

Lift-Irrigation at Rajangana

—Some problems of cultural adaptation

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The potential for future development and diversification of the agriculture of Sri Lanka lies in the Dry Zone. However, the climatics — particularly the seasonality and variability of rainfall, make the Dry Zone highly dependent on irrigation for this purpose (Cooray, 1948; Farmer, 1956). Hitherto, the major emphasis has been on flow irrigated agriculture; but an integrated approach to Dry Zone land-use has to take into account the large extents of land that cannot be flow-irrigated. The traditional method of utilizing such land has been *hen* (land-fallowing) agriculture; but *hen* cultivation is ecologically sound only in situations where a reasonable equilibrium is maintained in man/land relationships (Allan, 1965). This, of course, is impossible under conditions of a rapidly increasing population. Hence, the importance of lift irrigation in the development of Dry Zone agriculture. Lift-irrigation was introduced on an experimental basis in a number of Dry Zone development schemes (e.g. Nagadipa, Vavunikulam, Muthuviyankattu, Galoya etc.)¹. However, in the majority of cases the experiment has not achieved anticipated results. In this paper Dr. Marcus Karunanayake of the Sri Jayawardanepura University and S. L. Thilakasiri of the People's Bank Research Department, argue with reference to the Rajangana scheme that problems of cultural adaptation limit the successful application of lift-irrigation to Dry Zone peasant agriculture.² The technical aspects of lift-irrigation are briefly described in Part I. Part II attempts to identify the problem areas relating to the cultural adaptative process. In Part III the authors suggest several corrective steps that might facilitate the process of adaptation.

Lift-irrigation at Rajangana was introduced in 1968 as a joint Government of Sri Lanka and World Bank project. The World Bank was to meet 60 percent of the estimated cost of the project while the balance was to be financed by the Government of Sri Lanka.

The method of lift-irrigation is based on,

- (i) a Headworks system and
- (ii) a Distributive system

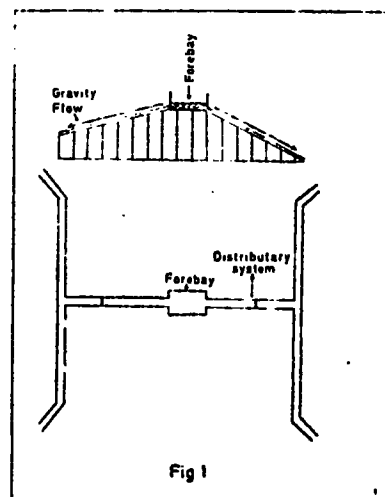
The headworks system consists of the 'pump-houses' in which the pump-sets are installed, and the 'forebays' into which irrigation water is conducted for gravity distribution. Pumping is carried out from both the Left and Right bank main canals of the Rajangana reservoir. The Left and Right bank canals are served by 41 and 34 pump-houses respectively. The forebays are usually located at points of elevated relief to facilitate gravity flow of the 'lifted' water. Thus the forebays are located at elevations ranging from 50 to 110 feet. The pumping of water above this level necessitates dependence on secondary pumping

stations, i.e. water has to be pumped into forebays with a large storage capacity from which repumping into smaller forebays sited at higher elevations has to be undertaken. This is expensive and might not be an altogether satisfactory arrangement. The cultivation of higher slopes is also difficult for the reasons mentioned in Part II.

The distributive system consists of the concrete lined major and minor distributional channels which facilitate the distribution of the water from the forebays into the lift irrigated fields. This is schematically represented in figure I. The concrete channels enable the easy flow of water (which indirectly restricts the rate of evaporation) and prevents water loss due to seepage. There are indications that conveyance losses along unlined irrigation channels are as high as 20 percent (Maduma Bandara, 1976).

