

Towards Sustainable Management of Chena/Unirrigated Highland Cultivation in Sri Lanka

Introduction

This paper attempts to analyse chena cultivation in Sri Lanka from its historical evolution as shifting cultivation to the present-day stabilised highland farming, aiming at making recommendations for more sustainable land management in chenas. It is divided into five parts. Part I explains what the chena cultivation is and traces its evolution and distribution, before dealing with the types of chenas, methods of farming and the combinations of crops grown to withstand rainfall vagaries seeking food security in Part II. Then, Part III will address the government chena policy, physical expansion of chenas as a supplementation of wetland rice production down the ages, ensuring food security, notably during the late nineteenth and twentieth centuries. The subsequent transformation of the shifting nature of chena cultivation into a form of stabilised upland highland farming (UHF) with least care for the forest, soil and environment leading to undesirable consequences in land management will be discussed in Part IV. Finally, as a solution to the dilemma faced by the government, that is, whether to allow or not to allow UHF, specific recommendations for the evolution of a sustainable land management are made in Part V.

Part I

Slash and burn method of highland farming which once remained widespread throughout the humid Tropics in Latin America, Africa and Asia (Gourou, 1953) was widely practised mostly in the dry zone

lowlands and the dry zone hill country of Sri Lanka too, when the country's population density was low. It is still being practised in Sri Lanka as chena cultivation which is a shifting form of agriculture where once a patch of forest is chosen, slashed it using ordinary implements (axes, bill-hooks knives, etc.), debris are burnt and the bared thin soil veneer is scratched and seeds are sown during two or three seasons the most. With the progressive weed infestation and the decline in soil fertility, the land is abandoned in favour of yet another patch of forest for a fresh clearing for cultivation. When the population pressure on land was low, it took 10 to 15 years or more to reopen a rejuvenated forest in an abandoned old chena site for the cultivation of a new chena. With the reduction of forest extents available for clearing, some of the old chenas, without abandonment, have been transformed in to a type of semi-permanent or permanent upland highland farms (UHF).

The subsistence and supplementary advantages of this method of cultivation include: a) its ability to provide food early and spread over a long time; b) its significance in raising food from highland cultivation; c) its low cost of production; d) simplicity and affordability of its technology in use; e) its ability to adjust to a variable rainfall environment where at least some crops are able to thrive and able to provide food depending on the moisture needs of the different crops; f) low labour inputs required notably when labour inputs are concurrently required for wetland rice farming elsewhere;

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and g) the ability to rotate crops from season to season as required. The origin of chena cultivation can be traced back to the tail-end of the Iron Age (1000 -500 B.C.) in Sri Lanka, where the man has learnt first to use crude iron implements which were further improved enough subsequently to slash or hack bushes and plants of soft wood types to clear tiny patches of land. With the continued improvement of such iron tools, by 400 B.C. (Deraniyagala 1992), the hunter-gatherers were able to cut even the tough hard-wooded trees in the dry zone forest to clear extents of forest land, sufficient for a family for chena cultivation (Panabokke, 2009).

The ancient hunter-gatherers would have temporarily stayed closer to a water hole - a rudimentary pond - because, like food, water was a life-giver to them. They may have hunted animals, gathered edible roots, fruits and nuts within the periphery of a limited forest range and when the supplies dwindled there, due to natural causes or exhausted due to over exploitation of food resources, they may have shifted to yet another once familiar forest environment also with a source of water to meet their domestic food and water needs. As hunter-gatherers, they may have realised that their food leftovers of nuts, seeds and roots casually thrown

into the nearby garbage heaps have germinated, rooted, grew up with the passage of time and fruited adding some amounts of food to their food-basket. This would have convinced them that wild food plants can be domesticated adding food to their food-basket collected in the wild.

This conviction would have lead them to take to orderly growing of such wild roots, grain-seeds and fruit plants or seeds in small patches of forest cleared, closer to where they temporarily camped. When food supply from the grown plants and seeds became more reliable than uncertain collection of wild food, these hunter-gatherers would have gradually shifted to a rudimentary form of farming for which clearing small patches of land was necessary. With the passage of time, the role of that rudimentary farming might have become the principal source of food, but some hunting and gathering may have continued as secondary sources of food procurement.

