



A Study on the Use of Indigenous Knowledge in Pest Control Methods in Traditional Farming Systems in Rural Villages in Dry Zone of Sri Lanka

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ශ්‍රී ලාංකේය කෘෂිකර්මාන්තය වසර අවුරුදු දෙදහසක් පමණ ඉතා ඇත අතීතයකට දිව යයි. රටේ ජනතාවගේ ප්‍රධාන ජීවනෝපාය මෙන්ම රටේ ප්‍රධාන ආදායම් මාර්ගයක් වූයේද කෘෂිකර්මාන්තයයි. කෙසේ වුවද නූතන ගොවියා විසින් කෘතීම කෘෂි රසායනික ද්‍රව්‍ය, පළිබෝධ පාලනය උදෙසා වර්තමානයේ යොදා ගත්තද අතීතයේදී කෘෂි හානි සාර්ථකව පාලනය කරනු ලැබූයේ පරිසරයට හානි නොවන ආකාරයට කෙම් ක්‍රම හා සාම්ප්‍රදායික ක්‍රම ඔස්සේය. මෙම අධ්‍යයනයේ ප්‍රධාන ගැටළුව වනුයේ පුරාතන කෘෂිකර්මාන්තය තුළ භාවිතා කරන ලද වාරික, කෙම් ක්‍රම සහ පැරණි තාක්ෂණික ක්‍රම අධ්‍යයනය කිරීම සහ එම තාක්ෂණය සමාන ව්‍යුහය හා පාරිසරික තිරසාරභාවය තහවුරු කිරීම සඳහා ලබා දුන් දායකත්වය පිළිබඳ අධ්‍යයනය කිරීමයි. මෙම පර්යේෂණය තුළින් වත්මන් කෘෂි කාර්මික ක්‍රමවේදයන් තුළ නොසලකා හැර ඇති පළිබෝධ කළමනාකරණය සඳහා භාවිතා වන සාම්ප්‍රදායික ක්‍රමවේදයන් පිළිබඳව විද්‍යාත්මක මූලධර්ම හඳුනා ගැනීම සිදු කරනු ලබයි. මෙම පර්යේෂණය ප්‍රධාන වශයෙන් ද්විතීක දත්ත මත පදනම්ව ඇත. ඓතිහාසික ක්‍රමය ප්‍රධාන

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පර්යේෂණය ක්‍රමය වශයෙන් යොදාගෙන ඇති අතර පොත්පත් ලිපි, පර්යේෂණ ලිපි ලේඛන හා අන්තර්ජාලයෙන් ලබාගත් දත්ත සහ තොරතුරු භාවිතා කරන ලදී. මෙහි දී දේශීය වශයෙන් පුරාණ කෘෂිකර්මාන්තය තුළ පළිබෝධ පාලනය සඳහා යොදාගත් සාම්ප්‍රදායික තාක්ෂණික ක්‍රමවේද වශයෙන් දිය හොල්මන, සුළං හොල්මන, ටකපෝරුව වැනි තාක්ෂණික ක්‍රම හඳුනා ගැනීමේ කෘෂි පාලනය සඳහා මී හා කොහොඹ ගස් සහ වෙනත් පැළෑටි වර්ග ජෛවීය තාක්ෂණික ක්‍රමයන් සඳහා භාවිතා කර ඇත. මෙම සාම්ප්‍රදායික තාක්ෂණික ක්‍රමවේදයන් රට තුළ ජෛව විවිධත්වය පවත්වා ගැනීමත් ආහාර සුරක්ෂිතභාවය සමග රට තුළ තුලනාකෘමක පරිසර පද්ධතියක් පවත්වාගෙන යාමත් සහතික කර ඇත.

මූලික පද :- වාරිත, කෙම් ක්‍රම සාම්ප්‍රදායික පළිබෝධ පාලනය, යාන්ත්‍රක ක්‍රියාවලිය, වී ගොවිතැන.

Introduction

Sri Lanka is a rich agricultural country with one of the oldest traditional agricultural civilizations in the Asian region dating back more than 2500 years. For centuries, paddy cultivation in the island nation was not just an economic activity but a way of life that shaped the society, culture, religion and economy.

The sustainable and organic agricultural practices of both the near past and the ancient people of Sri Lanka, exemplify the interconnectedness of nature and human life. Sri Lankan history exceeds more than two thousand years and was supported with a well-developed irrigation farming system and culturally-defined specific agricultural practices. From the Anuradhapura period, the Buddhist Central Value System (Herath, 1993) provided the necessary guidance and stability for agricultural production while ensuring sustainable development. Those practices were extended to different agricultural systems in different agro-ecological areas of Sri Lanka. Day-to-day lifestyles, rituals and religious practices, particularly in paddy cultivation, chena cultivation were developed harmoniously, leading to social integration, food security and community strength. Those practices helped maintain biodiversity in the country through conservation while it ensured maintenance of a balanced environmental system in the region in relation to both agricultural practices and environmental protection.

