AGRICULTURE

The importance of irrigation agriculture

by
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The most productive kind of farming devised by man, from remote antiquity, is irrigation agriculture, because it provides adequate supply of water for cultivation purposes, mainly to produce the staple food, whether there is no rain or less rain, provided that the tanks do not run dry. However, irrigation agriculture is very expensive because facilities have to be provided to store water in tanks or reservoirs, and feed the fields by gravity pressure.

The capital expenditure to provide water for irrigation purposes is so large that it cannot be fully met by the farmers themselves. In the old days, kings built the tanks, and today, the government does it from public funds provided by the Ministry of Irrigation, mostly by making use of the old tanks, such as Debarawewa, Yodawewa, Soraborawewa, Horuwilawewa, Namaloyawewa, Nuwarawewa etc., most of which are found in the lowland country.

The yield for unit of water is very high and requires intensive use of land for inundation. If the water is allowed to spread over a large extent of land, a high percentage of water will be lost through seepage and unnecessary evapotranspiration. To maintain high yields by irrigation agriculture, other factors necessary are fertilizers, pest control, high-yielding seeds and effective farming and these have to be looked into by farmers.

The potential evapotranspiration, during the growing season, the permeability of the soil, the quantum of water used and salt toleration of the crop, have been cited as the four principal factors necessary to determine the amount of irrigation water that must be fed for maximum crop yields under varying situations. Whether irrigation water is economical in use depends on the supply, the kind of crop grown and the optimal water inputs.

Irrigation agriculture is as old as recorded time and its area is as wide as the inhabited earth. Sometimes, the farmer has to depend on unpredictable and uncontrollable weather conditions, since cultivation is impossible, without adequate water supply to feed the crops and to grow healthy and, above all, on the biological rhythm and caprice of plant life. The farmer cannot say definitely, as to how much he will produce in a single crop, what the results of his efforts would be and whether he could complete farming to compete the market successfully. But, with irrigation agriculture, he can have some hope to his advantage.

Water for irrigation purposes can be collected from large or infertile areas, to be used on a relatively small area, or water that flows in excess of evapotranspiration, during the wet season, can be stored for use during drought when rains fail unexpectedly. Water may be stored either on the surface of the earth protected by dams or underground, usually, in porous alluvium or limestone earth.

When we look into our history, we find that among the works of public utility, there is one which deserves more than a mere passing note, with which king Pandukhabhaya (BC 437-407) stands credited. It was the construction by him of the tank Abhayavapi (now known as Basavakkulama) in Anuradhapura, having a surface areas of 107 hectares. It was the earliest constructive work which can be identified with certainty, and it was the first of the great irrigation works which formed a very special feature of the ancient civilisation of the island.

Minneriya Tank - Spill

These irrigation works were intended to store or convey the necessary water for the paddy fields, which the Sinhalese had begun to form wherever places suitable for their construction. The system they adopted at first was to impound the water in reservoirs or tanks with low embankments. From these the water was gradually passed out, either directly on to the fields where it was required, or by means or excavated channels down which it flowed to the fields.

Later, however, when the people had acquired a better knowledge of the art of raising embankments to hold back great depths of water, the constructive genius of the Sinhalese asserted itself and schemes of a more comprehensive character were attempted to promote irrigation agriculture. Great earthen embankments, often some miles in length, were raised across many suitable valleys, intercepting in this manner the flow of the streams and storing up, during the rainy season, in the tanks thus formed, immense sheets of water for the irrigation of large tracts of land, lower down the valleys, that were found suitable for paddy cultivation.

Man needs water to drink and for many other indispensable purposes, but, by far, the largest amount of water goes to agriculture. Water is both the abundant and the most important substance with which man deals. Much of the water is utilised for cultivation purposes and varies over a wide range. The amount of drinking water needed each year by man and animal is said to be in the order of 10 tons per ton of living tissue. To grow a ton of rice under irrigation, about 4,000 tons of water is required per ton of crop.

