

Traditional Rice Farming in Sri Lanka

Historical Perspective

History and cultural heritage of Sri Lanka extends over a period of more than 5,000 years. The great King Rawana ruled Lanka, which covered even a part of India in 3,000 B.C. as mentioned in the popular Indian epic *Ramayana*, written in 500 B.C. The arrival of Vijaya, who invaded Lanka through the Princess Kuweni took place in 600 B.C. The Princess Kuweni ruled the area *Chalaka* (Thambapanni), which was one of the ten divisions at that time. According to a lost record called *Warga Poornika*, these ten divisions are: *Kewesastha* (Northern area); *Upulwangiri* (Dambulla area); *Rakungiri* (Ritigala area); *Neelagiri* (Manewa area); *Kawastha labha* (Habarana area); *Dhumaka kaddeera* (Kala Oya area); *Chalaka* (Thammanna area); *Indra* (Eastern area); *Agni* (South-eastern area); and *Mahagiri* (Samanala mountain area).

The first extensive Sinhalese settlements were along rivers in the dry northern zone of the island. Because the early agricultural activity, primarily the cultivation of wet rice was dependent on unreliable monsoon rains, the Sinhalese constructed canals/channels, water-storage tanks, and reservoirs to provide supplementary irrigation to overwhelm the risks posed by periodic drought. Such early engineering skills reveal the wealth of knowledge owned by ancient people on hydraulic principles and trigonometry. The discovery of the principle of the valve tower, or valve pit (*Bisokotuwa*), for regulating the water release from reservoirs is a unique innovation made by Sinhalese more than 2,000 years ago.

Social divisions arose over the centuries between those engaged in agriculture and those engaged in other occupations. The *Govi* (cultivators) belonged to the highest Sinhalese caste (*Goyigama*) and remained so in the late twentieth century. All Sri Lankan heads of State have, since independence, belonged to the *Goyigama* caste, as do about half of all Sinhalese. The importance of cultivation on the island is also reflected in the caste structure of the Hindu Tamils, among whom the *Vellala* (cultivator) is the highest caste (Russell and Savada, 1988).

The establishment of forests and construction of ponds, reservoirs and irrigation systems were considered great meritorious acts in accordance with popular Buddhism, the faith of the leaders and the large majority of the people. Sri Lanka's history is full of achievements of kings who contributed to the development of water resources for agriculture. Since the first century AD kings, such as, Vasabha (67-111 AD), Mahasena (276-303 AD), Dhatusena (455-473 AD), Agbo II (575-608 AD), and Parakramabahu (1153-1186 AD), built numerous reservoirs and irrigation systems, which fed vast expanses of paddy field in the dry zone. Construction and maintenance of these irrigation systems became massive undertakings. The indigenous expertise developed in the island over the centuries was said to be shared with other countries of South Asia.

Traditional Land Use and Farming Systems

In the hill country, the people modified their life to suit the wetter and more rugged terrain. The paddy

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cultivation in the *deniyas* (valley bottoms) was irrigated during the drier periods through canals that collected water from springs in the hill slopes. Hills perform the function of the reservoirs, and the management of the watersheds necessarily formed an integral component of the agricultural enterprise. Different ecological segments of the slopes were recognised, as reflected on village names such as *Ovita*, *Ovilla*, *Ovilkanda*, etc. according to their location. Valley bottoms around which settlements arose were named after the valley with the suffix of *deniya* (e.g., *Gurudeniya*, *Aideniya*, *Peradeniya*). At the lower segment of the catena, forest gardens were developed in the homesteads. Further up, *chena* cultivation was practised occasionally on a largely sustainable basis. Hilltops were kept permanently under thick forest cover, which helped control soil erosion and regulate water flow.

The farming system in the dry zone landscape was characterised by its three fold pattern of land use. Rice, the staple food crop was grown in the irrigable lowland mainly in *maha* season and perhaps in *yala* season depending upon the availability of water in the tank. The village hamlet (*Gan goda*) was on either side of the paddy tract (*Wel yaya*), usually below the tank and cultivated with perennial crops and vegetables. Due to the influence of tank water and lower elevation, where the soil is imperfectly drained, most of the fruit crops such

as mango, jak, etc., coconut and some vegetables were easily grown in the home garden. 'Chena' the third component, was the oldest farming practice of dry zone villagers in the upland using direct rainfall. Further, to the three-fold pattern cattle and buffalo played a significant role in the traditional farming system.

