Indigenous Agricultural Knowledge in the Present Context

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Indigenous Knowledge

Over the course of history, many communities could develop their own culture and lifestyle that are in harmony with nature and the local ecosystems. Indigenous knowledge is one of the products remained for centuries, firmly inbuilt into the belief systems, myths and folklore of society; and it expresses the local solutions. It makes decisions regarding the use of resources and environmental conservation. It includes strategies to address the negative impacts of natural disasters. It provides guidance on agricultural practices and food preservation, health care and a host of other activities. It constitutes an environmental management system that is largely community led. Enforcement of these customs and norms is often ensured by social conformity and by codified threats.

In the past two decades, a growing set of evidence has indicated a strong relationship between indigenous knowledge and sustainable agricultural development. Large populations in developing countries owe their survival to the time-tested application and use of indigenous knowledge in environmental protection and reduction of the impacts of natural disasters in farming.

Principle 22 of the 1992 Rio Declaration on Environment and Development specifically underlines the vital role that indigenous people and their communities play in environmental management and agricultural development because of their knowledge and traditional practices. It calls for recognition and support of their identity, culture and interests to enable their effective participation in the achievement of sustainable development.

Indigenous knowledge is a precious national resource that can facilitate agricultural production in cost-effective and sustainable ways. Hence a blend of approaches and methods from science and technology and from traditional knowledge will open avenues towards sustainable agricultural development in Sri Lanka.

Traditional knowledge systems of indigenous people, while highly variable in their content and style, nonetheless all have a great deal to offer in sustaining life on the planet. Most traditional knowledge systems assume that people are part of the environment, not that they own their surrounding, so they consider themselves as true guardians. The wisdom derived from this philosophy can be used to advantage when planning for sustainability.

Indigenous agriculture is based on more realistic principles. People observed natural phenomena operating around them and studied how it could be manipulated for their needs. They could see the forest, its anatomy, association of different species for coexistence, regeneration after fire, spatial variations, etc. The farming system, which includes *chena,* paddy and home garden cultivation has evolved with interaction of man with the environment and developed in harmony with natural ecosystems. Their experience and observations on rainfall pattern, wind, temperature, humidity and soil behaviours have used to adjust their cultivation activities. When they found that some of the tragedies they faced in farming as reasons beyond their control, they appealed the support from the religion and spiritual and cosmic influences. Most important fact they realised on top of others is that, without giving due respect to the resources using for farming, they could not expect the sustainability of their food sources.

In Sri Lanka, the tank-village community existed in the dry zone is the best example to illustrate how the environmental conservation yielded sustainable agriculture. These communities frequently face four natural disasters namely drought, flood, cyclone and epidemics. Their traditions, agricultural practices, land use systems, etc. have evolved during centuries to face these challenges imposed by the nature.

Some of the special features in the traditional agriculture are mentioned below:

i. Risks of farming due to factors, such as, rainfall, drought, pest and diseases, damages from wild animals, etc. were reduced through adoption of auspicious times and spiritual powers in farming operations, timely cultivation, crop management, etc.

ii. Maintenance of favourable environment for crops by adopting relevant conservation practices.

iii. Maintenance of the land productivity by adjusting the farming practices with least disturbance to soil and addition of organic biomass.

iv. Adoption of diverse crop combinations in agriculture to cope up with the variation of climate, soil and other biotic as well as abiotic stresses.

v. Use of simple farm implements with lesser energy consumption

vi. Making use of natural processes to minimal use of inputs in cultivation, i.e., introducing and maintaining crop diversity (to minimise pest attacks), planting Mee (*Madhuka longifolia*) to attract bats to improve fertility, maintaining natural vegetation around the tank to conserve water storage, etc.

Irrigation and Agriculture in the Past

As long as the fact exists that there have been farmers for about seven or eight millennia and with the present archaeological understanding, it is certain that they must have been struggling with the surrounding environment to practise their agriculture for eking an existence. It is also obvious that they must have thought of water as the most essential element for agriculture. Certain regions, such as, arid and desert areas, are affected more by severe moisture constraints than other regions such as rainforests. However, in nearly all regions of the world, even the tropical zones of Southeast Asia, agricultural production can be improved through irrigation at least in certain seasons, and for certain crops.

The excavations in citadel of Anuradhapura produced important evidence of iron technology, breeding of horses and cattle, and paddy cultivation, from cultural horizons nearly ten metres below the present ground surface. There is incidental evidence from excavations for water management associated with paddy cultivation. Agriculture would undoubtedly have been dominated by paddy, which can only be intensified in Sri Lanka's dry zone by the adoption of water management measures to control supplies from seasonal rainfall, streams, and perennial rivers (Deraniyagala, 2002).

