SMALL TANK SYSTEMS IN SRI LANKA: ISSUES AND CONSIDERATIONS

C.R. Panabokke, M.U.A. Tennakoon
and
R.de. S. Ariyabandu

Physical and Hydrological Aspects

Different scholars have made different estimates of the number of small tanks in Sri Lanka ranging from 12,000 to 16,000. About half the existing number of small tanks seem to remain either dilapidated or abandoned. This being an approximation a more realistic inventory of small tanks in operation and in abandonment needs to be prepared.

As per origin of tanks, gaps in knowledge are very many. When did people really start constructing tanks? Was it with the advent of Vijaya and his companions or even before? Did they first practice a highland form of agriculture around natural water pools (villus or wilas) and on the banks of the streams or created artificial pools by blocking of the streams near their upland farms for personal use and gradually improved those pools (wilas) and stream blockades to commence settled irrigated agriculture? Along a cascades main axis stream where did settlers constructed tanks first; in upstream areas moving downstream or *vice versa* or at a mid-point moving upstream first and then moving downstream? Answer thus far advocated to meet these questions are in their embryonic form. Hence, more investigations are necessary to answer them fully.

Small tanks are heavily concentrated in the Dry Zone. Recent studies on the major river basins, sub watersheds and small tank cascades in the Rajarata with due reference to topography soil, rainfall probability and hydrological characteristics, have contributed significantly to expand the understanding the setting, distribution patterns and hydrography of the small cascade systems in the Dry zone. It has been also shown that consideration of a meso-catchment or cascade of interlinked small tanks (STCS) provided a reliable base for further analysis and interpretation of the hydrological basis of small tank systems. This has been clearly demonstrated in a study of 230 STCs of the Rajarata which reveals that 197 of these cascades have an adequate catchment area, but that at the same time 190 of the cascades also have an excess of command area that cannot be serviced by the present tank capacity within the cascade.

Triggering off from the foregoing macro-and meso-morphological studies what is further needed is to try and understand those micro-morphological characteristics (e.g. heennas and mudunnas) which have had a profound influence on the distribution, density, alignment, size, shape and use of small tanks within cascades. When such studies are advanced, they would enable us to acquire a greater 'sense and substance of each tank. Tanks are not isolated entities. Though they may physically differ from one another, they are within certain patterns that are hydrologically and socially determined. They remain economically and socially beneficial and eco-friendly 'pools' of water which have become acclimatized to the extent that they have become an integral parts of the dry zone

environment, with some general resemblance to those in south India, but virtually unparalleled to any other system in the world.

A catchment, storage and command area of a tank are determined hydrologically and socially. The extent of a total catchment area of a cascade determines the amount of run-off that could be collected within the small tanks. The run-off in a catchment area varies depending on gradient, soil characteristics, landuse (e.g in chena lands 30-50%, scrub jungle less than 20 percent, in teak forests 16%), density of drainage and the number of ephemeral streams blocked by the upstream tanks. The water spread area of a tank is a function of the geometry of that tank changed through the siltation process over time as well as the changed condition of the tank embankment, its sluices and spill(s). The ways and means of partial desiltation enabling the return to original tank geometry has been demonstrated and thereby how the negative consequences of present tank geometry could be minimized. It is difficult to comprehend why desilting is avoided and raising tank embankment and raising spill levels preferred. Seeing the importance of not only increasing the tank capacity, but also improving the conditions of tank eco-system which is dangerously deteriorating and small tanks turning to mere grassy swamps it has been reported that if present method of bund raising continued, scientists, planners and engineers cannot escape from the challenge of disappearing of minor tanks from the Dry Zone landscape during the next few decades.

It is argued that cost of desilting a tank is considerably high in terms of the value of paddy that can be generated in the short run by that extra amount of water retained in a tank after desiltaiton. It is difficult to accept because the tank water is not meant for the sole purpose of irrigating a few hectares in its command area. A tank which is multi-functional in terms of receiving, storing regulating and distributing water is truly multi-purpose in character. Economically (for irrigation) socially (for domestic use), religious culturally (for temple goers and its residents use) and environmentally it is indeed multi-purpose in usage.

It is even argued that non-economic purposes for which tank water is used are more important than for economic uses. This finds support from villagers' decision at times, to forego irritated cultivations (in seasons of deficit rainfall) in favour of the use of tank water to meet social needs-drinking, bathing and washing. Though the importance of non-economic functions to which tank water is put into are often inventorized and stressed by many scholars, quantified values of those functions have not yet been scientifically ascertained and demonstrated.