Identification of a suitable land for chena cultivation, selection of crops, sharing of the land block among the group, time of cultivation, crop management, protection and all any other activities taking place in chena were merely based on sound scientific reasons. Cultivation of paddy with the irrigation facilities of tank water has been a century old farming practice among Sri Lankan rural communities. In certain places, the tank was replaced by small water diverting anicut. Even at present, there are about 11,260 small tanks and 12,940 anicuts serving to poster about 246,120 hectares of paddy lands in Sri Lanka (DAS, 2000).

The village hamlet in old days was located closer to the paddy tract below the tank bund. Most advantageous features in this area for a settlement are:

- a) the paddy tract can be easily protected from wild animals;
- b) the paddy tract is closer to the water source;
- c) the groundwater table is closer to the surface in a considerable period of the year so that perennials could be successfully grown; and
- d) the micro-climate developed in this area is comfortable for living.

Farming system in the wet zone was mainly characterised according to the topography, climate, soil and other geographical and environmental features. Upper portion of the landscape mostly consisted of natural vegetation, which varied from grasslands to dense forest cover. Below that, forest home gardens were located,

where a stratification formed by different canopy layers consisting of trees, shrubs and herbs species of economical importance. These forest home gardens consisted of timber tree species, fruit trees, roots and tuber crops, vegetables and medicinal herbs. Hence, all the conservation and protection functions, which are provided by the natural forest, were also provided similarly by these forest home gardens. Therefore, forest home gardens found at mid and high elevations played a major role in socio-economic sustainability and environmental sustainability of rural areas.

Paddy fields were located below these forest home gardens on terraced lands according to the terrain condition. Forest home gardens and natural forest cover situated in upper elevation of paddy field helped to conserve and store water, which could be utilised in the dry season of the year for paddy cultivation and to maintain the dry weather flow in water streams. There were two types of paddy fields in these areas. One was fed by its own springs. The other was cultivated by diverting water from a stream. Villagers lived in these areas traditionally were self-sufficient because rice was provided by paddy field while other almost all requirements such as vegetable, fruit, medicine, fire wood and timber were met by the forest home gardens.

In hill country, the water source was not wells or tanks, but fountains or streams, which were more or less perennial because of the forest cover on the upstream hill slopes. Paddy was grown with the supplement of

water from those sources through construction of small weirs or anicuts across them. In addition to these structures, small ponds referred to as 'pathaha' located nearby fountains were also used. The unique culture in this area was the well known *Kandian* economic type home gardens, which can be described as forest gardens or analogue forest.

Sustainability of the traditional tank-village system had been maintained in the past simply not only through structural maintenance. Each and every component of the eco-system was given due consideration. The attention was paid not only on macro-land uses, such as, paddy land, settlement area, chena lands, tank bed, etc. but also on ecological segments, such as, *goda wala*, *iswetiya*, *gasgommana*, *perahana*, *kattakaduwa*, *tisbambe*, *kiul-ela*, etc. Fig.1. illustrates the geographical setting of these land uses, and descriptions and importance of them are discussed below (Dharmasena, 2004):

- **Gasgommana** – It is the naturally-grown vegetation in the upstream land strip (*Vaan-gilma*) above the tank bed, accommodating water only when spilling. Large trees, such as, *kumbuk*, *nabada*, *maila*, *damba*, etc. and climbers, such as, *kaila*, *elipaththa*, *katukeliya*, *kalawel*, *bokalawel*, etc. are found