The ancient water soil conservation ecosystems of Sri Lanka are a classic example of man's active adaptation to nature. They include river diversion systems and storage systems, themselves consisting of small, medium and large reservoirs. These systems had been constructed over a long period of time, beginning in about the mid first millennium B.C. (Mendis, 2002).

In a written history of Sri Lanka (*Mahawansa*), dating back to the first millennium B.C., the existence of three ancient kingdoms is shown, and construction of ancient river diversion systems and storage reservoirs is recorded. The kingdoms were *Rajarata* or the king's country and *Ruhunurata*, together covering most of the modern dry zone, and *Mayarata* covering most of the wet zone. The ancient irrigation works were mainly in the dry zone, of which many are still functioning, but some ancient works are also found in the wet zone.

The legendary story of civilisation in Sri Lanka begins when the island was inhabited by people of the original tribes, i.e., *yaksha, raksa, naga* and *deva*. These early people gradually developed systems of sedentary agriculture based on irrigation. Even before the arrival of Vijaya around 500 B.C., small-scale irrigation systems were in operation. It is reasonable to postulate that the early Vijayan settlers probably harnessed the skills of local inhabitants, to construct irrigation works and clear forests. Some believe that the multi-headed cobra symbol often discovered at the sites of ancient irrigation structures and other water works, was the insignia of a *naga* line of royalty well versed in hydraulic engineering (NARESA, 1991).

Conveyance of irrigation water over long distances needed efficient control over distribution and allocation between the top and tail-ends of the system. Smooth functioning of all hydraulic structures required efficient maintenance. Irrigation depending on micro-catchments required careful watershed management to reduce siltation and ensure catchment water yields. The land and water use systems that developed over centuries to satisfy these requirements was described as tank cascades first by Madduma Bandara (1985).

Organisation of small tanks into a cascading sequence within micro-catchments allowed grater efficiencies in water use. Drainage from the paddy fields in the upper part of the cascade flowed into a downstream tank for reuse in the paddy fields below. The system fully expressed the well known dictum by the King Parakramabahu (1153 - 1186 AD) that "not a single drop of water received from rain should be allowed to escape into the sea without being utilised for human benefit".

System management required community effort and coordination. A breach in the upper-most tank bund through neglect or excess water would threaten the collapse of the entire sequence of tanks below. Similarly, if the capacity of a tank was increased arbitrarily by one village raising the bund or the

spillway, it could inundate the lowermost paddy fields in an upstream village. Interdependency between villages in a cascade required well-coordinated management of land and water resources.

Indigenous Vs Scientific Knowledge

Indigenous knowledge is often contrasted with scientific, western, international, or modern knowledge that the knowledge developed by universities, research institutions and private firms using a formal scientific approach. Because indigenous knowledge changes over time, it is sometimes difficult to decide whether a technology or practice indeed is indigenous or adopted from outside, or a blend of local and introduced components. In a development process, however, it does not matter whether a practice is really indigenous or already mixed up with introduced knowledge. The most appropriate way is to investigate the available knowledge in a locality before planning for effective adoption of any technology in the development. It suggests that indigenous knowledge and western knowledge need to fuse in terms of knowledge, practice and internationally accessible knowledge pool (Charyulu, 2008).

There are situations in which modern science is not appropriate, and use of simpler technologies and procedures are required to solve problems. Thus, indigenous knowledge provides basis for problem-solving strategies in local communities, especially the poor.

It is realised by many development organisations that learning from indigenous knowledge can improve understanding of local conditions and provide directives to help rural communities. In addition, the use of indigenous knowledge assures that the end user of specific agricultural development program is involved in developing technologies appropriate to their needs (Warren 1993).

At present, indigenous knowledge disappears rapidly from these communities accommodating modern practices with advancement of science. However, as once stated by Robert Chambers (1994), *"Systems of knowledge are many. Among these, modern science is only one, though the most powerful and universal. Rural people's knowledge is in contrast 'situated', differing both by locality and by group and individual, and differing in its modes of experimenting and learning: different people know different things in different places, and learn new things in different ways."*

Inability to interpret any phenomenon does not mean that it is a myth. Many practices adopted in the traditional communities are blended with religious and spiritual beliefs and cosmic influence. Thus, it is wise to use a 'package effect approach' rather looking for effects of each component separately. For example, the *nawa kekulama* is an improvement of the traditional *kekulama* considering the present environment, where it is to be practised. Irrespective of the unknown and unseen influence of certain components, the null hypothesis can be tested for the whole package of *kekulama*.