This faming would have necessitated periods of longer stays near the rudimentary ponds that they camped and that would also have necessitated improvement of those rudimentary ponds to ensure more assured supplies of water to meet their domestic needs uninterruptedly. Thus, Panabokke (2009) contends that by the second century B.C. the early prototype of the small village tanks evolved from these rudimentary pond improvements, and he further states that, "at this stage of evolution, it should be very clearly recognised that chena cultivation with *kurakkan* (*Eleusine coracana*), a crop of antiquity, had been the main cereal component" in their farming. The significance of the evolution of small tanks from rudimentary ponds and chena cultivation is that there evolved a system of more permanent

settlement in association with reliable water storages, and it may not have taken a very long time to evolve a wetland rice cultivation system downstream of those water storages with the use of simple gravity-guided irrigation during the dry spells, in addition to the already familiar chena cultivation.

The notion that rice cultivation was introduced to Sri Lanka only by the Aryan settlers who arrived here, has been put into serious challenge, emphasising that even irrigated rice cultivation prevailed in Sri Lanka before the advent of the Aryans. Supporting this argument, Panabokke (2009) says, **"it should be emphasised that wetland rice cultivation in its early form was purely an indigenous development and not one introduced by early Aryan settlers as is often stated by some historians and scholars"**. It may also be possible that different varieties of rice were grown in highland chenas and in wetlands. Even today, *el vee* is regarded as a variety of rain-fed highland paddy.

It could be seen in the evolution process described above, that even before the Christian Era an advanced human civilisation thrived in this country based on permanent settlements besides tank storages, being dependant on wetland rice farming and chena cultivation for food security. The uniqueness of chena cultivation in Sri Lanka is that, unlike in other countries in the humid Tropics, there is a harmonious blend of both chena and wetland rice farming evolved by the early inhabitants of permanent village settlements. In the early period of hunter-gatherers transforming themselves into a farming livelihood, chena cultivation seems to have been the dominant food supplier. With subsequent irrigation development, wetland rice farming achieved a

'subsistence affluence' with a dominancy over chena cultivation, making it only a supplementary source of food.

Part II

In the words of B.H.Farmer (1957), though "it cannot be doubted that chena cultivation dates from ancient times," our chronicles and inscriptions do not throw a clear light on this mode of cultivation during the Anuradhapura and Polonnaruwa periods. It was only during the Dambadeniya period of our medieval history, that, some reference to chena cultivation has been made by the monk-author of *Saddharmaratanavaliya*, a literary work. Thereafter, no known authentic references had been made to chena cultivation until the British administration firmly established here in the early nineteenth century.

It was certainly under the British administration that proper documentation of chena cultivation practices have come into existence. The British writers such as Tennent (1859) and Forbes (1840) and administrators of the North Central Province like R.W. Ievers (1899) have made many authentic records on chena cultivation in their diaries which they preserved very carefully. Ievers. published his authentic study of **Manual of the North Central Province** in 1899, having thoroughly studied the province with painstaking field work undertaken almost over a decade, which refers to many aspects of chena cultivation in the north central dry zone. The British Government Agents' diaries maintained in the Anuradhapura Kachcheri, Final Village Plans (FVPP) prepared and the numerous petitions filed by the villagers in respect of their seeking permission to clear forest patches for chena cultivation, complaints on losses caused to the cultivation by

rampaging wild animals, drought effects on chenas, methods of forest clearing for chena cultivation have been retold by Government Agents capturing the information provided to them by their subordinate officers (*koralas, Tulana Headmen* and *vel vidanes*) at regional and village levels in their mundane administrative functions are dependable sources of information on chena cultivation

Types of Chenas

There are taxonomical imperfections and even confusions in respect of the subject, chena cultivation. One would find that the chena cultivators liberally use any one of the names in Table 1 consistently or interchangeably.

Methods of Land Clearing

The traditional chena land clearing remained one of the most environment-friendly system to ensure the sustainability of forest, soil and humans. There was a distinct **three-tier forest felling**. First is the *mul val keteema*, meaning slashing all plants of the size of the toe of a human foot at the ground level which are most probably of two to three years of age. The second is the *athdanduwawe*

kepeem, that is, pruning or lopping off the young tree-head branches each of the size of a human arm at the eye level. The third and the final is the *gas kandubema*, that is, lopping off the branches of tall trees to maximise the receipt of direct sunlight to invigorate the crop growth.