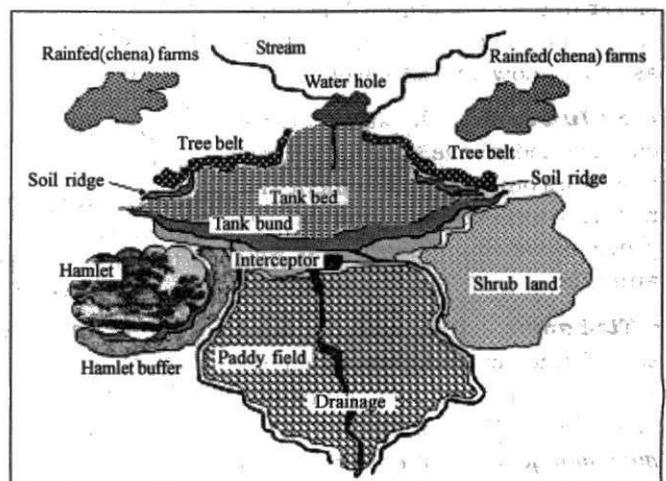


Fig.1: Land use and ecological segments of Tank-village system

in this area. This vegetation is natural and seeds are floating on water. The *gasgommana* acts as a wind barrier reducing evaporation from the tank and lowering water temperature. It gets closure to the bund from either side where roots of large trees make water cages creating breeding and living places for some fish species. This strip of tree demarcates the territory between human and wild animals.

• **Perahana** - It is the meadow developed under *gasgommana* and filters the sediment flow coming from upstream *chena* lands.

• **Iswettya** or *potawetiya* - An upstream soil ridge constructed at either side of the tank bund to prevent entering eroded soil from upper land slopes.

• **Godawala** - A man-made water hole to trap sediment and it provides water to wild animals. This might had been a strategy to evade man-animal conflict.

• **Thavula** - Upper part of the tank bed, where shallow water body is found on almost a flat area. Water will disappear during 2-3 months after *maha* rains.

• **Wew-pittiya** - This is the deep area of the water body, which accommodates major part of the tank water and it is covered with water for more than 8 months in a year.

• **Mada-kaluwa** - The portion of the water mass found during dry months of the year and located closer to the tank bund. This water cannot be moved through the sluice as it is below the sill level.

• **Kuluwewa** - A small tank constructed above relatively large reservoirs only to trap sediment and not for irrigation purpose. It provides water for cattle and wild animals.

• **Nis-bambe** - It is a fertile land strip found around the settlement area (*gangoda*) and does not belong to any body. Tree species, such as, *mee*, *mango*, *coconut* etc. are grown in scattered manner. Mostly this area was used for sanitary purposes

as the resting place of buffaloes. Buffaloes were used as a protection mechanism from wild animals and malaria.

• **Kiul-ela** - This is the old natural stream utilised as the common drainage. Tree species, such as, *karanda*, *mee*, mat grass, *ikiri*, *vetakeya*, etc. and few rare small fish species are also found in water holes along the *kiul* ela. Most importantly, it removes salts and iron polluted water and improves the drainage condition of the paddy tract.

Kattakaduwa - This is a reserved land below the tank bund. It consists of three micro-climatic environments: water hole; wetland; and dry upland, therefore, diverse vegetation is developed. This land phase prevents entering salts and Ferric ions into the paddy field. The water hole referred to as '*yathuruwala*' minimises bund seepage by raising the groundwater table. Villagers plant *vetakeya* along the toe of the bund to strengthen the bund stability. It appears to be a village garden, where people utilise various parts of the vegetation for purposes such as fuel wood, medicine, timber, fencing materials, household and farm implements, food, fruits, vegetables, etc. Specifically, they harvest raw materials from this vegetation for cottage industries.

Traditional Rice Farming

Puranagamas islandwide were linked by common cultural patterns based on food habits. Rice comes first. Sri Lanka had more than 2,400 varieties of rice. For example, *heenati* rice was grown for lactating mothers. *Kanni murunga*, another variety, was grown for men going out to work in the fields. *Suvandel* was cultivated for its extraordinary fragrance. Monks who did not eat after noon were given a special variety grown over six months called *mawee*, which possesses high-protein content.

Agriculture was not an occupation; it was a way of life, closely

interwoven with other activities. Every stage in the cultivation cycle—from ploughing and sowing, to weeding and harvesting—was accompanied by ceremonies involving song, music and dance. Kandyan dancing had its origins in the *Kohomha Kankariya* ritual, which was performed in the village after the harvest. Many agricultural practices found among rural communities in the past had aimed at minimising the losses and failures of crop due to climate, wildlife and other natural disasters. However, with the launch of green revolution and intrusion of western culture into the rural life, centuries-old indigenous wisdom began to disappear mostly forever.

Land ownership of the paddy tract was distributed among villagers in a manner so that each farmer could have similar access and right to the irrigation water. Decision making on cultivation of a portion of paddy tract sharing proportionately among farmers in the seasons of water shortage (*bethma* cultivation) was a good example of their unity. Cultivation of the upper tank bed area (*thavulu govithena*) during extremely dry seasons taking adequate precaution to prevent sediment flow into tank was an example showing their cultivation wisdom.