Each and every aspect of agricultural practice was associated with Buddhist ethics and cultural values, and this enriched value system base provided guidelines to the leadership of the nation. According to that situation, both culture and agriculture were intertwined in formulating concepts that determined Sri Lankan lifestyle. Most of the cultural practices and rituals were interconnected to the agricultural resource management practices in the country.

This research may provide necessary understanding about the methods of pest controlling that have been used in indigenous farming system, as well as how to maintain environmentally sustainable, and culturally adaptable agricultural system prevailed in the country via traditional farming systems. Furthermore, it may provide the necessary answers to the causes of agricultural problems existing at present in Sri Lanka.

Materials and Method

The research problem of this study was to study the rituals and technical methods that used in ancient agricultural farming system and those practices how importantly contribute to ensure the social structure and environmental sustainability. The main objective of this study was to investigate the significance of rituals in traditional farming systems and cultural aspects of agricultural rituals in ancient traditional pest control methods in rural social environment in Sri Lanka. In addition to that identification of factors for the reduction of acceptability of agricultural rituals of the society, identification of present trends of agricultural rituals related to tank villages , evaluation the effects and impacts of poor acceptability of rituals in the present social structure were the other objectives of this research study. This research was mainly based on secondary data. The historical method has been used as a main research method and the data and information that obtained from books, articles, related publications, related web pages and research paper articles were used as secondary data.

Results and Discussion

Significance of rituals in traditional farming systems

The practice of kems is very widespread in rural Sri Lanka. Culturally-defined traditional ritual practices are still being used by some farmers in many parts of Sri Lanka. Kem is one of those practices. The word "kem" is probably derived from the Sanskrit word "Kshema", which denotes relief from difficulty. It also suggests an immediate solution to a problem in human life (Herath, 2010). All rituals represent some sort of religious belief to those who practise them, and may have some magical component. Furthermore, there may be some sort of scientifically valid reason of the ritual. In that sense, many, agricultural rituals in Sri Lanka are associated with one or more aspect of magical, religious, scientific or social significance, and they are closely inter-related to the lifestyle of the community. The practices of rituals present opportunities or signify an important social integration role among rural people.

Farming rituals (Kem Krama)- Kem as a natural method of pest control

The rituals and customs of any community are structured on the geography, climatic conditions and the modes of living of any given area. All rituals and customs of a primitive community, called the 'little tradition' are geared to peaceful coexistence and the continuity of each family unit. In view of the fact paddy cultivation was key sector to the survival of the community, all activities connected with paddy cultivation were treated with the highest honour and respect. The causes for floods, droughts, epidemics, crop failures and sicknesses being not aware to the people, they condescended to accept them as a rage of an unseen god or demon and made supplications to them to safeguard them against such catastrophes.

During the last three or four decades, rice farmers have been using pesticides on their rice crops to control pests. However, a few farmers adopt only "kem" as a means of controlling 'rice pests'. They use kem since it is a natural and inexpensive method that minimizes cash expenses of farmers and hence it saves money while minimizing environmental pollution and the destruction of other organisms. Also

the natural enemies such as predators and parasites of rice pests are not affected by the use of kem. At present, due to escalation of prices of pesticides, there is a greater interest on kem methods to save the crops from pest damage.

In Sri Lankan indigenous agricultural knowledge and technology which has been used for millenniums is still very popular among farmers in remote and rural villages. The ancient farmers of Sri Lanka had a sound knowledge about the limitedness of natural resources. These ancient farmers used this knowledge to efficiently manage the limited resources in a way which will protect it for future generations. They also hastened to control the pests and weeds in an environmentally friendly way. Ancient Sri Lankan farmers used natural indigenous rituals for fertilizer and controlling pests. A specialty of these indigenous rituals was, they were free of environmental pollution and they were done using different techniques and things made from simple materials and supplies which they found in their surrounding environment.

Methods of repelling pests from farm lands- Biological Methods

There was no application of artificial manures or chemicals to control pests and weeds. The manure was green leaves such as, keppettiya, titta, (wild sunflower) etc., and in order to control insects and pests certain vines and leaves of the forests were crushed and mixed with water and sprinkled on the water ways and the fields. The pungent and strong aroma and the tastes of these, convulsed the insects and they left. There was no exterminating.