The relations between small tanks and ground water availability in proximity of these tanks is well known. How the shallow regolith acquifers are recharged by tank water, where those acquifers are best found and appropriate spacing and optimal densities of agro-wells in different tank surroundings have been recently studied and documented. It has been found that in respect of fifty cascades in the Anuradhapura districts, the number of agro-wells should not exceed 3,600.

The former equilibrium maintained between a tank, available storage and its command area opened for irrigated cultivation is now in great inbalance. While siltation has reduced tank storage over time, the expansion of 'akkara welas over the past 75 to 100 years both legally and illegally exceeding the tanks' supply capacity has resulted in a high hydrological inbalance causing a perpetual scrambling of too many land-holders in command areas for too little water in these tanks. The demand for water through agro-wells is also placing a stress on the overall hydrological balance. This shortage of irrigation water coupled with land sub-division and prevailing tenurial complexity has aggravated difficulties in the economic use of limited available water.

In the distant past based on rain-fed chena farmers, lowland rice cultivation, homestead mixed garden farming, cattle grazing and herding, tank fishing and food gathering game and tree harvesting, there was a traditionally self-sufficient and inward looking contended life style in equilibrium in tank associated village settlements. This equilibrium having been subjected to external influences has gradually brought about a great disequilibrium, demanding a changed but sustainable production threshold, though the resource base remains limited. Due to chena lands being converted to settled rainfed settlements a high degree of land degradation, soil erosion, tank siltation has taken place. The earlier equilibrium that existed in relation to the tank capacity irrigated area and tree covered catchment area too have been severely altered, thus resulting in severe stress and conflicts both in respect of irrigated rice cultivation and upland rainfed chena cultivation. Further more, production systems too have become different in that they have to be responsive to the prevailing challenges of the open market forces in operation. This also makes it difficult to ascertain realistic production thresholds of both rainfed and irrigated farming systems in the small tank cascade systems.

Institutional Change and Development of Minor Irrigation

One of the main constraints to the development of minor irrigations in Sri Lanka is the continuing change that has occurred over the years, and continues to occur without any regard to it's beneficiaries. Minor irrigations thrive on unique customary water laws and traditions that have sustained a certain level of rural livelihood.

During the pre-colonial era, under the 'Rajakariya' system minor irrigations were operated and managed by the community themselves. The responsibility of management was vested with the "Gamarala" under the "Gamsabawa" system. With abolition of the 'Rajakariya' system in 1932 all customary regulations and traditions began to collapse.

This led to a vacuum in the responsibility of managing minor irrigations which resulted in the degradation of these systems, thus warranting the import of rice to feed the population. Realizing the mistake of abolishing the 'Rajakariya' system, the British implemented the Paddy Lands Irrigation Ordinance – No. 9 of 1856, with the intention of mustering the community organizations to re-establish traditional customs in irrigated paddy cultivation. In 1857, this ordinance was enacted with more state power and recognition give to "Vel Vidane" instead of the "Gamarala". The former was given the responsibility of distribution water equitably to all beneficiaries in a system and attending

to all cultivation activities impartially. The Paddy Lands Irrigation Ordinance was effective till end of the last century. With the tun of the new century, the Irrigation Department was established (1990) and all the irrigation management activities were centralized with the Irrigation Department with the Government Agent taking on the responsibility of minor irrigations with the help of communal labour for maintenance. During this period the handling of water disputes became the responsibility of the civil courts, though the "Gamsabawa" too existed as the main rural institution. In 1932, a new irrigation policy introduced by the Ministry of Agriculture and Lands gave the responsibility of construction and management of minor irrigations to the Irrigation Department. This situation remained until independence in 1948.

Since independence, the responsibility of minor tank management was transferred again to the Ministry of Agriculture due to the heavy involvement of the Irrigation Department with the Gal-oya development project. Subsequently in 1951 and 1956 the Irrigation Ordinance was amended to de-emphasize the role of farmer involvement through enforcement of rigid rules and procedures. These changes destabilized the otherwise self reliant and autonomous farmer institutions that have been in existence since independence. However, with the passing for the Paddy Lands Act of 1958, the Department of Agrarian Services was established in order to encourage farmer participation in minor irrigation development. Under this Act Cultivation Committees were established but lack of legal authority given to these committees malfunctioned their role as an effective village institutions.

In 1972 the responsibility of minor irrigation development was transferred back to the Irrigation Department with the passing of the Agriculture Productivity Law. Under this law, Agricultural Productivity Committees (APC's) were established for the development of irrigated agriculture. However, the composition of membership in these committees were weighted more in favour of officers than farmers. Thus, there was a skewed representation of farmer interests. In 1991, the Agrarian Services Act No. 59 was amended to established farmers organizations (FO's) and to given legal authority to FO's to undertake irrigation contracts. Though this represented the best alternative for farmers, the formation of FO's on village boundaries complicated the independent functioning of FO's. However, in subsequent irrigation development projects this drawback was remedied with FO's being formed on hydrological basis.