In the past, rice farming was a community activity. Individual decisions had to be in par with the common decision taken by the *Gamarala* or village chief. Cultivation commenced with rituals praying to gods to ensure the success of cultivation. Then shallow tillage with buffalo and country plough (*goda heeya*), puddling (*mada heeya*), levelling (*poru gema*), sowing, regulated irrigation and fencing took place at auspicious moments. Soil fertility was looked after by allowing cattle free grazing during fallow time, incorporating crop and weed residues into soil in puddling and adding various manure sources (fence lopping, ash, bat dung,

poultry manure, etc.). Crop was protected from pest by leaving a paddy strip to attract birds (*kurulu paluwa*), performing *kems*, a ritual or a religious rite, and if necessary, using plant or plant extracts (bio-pesticides). The crop was harvested and heaped in the field for some weeks or months, threshed and winnowed. Before consumption, a small portion of paddy grain was kept for the *Mangalya* or other festival.

There are few categories of traditional practices to protect crops from wild animal damages. The first group was based on astrology, the second on the powers of the spirits and Gods, and the third involved the chanting of verses and the use of specific symbols. Often, these different practices were combined (Upawansa, 2000).

Astrological practices – Astrology plays a significant role in the lives of Sri Lankan people. Rural people in particular have great faith in astrology and consult astrologers before embarking on any significant enterprise in their personal, educational or professional life. Astrology also played a dominant role in agriculture, especially in the cultivation of rice. Farmers believed that certain days were good for beginning cultivation. They also avoided certain days which they considered inauspicious or unlucky. Usually, a Sunday was chosen to initiate work relating to paddy cultivation. The work was begun on an auspicious day at an auspicious time. Most farmers followed the astrological calendar or *pancha suddiya* to ensure success and avoid bad luck.

Spirits and Gods – If the people realised that the issue cannot be addressed by their strategies, then they expected the support of Gods and spirit. One such example was that all farmers visited the temple and made offerings before they start

cultivating their crop. After the harvest, farmers performed again a ritual in the field as well as at the temple before use. They believed that such practice could please the unseen forces. These activities are still taking place in some rural villages.

Since ancient times, rituals have been used in Sri Lankan agriculture to support crop growth and animal husbandry and to chase away wild animals or pests that damage the crops. The combination of spiritual practices, astrology and eco-friendly technologies have become customs. One of the most important rituals was the *pooja* or offering, carried out during the annual festival that was called *Mangalya*. In many villages, this festival was held at the *devala*, a specific place, usually on the bund of the village water reservoir, the tank. On the day of the festival all items which were collected and purchased were taken in a procession to the *devale* premises. All men, women and children of the village were expected to participate.

Pirith - *Pirith* is Buddha's teaching for laymen and involves chanting specific verses in a group. Each verse deals with some aspect of good living. Some of these prescriptions were used for crop protection. The verses were used to charm sand and water. These were then sprinkled thinly over the field. Chanting specific verses extracted from Buddhist teachings was done in a group. In some areas symbols were painted on an ola leaf and hung in the corners of the field. However, the performer was said to be having a pious life, and he should refrain from robbery, sexual misbehaviour, eating animal protein or drinking alcohol.

Manthra – The *manthra* is also chanting with specific sounds repeating the same version specific number of times. This causes a

vibration in the environment. This influences the spirits to bring about the desired effect. Each mantra is different and depends on which animal is being addressed. When elephants were threatening the crops, the *mantra* was accompanied by placing a charmed coconut flower in the middle of the plot. If the animal concerned was a wild boar, a glowing fire stick was charmed and dipped in the paddy field.

To prevent rat attack sand and pebbles were taken from the field and these were then charmed. The sand was then sprinkled over the field while pebbles were buried in each of the corners. Charmed pebbles were also buried in each corner of the field to ward off monkeys. Birds were kept away by burying charmed mustard seeds and sand in the centre of the field.

Yanthra - A symbolic drawing preferred by a particular spirit was hung or kept in a specific place expecting the blessings of unseen power to carry out their activities or to live without any threats. Preparation of a *yanthra* had to be made under certain rules. If these rules were not carefully followed, the *yanthra* would be no effective and cause harm to the person.