A total extent of 4000 acres is to be provided with lift irrigation at Rajangana. Of this total approximately 2200 and 1800 acres of land come under the Left and Right Bank

canals respectively. The entire lift-irrigated area is divided into a number of 'tracts' for technical and administrative convenience; these in turn are sub-divided into several 'blocks'. The Left Bank canal supports 6 lift-irrigated tracts and on completion of the lift-irrigation network the Right Bank is designed to support 11 tracts of lift-irrigated land. In view of the differential quality of the land the tracts are not of uniform size. At the outset it was envisaged that each settler would receive a highland allotment of 2 acres of which 1½ acres were set apart for lift-irrigation and the balance for the homestead. However, in practice it is evident that the actual extents vary from ¾ to 2 acres depending on the physical quality and the time of settling of the colonist (i.e., the later arrivals received smaller allotments because of the scarcity of suitable quality land for lift-irrigation). It has, of course, to be noted that the highland allotments are in addition to the 2-3 acres of paddyland received by each colonist for the purpose of flow-irrigated agriculture. At the inception it was estimated that a sum of Rs. 7000/- per acre (at prevailing prices) was necessary to bring one acre of lift-irrigated land into cultivation. The



recurrent expenditure per acre per annum was estimated at Rs. 600,800/- but will now undoubtedly spiral with the rise in fuel prices.

The crop system introduced under lift-irrigation has been determined with due consideration of the agronomic conditions arising from the micro aspects of soils and relief.³ It has in fact been evolved to benefit by the careful and controlled use of irrigation water. The practices relating to the distribution and use of water at the field level is discussed in Part II, however, it is important to note that the system of water issues in operation is designed to prevent the wastage arising from excesses in water use, seepage and evaporation. Further, the water issues take place at specified times of the day and the quantities are strictly determined on the basis of specified crop combinations for Maha (rainy) and Yala (dry) seasons. Indeed, the Maha and Yala crop combinations have been determined with due regard to the availability of irrigation water.

II

At Rajangana cultural adaptation is made difficult by a combination of factors. The fact that the background of the settlers does not provide the cultural conditioning necessary for lift-irrigated agriculture is a basic problem. It was found that of the randomly selected sample of 40 settlers interviewed none had previous experience relating to lift-irrigation. A very high proportion of the settlers (20%) had previously been outside the agricultural sector. Also, 12.5 percent of the settlers had practised *hen* cultivation which does not require irrigation. The majority had previous experience of flow-irrigated agriculture; but the technique of flow-irrigation entails a wide departure from lift-irrigated agriculture.

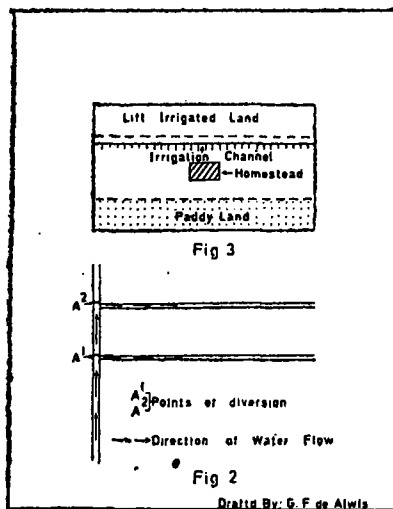
In lift irrigated agriculture, water has to be led into the fields with meticulous care. For this purpose, the fields are usually made into ridges and water led into the furrows in between, under strict regulation (Figure 2). It is at once obvious that this practice requires a highly intensive approach to the utilization of irrigation water. In contrast, flow-irrigated agriculture is based on a system of flooding which is more demanding in regard to the water supply. Indeed, in large-scale peasant colonization schemes where bureaucratic control is ineffective,

water over and above the specified levels while others have to face the problem of a deficit supply.

Further, both lift and flow-irrigated agriculture ultimately depend on the same source for the supply of irrigation water. In Yala (dry season) water issues are stringent and the demands between the two systems highly competitive. In this situation there is pressure exerted by the majority of settlers in favour of flow-irrigated paddy cultivation. The paddy crop gives quick returns and is viewed as a safe crop. Besides, the price-guarantee is most effective in respect of paddy. Hence, in the dry season lift-irrigation is frequently subject to inadequacies of water supply because water issues favour the paddy crop. The absence of a reliable water supply discourages the regular Yala cultivation of lift-irrigated fields. Even if some of the settlers were to practise lift-irrigation their demands for irrigation water, frequently pass unheeded by the bureaucracy because the minority cannot exert the coercive pressure necessary in such situations.