The paddy farmers portrayed a facile knowledge of the botanical species in their environment and identified a wide range of plants that they had used for pest control. *Diospyros affinin* (kaluwel), *Anamirta cocculus* (Tithtwel) and *Ananas comosus* (pineapple) are believed to control flies such as *Orceolia oryzae* (Gap Massa) and *Atherigona oryzae* (kanda Massa) *Euphorbia* (Daluk) is used by farmers to control *Tryporyza incertulu* (puruk panuwa).

The leaves of these plants are crushed and added at the point of impounding water (water body) for irrigating rest of the paddy. The

seeds of *Garyota urens* (kitul) are crushed and added to water at the field entry point to destroy paddy damaging worms.

The leaves of *Pongamia pinnata* (karadha) and *Crotalaria retusa* (keppitiya) are added to paddy soil to control rice pests. *Cycas circinalis* (Madu) *Cymbopogon citratus* are planted and hung around paddies; farmers believed these plants emitted odours that repels certain rice pests.

Again, to control rats, pieces of raw *Garica papaya* are spread in paddies. The farmers believe papaya has a chemical substance, causing tissue damage in rats mouths. Farmers world over, use wood ash, but those interviewed found *Cymbopogon nardus* plants particularly effective in controlling *Spodoptera mauritia* (Godawella)

And also another one of traditional technique that is used to repelling pest from farm lands is to make flower offering (Figure 1.) at the four corners of the field and light torches soaked with oil from seeds of Mee trees (*Maduca longifolia*). The scientific basis is that the torchers serve as light traps and burnt Mee oil has insect repellent properties. It is believed that this method very effectively traps moths, leafhoppers, and paddy bugs that damage the crops.

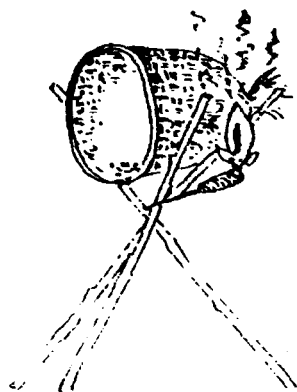


Figure1. 'Malpeġa' used for offering of flowers at the four corners of a rice field

(Source; *Some Indigenous Technology Knowledge And Practices For Watershed Management In Sri Lanka*, 1999)

Another traditional method involves the use of lump of 'perumcayam' inserted into 'Habarala' stalks and smoked to control armyworm damage in rice. The pungent smoke and the aromatic substances evolving from the smoke serve as pest repellents.

Light traps are traditionally used to control insect pests. (Figure 2.) These traps are set either early morning or in the evening to attract the insect pest. Rituals conducted by villagers are also timed to coincide with early morning or late in the evening where gathering of villagers carrying lighted torches attracts pest and destroy them (Herath, 1991; Upawansa, 1989).

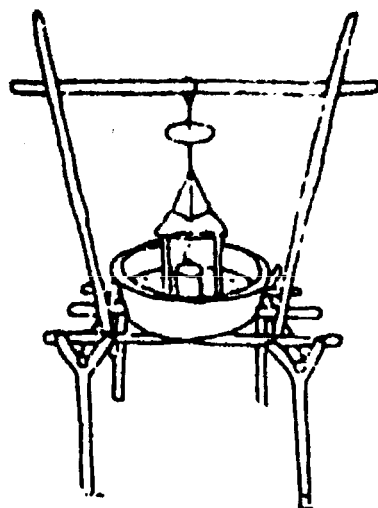


Figure 2. Light traps used by traditional villagers

(Source; *Some Indigenous Technology Knowledge And Practices For Watershed Management In Sri Lanka*, 1999)

These methods are very simple and have the advantage of being in harmony with nature and making use of material obtained locally. Often these methods are linked with religious ceremonies which compel the villagers to carry out the practice without postponement unlike the case of modern insecticide sprays (Herath, 1991). Most often practices are aimed at repelling the insect pest as opposed to destroying them completely. However, under large scale cultivation such methods are labour-intensive and may not be practicable. But they are ideally suited for small scale cultivation as practised in the traditional villagers.

Additionally there were other rituals called 'kema' such as 'dodam kema' and 'mande kema'. Another method of controlling the insects was to have a long strip of fields at the two extremities of the field called, 'kurulupaluwa' which was not harvested but allowed to be fed on by the birds, so that the birds will be ever present and would pick up flying or crawling insects in the fields.