Yantras are symbols that have been given the powers by *manthra* or *pirith* chanted by a sacred person. It can have the form of a drawing, an idol or a structure. Some *yantras* are inscriptions on a thin strip of copper or palm leaves. These inscriptions can represent gods, spirits or be geometrical figures or texts in Sanskrit or another language. *Yantras* were used to secure protection from enemies, the anger of the gods or evil spirits, ill effects of planets, forces of nature, envy and the evil eye. They also helped to ensure good crops or good health. In agriculture, the use of *yanthra* was widespread.

Kem krama – The practice of *kems* was very popular in traditional farming. A *kem* is a kind of practice, technique or custom that is followed in order to obtain some favourable effect such as relief from a specific illness. For example, washing in a pool of water immediately after a crow washes in that pool was believed to bring relief to people suffering from certain infirmities. A requirement in this *kem* is that the patient should wash without speaking or making much noise. The following *kem* was used for protection against the paddy fly:

Some *kems* combine the use of astrology with the use of certain plants or herbs. Other *kems* depend on the use of specific plants and *manthras*. There are also *kems* that do not involve any belief in spiritual beings or gods. These *kems* are based on a careful observation of nature and natural phenomena. Some *kems* are mechanical methods. For example, candles made using a piece of saffron robe for the wick and sticks of trees *wara* (*Calatropis gigantea*), *kadura* (*Pogonanthus dichotoma*) or *gurula* (*Leea indica*) for the handle. The wick is dipped in ghee. Candles are lighted and kept burning for about two hours at dusk. Most pests and insects are destroyed acting this as a light trap.

Best Practices

In addition to the socio-spiritual methods practised in traditional rice farming, there are other numerous practices adopted to address the issues emerged during farming. Some of them are briefly described below:

Bethma govithena – The *bethma* cultivation practice is adopted in poor rainfall seasons when the farmers can not cultivate the entire paddy tract by using limited water in the tank. They gather and decide to redistribute temporarily the upper portion of the paddy tract mostly in equal size. This provides a part of their food requirement otherwise would end up with full

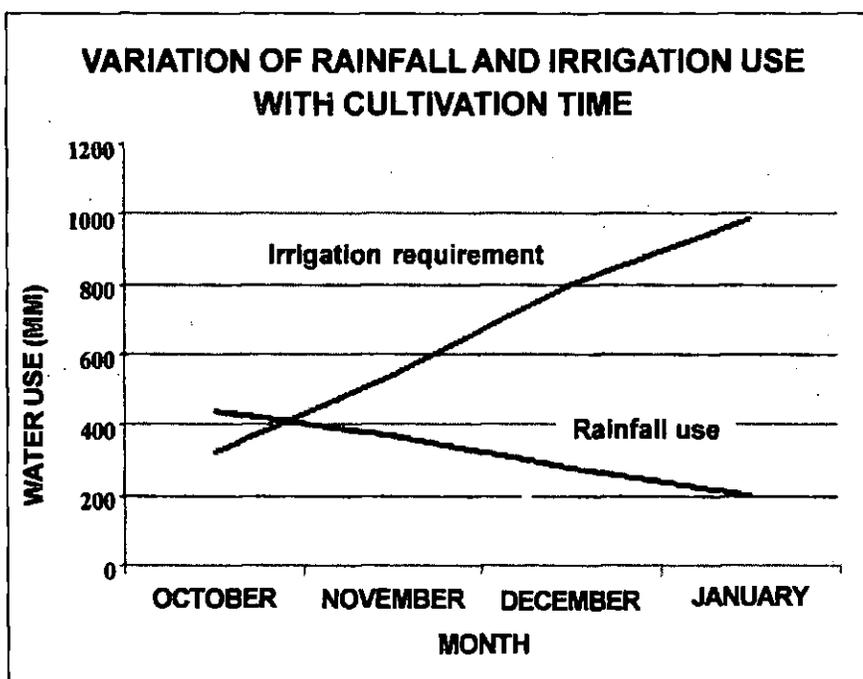


Fig. 2: Effect of delayed cultivation on irrigation water use

abandonment of the paddy cultivation for that season. Through *bethma*, the limited tank water could be utilised efficiently without causing crop losses. Such a practice does not depend on the coming rainfall, which is not certain. *Bethma* can also be practised in combination with field rotation, and the farmers may decide to cultivate either paddy or other field crops. This decision usually depends on the water level in the tank. In some cases, the land distribution is proportional to the ownership share of land, but in most cases, it is found to be in equal portions. Allocation of the plots is usually done by either the *Vel-vidane* or the farmer organisation.