A research methodology should be developed to conduct experiments with real practitioners of the indigenous knowledge and in real environment, where it is being practised. It should not be biased due to previous experience. The investigator and the practitioner should have close association but the interpretations should not be supported by past stories. In analysis, there may be a possibility of separating the effects of physical and spiritual components, however, it should not be done in this package effect experimentation. For example, effect of western and traditional medicines can not be compared by analysing the known ingredients only as the traditional medicine has many unknown constituents, specific way of application and post-application practices.

Types of Indigenous Knowledge

Indigenous knowledge is more than just technologies and practices. It includes the following many aspects as mentioned below:

- Information – What trees and plants that grow well together? what are the indicator plants? (plants that show the soil salinity or that are known to flower at the beginning of the rains).
- Practices and technologies – Seed treatment and storage methods, bone-setting methods, disease treatments.
- Beliefs – Beliefs can play a fundamental role in a people's livelihood and in maintaining their health and the environment. Holy forests are protected for religious reasons. They also may maintain a vital watershed. Religious festivals can be an important source of food for people who otherwise have little to eat.
- Tools - Equipment for planting and harvesting, cooking utilities.
- Materials – Housing construction materials, materials for basketry and other craft industries.
- Experimentation – Farmers' integration of new tree species into existing farming systems, Healers' tests of new plant medicines.
- Biological resources – Animal breeds, local crop and tree species.
- Human resources – Specialists such as healers and blacksmiths, local organisations such as kinship group, councils of elders, or groups that share and exchange labour.
- Education – Traditional instruction methods, apprenticeships, learning through observation.

• Communication – Stories and messages carved on palm leaves, folk media.

At many instances knowledge is subject to change or modification with time due to changes of the influencing factors. This is through experimentation of the practices to achieve most appropriate method/ tool/ practice/ technique, etc. Further, they became owners of animal breeds, local crop and tree species and kept them as family secrets.

Families had become experts and specialists for different purposes. Some examples are *Wedadura* (physician), *Yakadura* (healer), *Kammalkararaya* (blacksmith), *Dadayakkaraya* (hunter) and *Gamarala* (village headman). They gave their education to next generation through instructions, apprenticeships and learning through observation. They preserved their knowledge by writing on palm leaves and through folk media.

Conservation and Preservation

There are a few communities, which although not physically isolated, have been separated from the mainstream of the community for historical and social reasons. The aboriginal people called the *Veddahs* are a small community consisting of a few families, many of whose more public members are believed to be imposters seeking to profit from tourist and academic interests in their lifestyle. The *Rodiyas* are another group, which was isolated by social ostracism, but this group too seems to have been progressively assimilated into the general population. There is also a community of gypsies, who speak their own dialect. While each of these groups has their own traditional treatments for disease; there has been little or no attempt to document them. These communities have, over the years, become assimilated into the larger community, a process hastened by the smallness of the island and the good social infrastructure prevailing therein. Free health services and free education facilities are accessible to communities in all areas of the island and these provide a powerful incentive for traditional communities to move out of their traditional life styles (Vijaya Kumar, 2000).

Traditional knowledge that has not been documented survives today usually as a "family secret" similar to a trade secret. The knowledge is passed down from generation to generation and is closely guarded from those outside the immediate family. However, traditional knowledge maintained as family secrets have a tendency to leak or gradually move into the public domain and their leakage cannot be effectively prevented unlike trade secrets in the corporate sector.

Non-formalised traditional knowledge in agriculture has been largely lost. There are a few sources of food materials, which are generally consumed by minor sections of the community, but with the assimilation of these communities, this knowledge has also become public and the habits popularised. Traditional seeds were regularly used in the past, but they have been replaced over the years. The Green Revolution saw most of our farmers moving away from traditional rice to modern hybrid varieties. Some of the germplasm has been preserved locally, but most of them are available in International Germplasm Depositories. It is unlikely that Sri Lanka's prior consent will be obtained or that it will share in any benefit if its traditional germplasm available in these depositories is used in the development of new commercial seeds.

Identifying, documenting and incorporating indigenous knowledge in agricultural extension organisation is essential to achieve sustainable agricultural development. Indigenous knowledge systems provide a frame of reference for strengthening agricultural extension programs and this led to reorganisation of interventions made by extension personnel. The participatory technologies that are developed through integration of indigenous knowledge will:

i) 'provide diversified technological options, which enable farmers to choose using their own decision-making systems;

ii) originate from the farmers' own knowledge, and

iii) use diversified sources in active participation of research-minded farmers (Rajasekaran, 1993).

Extension strategy should now focus on improving current benchmark of indigenous knowledge practices. The strategy should also concentrate on facilitate skills to build capacity of producers of innovations to formulate questions, which they use to engage specialists or to utilise information systems.