Once a chena cultivated is abandoned at the end of a single season of cultivation or two or three seasons of cultivation the most, the lopped off tree branches and pruned bush-heads soon begin to sprout and re-grow fast along with a newly-emerging undergrowth of small plants to gradually restore the original forest status in a few years. While these vegetation growths soon begin to protect the top soil from soil erosion and enrich humus in it with leaf falls of the re-growing trees over the years enhancing soil moisture retention that facilitate the growth of vegetation. **It should strictly be kept in mind that where such time-tested careful land clearance methods are ignored, as we shall see later, the consequences have lead to the ruination of vegetation, causing serious damages to the**

environment all round, pausing serious threats to human survival

Land Preparation and Crop Selection Adjustment to Rainfall Vagaries

A little could have been done by the people to increase the amount of rainfall or the number of rainfall events (Benites and Castellanos, 2003). Chena cultivators' focus, therefore, had been on improving the capture of water in the soil by cultivation methods inducing the rainwater to enter into the surface soil first and then to the sub-soil making the moisture retention period in soil longer and use that moisture efficiently in chena cultivation. These they had to do amidst many uncertainties perceived, which demanded many adjustments to cope with them. Chena cultivators knew that they had to live with many vagaries of rainfall uncertainties, such as, too excessive rain, too little rain at times, non-arrival of it in time, uneven distribution of received rain over space and time or even total failure of it. The more the adjustments that they are able to make to these uncertainties in

Table 1: Varying Chena Taxonomy

Based on seasonality	<i>Maha hen</i> (Main season's chenas)	<i>Yal hen</i> (Minor or <i>Yala</i> season's chenas)
Based on age	<i>Nava deli hen</i> (newly-burnt chenas)	<i>Kanatu hen</i> (second or third season's aged chenas)
Based on dominant crop sown	<i>Kurakkan hen</i> (kurakkan dominant), <i>aba Hen</i> (mustard dominant) and <i>vee hen</i> (highland paddy dominant)	<i>Tala hen</i> (gingerly dominant during the <i>Yala</i> or Minor season of cultivation)
Based on method of land clearance	<i>Thani hen</i> (isolated chenas), <i>Yaya hen</i> (individually operated plots but tightly adjacent to one another) and <i>Mulketa hen</i> (wheel chenas)	<i>Thani hen</i> (isolated chenas during the minor season for gingerly cultivation only) <i>Yaya hen</i> (individually operated plots but tightly adjacent to one another during the <i>Yala</i> or Minor cultivation season)
Based on the type of forest cleared	<i>Mukolan hen</i> (chenas in high and dense forest cleared to cultivate mainly kurakkan and mustard during the <i>Maha</i> season)	<i>Landu kele hen</i> (cleared in secondary or scrub jungles during the <i>Yala</i> or Minor) season to cultivate gingerly)

Note:

For more details see, Tennakoon, (1964, 1974, and 1993) and Leach (1961). They both describe with clear diagrammatic representations the advantages of *yaya hen* and *mulketa hen* (wheel chenas) particularly in periphery fencing and crop watching

their chena cultivation regime, the greater would have been, and will be, their success. What are these adjustments?

To begin with, immediately after burning the slashed vegetation they collect the remaining debris after burning and make low stockpiles of them as ridges across the likely flows of water once it rains by which means sheet erosion in burnt and bared land will be reduced in the cases of newly-burnt (*nava dell*) chenas. In sowing seeds they scratch one or two inches of bare surface soil only to cover the seeds. This would not allow excessive evaporation of moisture from the soil. Some debris will be even allowed to remain strewn over the sown surface so that rain fallen after sowing slow down free flow of water. This enables a greater penetration of water into the soil causing more moisture retention, facilitating a healthy crop growth. In sowing a chena for the second or third time, the remains of uprooted or scraped dry grasses are strewn over the sown surface with the same objective.

More than these land preparation and sowing practices, it is the 'game-plan' strategy that the chena cultivators adapt to defend themselves against the threats of rainfall vagaries that they expect but do not know when they strike. That is, sowing a mix of crops - some more water loving (e.g., mustard), some drought resistant (e.g., *kurakkan*) and some requiring moderate rainfalls - so that under any erratic rainfall behaviour and under any amount of water that it gives, a harvest is received avoiding a total crop failure unless in an extreme event of a prolonged severe drought. This strategy has indeed helped the subsistent chena cultivators, whose risk taking propensity is low, to have their food security in place (Tennakoon, 1974).

