre and per unit of water (from more timely cultivation and from a more reliable supply of water) and also the cultivation of larger acreages in both *maha* and *yala*. There are so many imponderables that it is difficult, perhaps impossible, to make a secure estimate of the potentially feasible increase in paddy production. It would be much easier to gauge if a few tanks were designated pilot projects for the closer management proposed. In order to appreciate orders of magnitude, however, we can start with the estimate of 20 to 25 million bushels per annum being produced from major irrigation in the dry zone. Additional production under different assumptions is shown in Table 8.4.

TABLE 8.4

INCREASES IN PADDY PRODUCTION FROM DRY ZONE MAJOR IRRIGATION UNDER DIFFERENT ASSUMPTIONS (million bushels)

Estimated base of dry zone production from major irrigation	*Increase in output if (at current yields) acreage cultivated is increased—*		*Increase in output if yields increase in currently cultivated areas —*	
	by 10 *percent*	*by* 20 *percent*	*by* 10 *percent*	*by* 20 *percent*
20 million bushels ..	2.0	4.0	2.0	4.0
25 million bushels ..	2.5	5.0	2.5	5.0

If the increase in cultivated acreage was in the range of 10 to 20 percent, and if the percentage increase in yields on the presently cultivated area was also in the range of 10 to 20 percent, then the increase in production would be between 4 million bushels (combining all the lowest assumptions) and 10 million bushels (combining all the highest assumptions). If 20 percent increases in acreage and yields could both be achieved, then the additional production would exceed that which may be anticipated at current standards of water management from the Mahaweli Ganga project by 1980. Substituting political and administrative will for foreign exchange through better water management is less visibly dramatic than building a huge new irrigation system; but it may achieve as much or more in production and in steps to self-sufficiency in food, may achieve it more quickly, and has the supreme advantage of involving negligible costs in foreign exchange.

These estimates may be low or high. To improve them requires field testing. At the very least, if the evidence and arguments presented are correct, there is a strong case for experimental pilot projects in stricter water control in order to gain further experience. While the productivity aspects of such organisational experiments are obviously very important, the social equity aspects could also be monitored. There is a danger with any rural reform that it will be captured and exploited by a local elite to the disadvantage of those who are less powerful and less well-off. The aim should be to design the irrigation organisation and its management so that both equity and higher production could be achieved.

APPENDIX 8.1 — GLOSSARY AND DEFINITION OF TERMS

Channel	:	refers to canals, branch canals, distributaries and feeders down to the level of the *yaya*, but not within *yayas*.
Ex-sluice	:	refers to water allocations and issues from a tank into a channel.
Inter-yaya	:	refers to the relationship between different *yayas*.
Intra-yaya	:	refers to relationships within a *yaya*.
Maha	:	the period of cultivation during the northeast (and larger) monsoon.
TCEO	:	Territorial Civil Engineering Organisation.
UCARTI	:	University of Cambridge and Agrarian Research and Training Institute Project on Agrarian Change.
Yala	:	the period of cultivation during the southwest (and smaller) monsoon.
Yaya	:	refers to a paddy tract on major irrigation which is supplied from one point controlled by the irrigation bureaucracy.

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