The content of an indigenous knowledge of a country varies depending upon the needs and problems that the nation faced during the history. It can be categorised according to its variability of importance. It is an information base for many aspects in the community such as agriculture, climate, history, tradition, medicine, religion, belief, etc. For example rural people understand the salinity status of soil by observing the plants found in an area. Diwul (*Feronia limonia*), keeriya (*Acacia chundra*), indi (*Phoenix zeylanica*), ikiriya (*Hygrophila spinosa*), pothu-pan (*Scleria poaeformis*), vetakeya (*Pandanus kaida*), illuk (*Imperata cylindrical*) can be grown in saline soils. Good rains are expected if they observe more flowers in wood

apple trees. Occurrence of heavy rains in the *Binara* (September) indicates a *maha* season with low rainfall (Dharmasena, 2007).

Sri Lanka's traditional knowledge therefore has been lost and is being lost because of modernisation. This brings up the question as to whether developing countries should attempt ensure the preservation of traditional knowledge by preventing changes in the lifestyles of the holders of traditional knowledge. Such a strategy will in effect be a denial of the benefits of modernisation (improvement in living standards, social mobility, etc.) to these communities.Although the benefits of modern lifestyles over traditional lifestyles can be questioned, there can be no justification for preventing the modernisation of communities with traditional lifestyles, merely to preserve traditional knowledge. The only way of preventing the loss of traditional knowledge is through documenting the traditional knowledge. However, the conventional system of intellectual protection, not only does not encourage the disclosure of traditional knowledge for documentation, but also appears to militate against the rapid documentation of traditional knowledge.

In the context of indigenous knowledge, storage of materials in air-conditioned rooms alone does not mean preservation. The libraries should have specific ongoing programs to collect indigenous knowledge before preservation. In general, the situation with regard to the preservation of indigenous knowledge in Sri Lanka is not satisfactory.

In Sri Lanka, so far, no concerted efforts have been taken to preserve its indigenous knowledge. On the other hand, legitimised knowledge system of the country is also on the verge of extinction. Within the next few decades most of the records of this knowledge (palm leaf manuscripts), heaped in Buddhist temples here and there will be destroyed due to neglegence. Preparation of bibliographies alone does not preserve these manuscripts. They are immediately to be copied, classified, indexed and preserved.

Vast amount of true indigenous knowledge of the country, the oral knowledge has already vanished since the word by mouth tradition does not exist in modern society. The verbal tradition is on the wane. Young generation of the country is not interested in the practising of verbal traditional knowledge. Therefore, if no immediate actions are taken, it is inevitable that the verbal indigenous knowledge in Sri Lanka will be lost by the end of the present generation of elders. Hence, it is to be immediately collected, recorded, preserved and make available to the future generations.

Preservation and development of indigenous knowledge depend upon the commitment of the society for the purpose. Sri Lankan society has still not fully recognised the importance of such a project. Perhaps, authorities might have considered it is an unnecessary luxury to spend national income on such programs, as there are enough bread and butter problems to be addressed immediately.

Documentation and Dissemination

Indigenous knowledge is predominantly tacit or embedded in the practices and experiences. It is commonly exchanged through personal communication and demonstration: From master to apprentice, from parents to children, from neighbour to neighbour, etc. Unless indigenous knowledge is properly documented, analysed and disseminated, there is a risk that within one generation, the knowledge could be lost forever. Databases and resource centres would help to exchange indigenous knowledge from one community to another and promote integration of indigenous knowledge into the development process. The following steps would be recommended for the process of documentation and dissemination:

- Identification of Indigenous Knowledge through technical and social analyses,
- Analysis of Indigenous Knowledge for scientific background and relevance, reliability, functionality, effectiveness and transferability,
- Recording and Documentation by using modern tools in some cases and through traditional methods in other circumstances,
- Storage in retrievable repositories.

Networking

A growing number of formally-established indigenous knowledge resource centres are being established worldwide with an objective to provide an instrument for exchange of information; platform for debate on concept of indigenous knowledge. The Internet is extensively used to share indigenous knowledge for purpose of development activities and extension. At present, only the institute established in Sri Lanka is the SLARCIK – Sri Lanka Resource Centre for Indigenous Knowledge, University of Sri Jayewardenapura, Forestry Building, Nugegoda, Sri Lanka.

The use of modern Information and Communication Technology for the exchange of indigenous knowledge is very exceptional. As the countries establish connectivity to reach rural people, modern indigenous communication

technology could become a powerful enabler for dissemination of indigenous knowledge. In the near future, more traditional and suitable channels for dissemination of indigenous knowledge could be used.

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