Part III

Chenas' Supplementation of Wetland Rice Cultivation

Though chena cultivation was the fore-runner of initiating permanent settlements as set out in Part I above, from about the fourth or the third century B.C., with the gradual transformation of rudimentary natural ponds into tanks, and then using them as prototypes for the construction of the later-day large irrigation reservoirs, notably since the fourth century A.C. the eminence of irrigated wetland rice cultivation had risen steadily in the country. However, there is no reason to believe that chena cultivation was abandoned because as a civilisation advances, always the demand for a food diversity arises, and for that diversity, a food source in the past would have been the chenas where a multitude of food items were grown. This form of agriculture too remained as a **crop insurance** against the failure of small tank irrigated wetland rice cultivation amidst unpredictable rainfall failures in some seasons or years, denying adequate tank storage for rice field irrigation providing food adequately.

Re-emergence of the Significance of Chenas since the Nineteenth Century

Ever since the chena became a subject of much reference under the British administration in the early nineteenth century when all the uncultivated lands, natural forests, etc. were considered Crown property under the Waste Land Ordinance of 1840 and more so throughout the twentieth century, the government's chena policy ever continued to be ambiguous (Leach 1961, Brohier, 1975). Though the policies were more attuned against chena cultivation, there were staunch chena defender-administrators. Once in the 1920s in the State Council Mr. Freeman,

the State Counsellor for Anuradhapura District, blasted his opponents in the Council itself by yelling, 'don't be anti-kurakkan' (Stockdale, 1926), inferring the importance of chena cultivation at times of food crisis due to drought. Still later due to war time difficulties in importing food or foreign exchange shortages to import food, the successive governments did not mind villagers cultivating chenas. At such critical times, the government quietly preferred to 'see no evil, hear no evil and speak no evil' of chena cultivation, because at such critical times, chena cultivation has come to the rescue of the government and the people in supplying food (Brohier, 1975). Hence, chena cultivation continued unabated to the twenty-first century as well.

Other Clamouring Needs for Chena cultivation

The gradual population increase both in the dry zone lowlands and in the mountainous hill country dry zone amidst extremely limited irrigable extents and there emerged an acute land-hunger. Amidst the custom of dividing one's irrigable lands equally among his children, 'land parcelisation' continued generation after generation, and in the process, either the inherited extents became inadequate to raise the needed family food or completely turned to be landless after selling those tiny parcels of irrigable land inherited, forcing them to cultivate chenas for food supplementation or for total food dependence. Thus, the cultivation of chenas came to be for '**subsistence affluence**' to those who had some irrigable land for wetland rice cultivation and of '**near total subsistence**' for those who had no irrigable land holdings for rice cultivation.

The increased pressure on forest land for chena cultivation caused an accelerated forest denudation,

soil erosion and depletion, drying of forest water sources, and there by, increasing aridity in the total environment. This became more pronounced by the 1970s when the food imports had to be severely curtailed amidst a world food crisis and foreign exchange restrictions locally prevailed. Hence, there was an unprecedented rush and competition to grow more food in chenas. In this scramble for chena cultivation, the time-tested forest clearing and land management systems with the **three-tier vegetation clearing** for chena cultivation too lost its careful land management objectives.

It was during the 1970s that chena cultivation's food supplementary role changed into a commercial role, tempting those who once had no interest in chena cultivation to rush to whatever and wherever available forests in the dry zone to clear forest indiscriminately cutting down any or every standing plant almost completely and grow commercially lucrative crops such as chillies in demand in the domestic market. They neither had the knowledge nor the regard for the time-tested **three-tier forest clearing** leading to careful land and forest management. They were also aided and counselled by the timber wheeler-dealers and those who were in dire need of fuel wood for commercial activities such as brick and tile making. This has caused a ruination of the natural vegetation.

Part IV

Chena Transformation

The majority of the present-day chena cultivators have no chances of changing their plots freely because of the dearth of forest areas for further cultivation of new chenas due to the increase of population pressure on land all round. Thus, it has become a form of continuous tilling for farming sans soil and land management

practices referred to above. The nastiest land preparation forms are more ubiquitous in the dry zone lowlands rather than in the hill country dry zone. In the dry zone lowlands in particular, deep soil 'rippers' such as two-wheel and four-wheel tractors are used to plough and harrow, because of which deep-seated coarse soils raised on to the surface, deep-burring humus contained in the thin veneer of surface soil reducing surface soil fertility, demanding chemical fertiliser application for its enrichment. It has also accelerated surface soil erosion and silt accumulation in the nearby small village tanks, reducing their water storages, eventually threatening irrigated wetland rice cultivation as well. Because of chemical fertiliser application, yields have risen. But, the over application of chemical may not be the long-term solution for successful soil management. Tank water pollution is a serious health hazard faced by the villagers. The dry zone highland farmers generally remain indifferent to them though they have some awareness of the impending disasters.