Still another effective way of controlling insects was to prepare a good amount of milk rice and sprinkle them on the field prior to break of dawn and provide dried branches of trees (ipal) at convenient distances in the field for the birds to perch. The birds, while feeding of grains of milk rice, pick all insects too.

Mechanical methods of pests control (methods of scaring pests)

Through the use of Historical method and literature survey showed that there is a large body of traditional knowledge systems in pest and disease management in Sri Lanka particularly in relation to rice farming culture.

Water ghost (Diyaholmana)- Diyaholmana is a simple device that is powered by flowing water in rice fields to produce a sudden noise to scare animals and birds (Figure.3). It is made of two or three nodes of bamboo lengths. The nodes at the front end is open while the nodes that follow are closed with a slit on its side. The bamboo length is pivoted in such a way that it is balanced with the open node lifted up. Water from an upstream source is fed into the opening in the node. When the node is full it tilts forward emptying the water in it. As it is emptied the bamboo length over turns and returns to the original positions very

quickly and strikes a stone placed underneath to make a loud noise. This simple contraption works effectively to produce noise as long as there is flowing water. The noise is sufficient to scare away animals, particularly wild boars, porcupines and birds. The advantage of the device is its simplicity and ease of construction with material available in the locality. No external source of energy is required for operation. However, the use of this device is restricted to locations having flowing water.

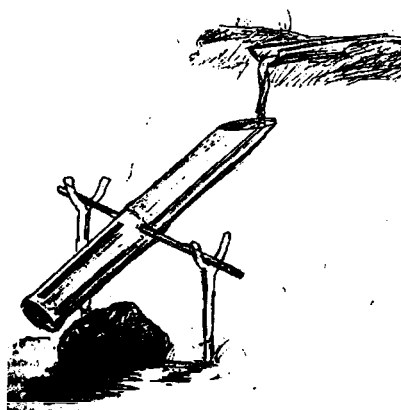


Figure 3. *Diyaholmana (water ghost) for scaring away wild animals*

(Source; *Some Indigenous Technology Knowledge And Practices For Watershed Management In Sri Lanka, 1999*)

Wind ghost- this technique also very similar to the water ghost, the wind ghost is made by suspending a dried palm leaf frond on a planted stick. The movement of the dry palm leaf with the wind makes a continuous noise depending on the direction of the wind and its blow. A modern improvisation of this technique involves stretching of strips of polyethylene along the field to make a noise sufficient to scare the animals. The buzzing produced is louder with stronger breeze. Stretching several discarded music cassette ribbon on wooden poles planted at the opposite boundaries of the field is another technique of scaring the birds. The cassette ribbon makes a very high pitched noise

with the wind that scare away the birds. Farmers also stretch a polyethylene sheet along the boundary fence of the cultivated field. Most vegetable and rice farmers use this method to reduce the damages by wild boars and rats. Fluttering of flags made of polyethylene is also used widely to scare animals.

The wind ghost is applicable under both highland and lowland conditions unlike the water ghost. It is very simple technique requiring minimum resources that are obtained from locally available discarded materials.

Tiger box (Takaporuwa-Kotipettha)- Siriweera, (1969) described a traditional mechanical devise made out of wood to scare animals and birds which damage crops. This is a simple ratchet mechanism designed from wood with handle. A gear wheel is carved into the handle and two wooden strips attached to a frame that is free to rotate around the handle serve as the ratchet. When the handle is swung around the wooden frame it makes the ratchet to slip over the gear wheel making a loud noise (Figure. 4).

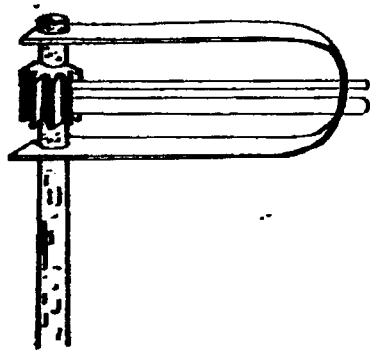


Figure 4. Taka poruwa (Tiger Box) used to scare away the birds

(Source; *Some Indigenous Technology Knowledge And Practices For Watershed Management In Sri Lanka*, 1999)

Mechanical methods of removing insects and pest In order to control the flying insects and pests during grain ripening, a latex exudate obtained from Jack trees is applied on the back of a 'Kulla'. This is dragged while touching the panicles twice a day. The flying insects get stuck on the sticky latex at the back of the kulla. (Siriweera, 1968) describes this same practice referring to the fly traps as 'Boku Kulla' on which sticky resins are applied barely touching the crops. Kahandagamage, (1995) reported several variation of the same practice.