The cultural adaptation to lift-irrigation is also made difficult by the not too infrequent failure of the headworks and the distributary system. Thus the settlers have failed to develop a sense of confidence in the system. It has frequently been observed that when pumpsets breakdown, repairs are not effected at once.⁴ The failure of the distributary system too causes problems. It is often observed that the concrete channels forming the distributary system are subject to frequent damage. This is attributed to the fact that some settlers attempt at misappropriation of water by deliberately damaging the distributary system at advantageous points.⁵ This again is a reflection of the permissiveness and the insufficient supervisory control over water-use at the field level. The failure to effect immediate remedial measures adversely affects the crop system. It is relevant to note that the groundwater conditions relating to the Dry Zone "slopes" in particular leads to rapid wilting of the plants when the water supply fails (Panabokke, 1958).

In this respect the land located in proximity to the main canals are at



there is a highly permissive approach to irrigation water use (Chambers, 1976). An attempt is made by the settlers to transfer the same permissive attitude into lift-irrigated agriculture; there is also the practice of flooding the fields in accordance with the techniques of flow-irrigated agriculture which interferes with the distribution. Therefore, some settlers tend to utilize

1. Traditional methods of lift-irrigation have been practised particularly in the Northern parts of Sri Lanka. The well and sweep and the 'kavalai' drawn by bullocks are examples.
2. The study is based on a questionnaire survey of a randomly selected sample of 40 Left Bank settlers. Discussions were also held with the technical staff of the Department of Irrigation. The study does not pretend to be an exhaustive one; there is need for further research into the problems identified.
3. The more important crops included in the crop system are the following: chillies, green-gram, red and B. onions, groundnuts, soyabeans and cowpea.
4. It must not be inferred that the failure to take immediate remedial measures is deliberate on the part of irrigation officials. Indeed, there is genuine concern and awareness on the part of some of the officials. However, problems may arise due to technical difficulties such as the non-availability of spare parts and lack of effective communication between officials and settlers. It should, however, be noted that allegations of corruption against pump operators were made by some settlers.
5. Damage may also be caused by stray cattle treading on the concrete channels.

cultivation within and outside the scheme, *ken* cultivation and lift-irrigated agriculture, this necessity adversely affects the last mentioned innovative system of agriculture.

III

In this section attention is focussed on the need for corrective measures to eliminate the problem areas identified above.

At the outset the need for better water management cannot be over-emphasized. However, a prerequisite to better water management is a regular and a regulated supply of water. There is the need to establish greater co-ordination with the Central Workshop at Anuradhapura, which undertakes the maintenance and servicing of pumpsets; unless urgent remedial action is at hand when the pumpsets breakdown lift-irrigation will be considered a risk by the settlers. There is also the need to station technical officers in respect of each irrigated tract. It will thus be possible to supervise effectively and arrange for the maintenance of the distributary system.

Another important factor is to educate settlers in the correct methods of irrigated agriculture. In this both flow- and lift-irrigated agriculture should be given due consideration because the two systems are ultimately interdependent. Indeed, there is the need to strengthen supervisory control over both systems. The strategy outlined by Chambers is relevant in this context. (Chambers, 1976). The levying of a tax on irrigation water should be given serious consideration. If irrigation water is viewed as an 'input with a price' then there is bound to be greater resistance against permissiveness.

It will also be necessary to introduce a group-approach to lift-irrigated agriculture. At present lift-irrigated agriculture is viewed as an individual enterprise; furthermore, the use is as it were divorced from the 'system'. However, a group-approach to extension, water regulation and management will result in the fostering of social cohesiveness

and a sense of commitment to lift-irrigated agriculture. It will also help in fostering internalized social relationships among the settlers. Such an approach will have desirable effects in regard to flow-irrigated agriculture as well (Gooneratna, W. et al 1977).