Pangu kartiya – Farmers divide the maintenance works, such as, tank bund clearing, canal clearing, bund repair, sluice cleaning, etc. among themselves to prepare the irrigation system for the seasonal cultivation. This reduces the cost, creates sense of responsibility and ownership and accountability. Performance of works is in good quality and working together could strengthen the social cohesion. Nevertheless, regular maintenance, attending all repairs, ultimately could contribute to efficient water management and system sustainability.

Kekulam govithena – Dry sowing of paddy seeds early in the season is referred to as *kekulam govithena*. When dry sowing is done in tank upstream areas, it is called *vee hena* or *goda hena*. In the traditional *kekulama* method, the dry fields are ploughed with the country plough (*Sinhala nagula*) to obtain a dispersed soil and burry the weeds. At the inception of rains, dry seeds are sown with the anticipation of more rains soon. After sowing, the land is shallow ploughed to mix-up the seeds with soil. In some instances, when the field becomes adequately wet, the same *kekulama* could be practised, but sprouted seeds need to be sown instead.

In some paddy tracts and under some tanks, certain sections are sown to *kekulama* and then when the tank is full of water, other sections could be cultivated with normal wetland land preparation. A recent study indicated that delaying cultivation without adopting *kekulama* method would lead to high irrigation requirement failing to use a considerable portion effective seasonal rainfall for the cultivation (Dharmasena, 1989). Fig. 2 illustrates the effect of delaying cultivation on irrigation requirement of the crop.

A Study on Traditional Rice Farming

A study was undertaken by a Non-Governmental Organisation, 'Future in Our Hands Development Fund' with the financial assistance of COMPAS (Comparing and Supporting Endogenous Development) to assess the impact of traditional rice farming on economy and environment of the farming communities of the Moneragala District (Dharmasena, 2009).

The study was carried out during *maha* 2007/08 and *yala* 2008 seasons. It compared effects and impacts of traditional and conventional farming practices. In the conventional farming, farmers used improved varieties, which need high inputs (inorganic fertiliser, agro-chemicals, etc.) to obtain anticipated yield levels. In traditional farming farmers grew traditional rice varieties, used fertilisers of organic origin (straw, green manure, cow dung, poultry manure, liquid fertiliser etc.), managed weeds through hand weeding, mechanical weeding and water management and controlled pest and diseases by practicing *Kem krama* (rituals), maintaining biodiversity and using bio-pesticides.

Most important findings of the study are summarised below:

- Traditional cultivation can reduce salinity.
- It increases available Phosphorus and exchangeable Potassium in the soil.
- Traditional practices builds up soil organic matter gradually.
- Soils become loosen with traditional farming.
- Machinery and material cost could be reduced with traditional farming.

- Family labour can be more effectively utilised when traditional practices are adopted.

- Average total investment made to produce one kg of paddy from traditional farming was only about Rs 12, while it was about Rs 17 from conventional farming.

- Predator population found in traditional farming field is adequate to control the pest problem without any pesticides.

- A rich biodiversity is observed in traditional rice fields with higher number of broad leaf species.

Conclusion

A great effort was made by the hydraulic societies evolved in Sri Lanka to construct various water storing and conveying structures especially to develop the irrigated agriculture meant for rice farming. Nature of irrigated rice farming varied over the island with climate, geography, soil and other factors. Farming systems developed in dry and wet zones also varied accordingly with the interaction of socio-cultural factors. The evolution of traditional rice farming culture in the country in harmony with nature gifted a sustainable living environment to the nation. The traditional rice varieties kept the community healthy and wealthy. Methods of land preparation, planting, water and crop management, crop protection, harvesting, processing, storage and utilization were developed and adopted aiming spiritual sustainability of the community through bio-physical, socio-cultural and cosmo-spiritual processes.

Recent studies have confirmed that the traditional rice farming is still economically viable, environmentally sustainable and socially acceptable. Thus, a national effort is required to revitalize and promote this

indigenous agriculture, which addresses almost all present issues and constraints emerged in the modern rice farming sector.

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