The situation is different in the cases of the chena cultivators in the hill slopes of the hill county dry zone. They are aware of the dangers of soil erosion and soil degradation likely to cause in reckless farming in the hill slopes. In a field survey of UHF in the Badulla District (Tennakoon, 1993) it was revealed that as many as 29 precautionary measures of soil fertility and soil moisture protection have been taken by the chena cultivators, which were crystallised into eleven strategies -

- i) contour ridge construction;
- ii) contour drain construction;
- iii) retaining wall construction with stone splinters and boulders to support terraces and guided drains in place;

iv) terracing;

v) use of burnt vegetation debris, uprooted or cut grasses dried to either heap as contour ridges or to mix with earth and reinforce earth contour ridges;

vi) shallow sowing - that is scratching the thin veneer of surface soil sufficient to bury grain seeds;

vii) contour planting;

viii) growing deep-rooting hardy grasses or driving sticks down at the lower toe of an earth ridge to reinforce its strength;

ix) construction of an upper contour drain, outside a UHF to divert water flows from the upper contour to the sideways of that UHF in a lower contour;

x) practise land conservation methods specifically recommended to a particular situation; and

xi) planting permanent tree crops enabling them to anchor the surface and sub-surface soils properly, and thereby prevent earth slips and large-scale damage to soil.

Most of these methods used in hill slopes are not applicable to UHFs in flat or undulating dry zone lowlands. But, those applicable ones and new ones befitting to the lowland environments need to be understood and used, to revive traditional methods to minimise the current devastating damages caused in lowland UHFs.

Part V

The lack of sure-footedness in evolving a chena policy since the early nineteenth century hobbled through the twentieth century and it still remains wayward in the twenty-first century, while the forest and surface soil deterioration, soil erosion, silting of village tanks, increasing environmental aridity bringing some low rainfall areas to the threshold of desertification are continued

unabated (Tennakoon, 1980, 1993, 2005). The ongoing deteriorations have resulted from our piecemeal policy treatments in the use of our natural resources, such as, forest, soil, 'green water', 'blue water' and all forms of our agricultural practices associated with them' as compartmentalised domains in development. We need to revolutionise this compartmental development practice and go for a total environment-friendly micro basin-based (cascade-based) development, harnessing natural resources in our agriculture both on long term and short term perspectives, using the following recommendations:

Firstly, with those living in a cascade attempt two types of planning. One for the management of individual village land extent, where irrigation water is the limiting factor than land, in agriculture. As irrigation water required in that village depends on the 'green water' received in a greater part of the cascade to which that village belongs to, all village residents in a particular cascade need to decide with the State officials what extents of forest to be used for chenas or UHFs and the extents to set apart for natural vegetation, soil and moisture retention improvements, maximising both 'green water' and 'blue water' availability for farming. It is also required to know and practise the best forms of UHF land preparation practices with least damage to soil erosion and soil fertility, the knowledge of which is available with the Department of Agriculture. Soil erosion in UHFs or chenas increases silt accumulation in village tanks which in turn deteriorates irrigated agriculture.

Secondly, as the development is for the people, it should be of the people and by the people. They must have a greater responsibility

in development. The State's main role should be 'setting the stage' for the beneficiary people to be the actors mostly. This would be possible by facilitating the evolution and growth of people-centred strong rural institutions **independently** with the free and democratic voice of people ensured. It remains questionable whether most of the existing rural institutions are so.

Thirdly, there needs to have a better coordination and mutual understanding at least among the key village-level state development functionaries designated by the State through, training, field-based farmer-involved practical knowledge sharing devices, socialisation with the villages, etc, so that whatever State assistance to the rural institutions and individual farmers go more effectively than what happens today.

Fourthly, there is a need for retraining and relevant new technological training provision to those State functionaries so that impartation of that knowledge to the rural beneficiaries will be more effective than what exists today.

Last but not least, rethinking and realignment with necessary adjustments in terms of specific operations based on natural regions such as individual cascade-based mini drainage basins would be far greater effective than the current efforts of widely-defused and poorly-coordinated development efforts made. To be more convinced about this new thinking, it is urged to take a few cascades from each districts and experiment for about 2 to 4 years to be sure-footed in this proposed total development path.

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