It is necessary that steps be taken to encourage the settlers to accept the specified crop system devised on the basis of agronomic conditions. The need to provide supporting services is imperative in this regard. The capital inputs should be freely available and the institutional credit system should function smoothly. Two requirements are particularly important. First there is the need to provide satisfactory institutionalized marketing arrangements; the price-guarantee of crops in itself will not achieve desired results unless purchasing is efficiently organized. Secondly, it is necessary to introduce a crop insurance scheme providing coverage to lift-irrigated agriculture. This will provide the necessary incentive for the settlers to adopt capital-intensive methods in regard to lift-irrigated agriculture. It is worth noting that paddy is not only a safe crop, yielding quick returns, but also derives the full advantages of the price-guarantee and the crop insurance scheme. Hence, the cultural preference for paddy receives further impetus and restricts the scope for expansion of lift-irrigated agriculture.

It is also pertinent to mention that in lift-irrigation in particular, greater care should be exercised in the selection of settlers. A rigorous selection process utilizing objective criteria should be devised on how to select those with the aptitude for lift-irrigation. At the same time the concept of 'master farmer' could be applied to upgrade the level of skills of those already in possession of lift-irrigated land.⁸ Penalties should be imposed on farmers for wilful neglect and mismanagement of lift-irrigated land.

An effort is being made at Rajangana to resolve some of the problem areas identified above through the

medium of the 'special operations schemes'.⁹ There is, however, a need for intensifying such efforts. It is necessary to encourage the participatory role of the settlers with reference to the objectives of the 'scheme'. Thus a two-way flow of communication could be maintained between the bureaucracy and the settlers to provide a satisfactory framework for the implementation of the lift-irrigation programme.

Conclusion

In this paper were discussed the cultural adaptative problems relating to lift-irrigation at Rajangana. An attempt was made to identify the problem areas and suggest possible methods of elimination. An integrated approach to land-use planning of the Dry Zone necessitates a strategy for the successful utilization of the hitherto unirrigable lands, traditionally dependent on *ken* cultivation. Lift-irrigation provides a strategy for the utilization of such lands provided, however, a method of resolving the cultural adaptative problems are worked out perhaps on the lines suggested in this final part.

References

- Allan, W., 1965, *The African Husbandman*, London.
- Amunugama, S., 1965, "Chandrikawewa: a recent attempt at colonization on a peasant framework", *Ceylon Journal of Historical and Social Studies*, 8: 130-154
- Chambers, R., 1976, "On Substituting Political and Administrative will for Foreign Exchange: the potential for water management in the Dry Zone", *Agriculture in the Peasant Sector of Sri Lanka*, Ceylon Studies Seminar, Peradeniya, pp. 1001-14.
- Cooray, P. G., 1948, "Effective Rainfall and Moisture Zones in Ceylon", *Bulletin of the Ceylon Geographical Society*, 3, 39-41.
- Farmer, B. H., 1956, "The Rainfall and Water Supply in the Dry Zone of Ceylon", in R. W. Steel and C. A. Fisher (ed.), *Geographical Essays on British Tropical Lands*, London.
- Gooneratna, W., et al, 1977, *Group Production: A Case Study*, Agrarian Research and Training Institute, Colombo.
- Karunanayake, M. M., 1974, "The Damburawa Settlement Scheme: a study of human ecology in Sri Lanka", *International Relations*, 4, 649-657
- Madduma Bandara, C. M., 1976, "The Prospects of Recycling Subsurface Water for Supplementary Irrigation in the Dry Zone", *Agriculture in the Peasant Sector of Sri Lanka*, Ceylon Studies Seminar, Peradeniya, pp. 87-99.
- Panabokke, C. R., 1958, "A Pedologic Study of Dry Zone Soils", *Tropical Agriculturist*, 114, 157-174.

8. This involves the training of selected farmers. It is expected that these farmers will play the role of voluntary extension workers in spreading the use of improved cultural practices among other farmers.

9. The 'special operations scheme' envisages the co-ordination of functions of the various departments affecting peasant colonization.