While these changes have established the position of minor irrigation with respect to it's construction and management, the latest development under special gazette notification of year 2000 has reverted the responsibility of minor irrigations back to the Irrigation Department. Hence, it is unfortunate that the responsibility has been changing between these departments without the scantiest regard to the large peasant livelihood under village irrigation systems.

Importance of Socio-Economic Considerations

The dry zone farmer had a typical farming system that characterized the crop cultivation under water stress conditions. The "gangoda" (home garden) chena (shifting cultivation)

and "Welyaya" (lowland) were the components of successful farming system that sustained the livelihood of dry zone peasantry. The lowland was mostly cultivated with minor irrigations. However, most of these farmers gave priority to chena cultivation over the other two systems mainly because it was the most stable cultivation practice and also provided most of the family sustenance. Besides, it also provided an assurance against paddy crop failure due to lack of water. Usually the size of the chena depended on the family size, with 2-3 acres as an average. However, due to population increase and pressure on land the size of chena has declined with almost no fallow period between two cultivation periods. These changes have reduced the unit land productivity and total household income.

However, the synergy that exists between chena and lowland cultivation allows prolong chena cultivation to impound more water in small tanks before the commencement of maha cultivation. This incidentally gives the farmer the opportunity of decision making with respect to cultivation. However, one of the main problems of village tank cultivation is the fragmentation of land and complex land tenure patterns. Both these factors contribute to small size of land holdings, which are often economically not viable to cultivate. It has been shown that land sizes vary from 0.25 ac to 1.0 ac under minor tanks in Hambantota. Small size of lands, seasonal cultivation and uncertain income have all contributed to low level of investment on minor irrigation. This is evident in a study where 20 minor tanks were evaluated for its performance after rehabilitation. On an average a family receives Rs. 1000 per month from cultivating paddy under minor irrigation. Twenty five years of data also pointed out that the yield difference between minor and major irrigation to be approximately one ton per hectare.

As a measure of improving productivity under small tanks, various water management practices have been adopted. Some of these practices are traditional while others are more recently introduced. The traditional "bethma" and "Kakulun" have been in existence with minor irrigation since time immemorial. However, increase in "akkarawela" due to legal and illegal settlements have disturbed the water balance in small tanks, thus creating deficiencies in water during yala season even to cultivate a "Bethma". The deteriorating village cohesiveness and traditional organizations have been attributed as reasons for the failure to implement a " bethma". The "bethma" has been emphasized as a result of strong village customs and traditions. More recently, under minor tank rehabilitation programmes, crop diversification has been introduced as a measure of water management. However, in most attempts this has not been very successful due to storage, marketing, and labour problems associated with minor tank agriculture. Location of minor tanks and pre-occupation in chena cultivation have been deterrent factors to adopt more crop diversification.

The recently concluded minor irrigation rehabilitation under NIRP and WFP, suggests that small tank development should be taken as a continuum which is governed by contributory factors and resultant beneficial factors. Hydrological and management factors are the two main components of the contributory factors and it's interrelationship is the input to development of minor tanks. The result of this input is the beneficial factors, which has a direct bearing on livelihood of farmers and their surrounding

environment. The author is of the view that due to the inability of assessing the hydrological factors accurately, number of unsuitable tanks have been selected for rehabilitation, thus resulting in deserving tanks being ignored. Hence, it is suggested that more acceptable criteria and factors should be considered and that all small tanks in the country should be categorized.

Evidently there is a serious policy gap with respect to village irrigation in Sri Lanka. A national policy on minor irrigation should fill the vacuum created by the loss of ancient tradtions and customs. There is a gap between the demand and the real need of the village society, which can only be filled by the bureaucracy. However, the bureaucracy has failed in this endeavor, due mainly to lack of reliable and enhance database on natural resource management. To redress this situation, the department of Agrarian Services is now in possession of a database on village irrigation systems. This data base which consists of 76 main attributes is capable of linking village irrigation systems as well as meso catchment with the help of geographical information system mapping. Hence, it is now believed that the state bureaucracy will be in a better position to meet the gap between the demand and the real need of the village tank communities.

In the light of all the foregoing considerations one questions the scope or the opportunities that would become available for a transformation or a modernization of the various agricultural production systems within tank cascade systems. However, since small tanks constitute a very important part of the rural landscape and it's eco-system, there is a strong rationale for ensuring the sustainability of these settlements for economic, social and environmental reasons.