In sandy soils, much of the water will be lost by downward percolation, and hence for any particular crop the amount of water required will be far greater than the evapotranspiration requirement. In a tight silty or clayey soil, little water will be lost by downward percolation. Sufficient additional water must be supplied to prevent salt accumulation in the soil With salty irrigation water and crops of low salt tolerance, a great deal more water must be applied to the fields than is required to meet evapotranspiration.

Without storage facilities, the farmers have to depend for their irrigation water on variable and unpredictable river flows, which cannot be timed to coincide with crop growing seasons. If water can be stored, the farmers are able to use it when crops require it. Consequently, they can plant crops whose growing season does not match the rhythm of the rivers. When the river flows are peaked during part of the growing season, a combined use of water flows and stored water makes it possible to use more river water and a large extend can be planted and harvested.

Large-scale water development, involving the construction of dams on major rivers, diversion structures and canal systems, takes many years and often involves bringing new lands under cultivation. In Sri Lanka, the Mahaveli project is an example.

There are others too which have been built to harness the water potential going waste into the sea. The costs are usually high and only a national government can bear them.

Many irrigation projects fail due to lack of drainage facilities. Excess water, instead of draining off the irrigated fields, simply seeps into the underground and raises the watertable, which also may be raised by canal leakage. When the underground water has risen sufficiently, water is sucked up by capillary action and evaporates at the surface, and productivity of the land gradually diminishes. Drainage of excess irrigation water to maintain salinity control is as important in the long run as providing the water in the first place.

Small-scale water improvements can be accomplished by the farmers themselves. They include the construction of earthen tanks and small hillside dams the construction of water spreading structures to increase recharge of the underground aquifer, digging and rigging shallow wells, the construction of water courses to carry the water by canal systems and from wells to farm fields, terracing, building bunds and water guidance structures to conserve rain water, and digging drainage ditches to carry off irrigation return flows.

Tube-wells can be privately constructed, owned and operated, but the spacing, the depth and the quantity of water pumped have to be controlled and monitored, without allowing to flow unchecked.

Water storage for irrigation is one of the principal justifications for such spectacular public works as great dams and aqueducts. These structures, though enormously popular, is difficult to construct without incurring heavy expenditure. Underground storage of water and withdrawal by means of wells is very popular in the North, with the use of the mechanism known as 'andiya', where the water is lifted by the use of a bucket tied to a pole, upon which a man walks to and fro, making it to come up and go down to fetch the water.

Dependence on nature is the chief characteristic of agriculture, whether rain-fed or irrigated. One of the most promising and efficient ways to increase the productive capacity of land is the development of water resources for irrigation. By proper use of irrigation water in combination with improved seeds, fertilizers, tillage practices, soil conservation measures, crop rotation etc. farm output can be increased considerably and levels of consumption and nutrition improved as a result of more diversified production of fruits and vegetables, milk and meat.

Irrigation agriculture is more than a technique. It is a way of life. Attention cannot be confined, therefore, to technical aspects alone, and full consideration should be given to the economic and social aspects of water development schemes, particularly, the settlement of newly irrigated zones. Appropriate practices should be applied to prevent water-logging, salinity and the leaching of nutrients. Over irrigation should be avoided and the volume of water distributed should be determined on the basis of an accurate knowledge of crop requirements. Drainage should be regarded as a necessary complement of irrigation.

Although inefficient irrigation practices and insufficient drainage contribute to the spread of water-borne diseases, such as cholera, dysentery, typhoid, bilharziasis, malaria and ankylostomiasis, it should be borne in mind that, unless proper precautions are taken when establishing new irrigation schemes, the risk of many such social scourges, may actually be intensified by the favourable conditions created for the vectors. Besides irrigation, other water development schemes, such as flood control and reclamation of swampy lands can greatly contribute to the promotion of irrigation agriculture.

Sri Lanka depends on irrigation facilities for the development of agriculture where the rain-fed cultivation is only seasonal.