Harvesting ritual - After the harvesting is done, the ritual held is called, 'Kiri itirima'. All the share croppers (pangukarayo) having collected rice from parade to the bund of the tank (wewa) and set up hut under a banyan tree (kirigahak). Inside the hut a stage (messa) is set up and a white clean cloth is laid over it. On the 'messa' 100 betel leaves, and 100 arecanuts are kept. Thereafter in three separate pots the fresh rice is cooked along with coconut milk and the 'kiribath' thus made is offered to the gods. Thereafter, the remaining kiribath is shared among those present. Thus the entire village having worked in unison, gets about their daily chores with no friction but based on the Buddhist four sublime states of Loving kindness (metta), compassion (karuna), blissful joy (muditha) and equanimity (upekkah).

Conclusion

Today, modern agricultural practices threaten the environment and mankind's sustenance in many ways. Among them are the use of toxic agriculture pesticides, pollution from the agricultural machines and toxics added to the environment. Our food being contaminated with toxic agricultural pesticides and weedicides is one of the many dangerous side-effects of these modern agricultural practices faced by mankind today. Therefore specifically, indigenous techniques, which are recognized as social assets of the farmers, make the farmers self-reliant due to non-dependency on market oriented inputs. Moreover, environmental friendliness of these techniques also provides alternative solutions to problems of ground water pollution, worsening of natural soil fertility, and loss of biodiversity. They are the main economic and

environmental concerns of modern rice farming techniques. There are also several social and cultural values of indigenous techniques, including the exchange of technological knowledge, labour, and inputs among the farmers that develop interrelationships among them, which cannot be seen in the practices of modern farming techniques. This study provides some important facts regarding pest controlling farming in Sri Lanka through the rituals in traditional farming systems (Kem Krama), Methods of repelling pests from farm lands- Biological Methods and Mechanical methods of pests control (methods of scaring pests). Today, the farmers in the main rice growing areas of the country, especially in Dry Zone face a problem when rice farming with modern farming techniques. Recent reports by the various findings of scholars and authorities discovered that the chronic kidney, cancer, and diabetes issues in these rice growing area are the results of long term use of agrochemicals by the farmers. In this situation, this study provides important information concerning an alternative sustainable farming system to modern agricultural farming system especially in rice cultivation. This study provides necessary information to the farmers by encouraging continuing rice farming with traditional practices, without depending on expensive and harmful modern inputs.

However one of the main concerns of indigenous farmers was the relatively low yield from harvesting. It is evident that modern science-based rice farming techniques have mainly focused the yields by applying different combinations and types of chemical inputs, establishing a farming system in the dry zone regions. In contrast, this study confirmed the potential benefits of indigenous farming rather than modern farming techniques, demonstrating that they can record relatively high yields and healthy products from agricultural fields.

In this research study it is presented some of indigenous practices and knowledge systems that have survived the passage of time to date. However, today degradation and depletion of natural resources has reached alarming levels threatening the very survival of mankind. Hopefully, these knowledge systems and practices compiled in here, many of which are still valid in today's context, can help in conservation and management of these limited natural resources.

Recomandation

Through this study it can be makes following positive recommendations for further enhance traditional technology for agricultural farming throughout the Sri Lankan farming system. Because there are very limited farmers who have adequate knowledge of the indigenous techniques related to the agricultural farming. Therefore, it is important to identify and establish an indigenous knowledge techniques that available in the agricultural arena in Sri Lankan traditional farming context with the support of the traditional farmers, relevant research institutions, and volunteer organization. It is an important thing to make research investments and policy changes that emphasize development of pesticides and application technologies that pose reduced health risks and are compatible with ecologically based pest management. And also promote scientific and social initiatives to make development and use of alternatives to pesticides more competitive in a wide variety of managed and natural ecosystems.

Environmental friendly traditional farming techniques for healthy agricultural productivity at present is not adequate from agricultural sector. Hence indigenous technologies and strategies such as pest controlling methods through the 'Kem Krama', 'biological' and 'mechanical' (E.g.; Diyaholmana, wind ghost) should have further introduced and strengthened to achieve the expectation of rural farm families in the area.

Awareness programs and training programs should be conducted to introduce traditional technologies with demonstration on regular basis. Awareness programs along are not sufficient to change the attitudes of farmers towards the indigenous technologies as we expected. Therefore attention should be given to motivate farmers through the demonstration programs. For example farmers do not well known how to implement and functioning the traditional pest controlling methods. Hence practical knowledge is essential to make these programs a success. Then farmers should be able to visit and get practical knowledge and experience through already practicing indigenous farming methods in the Dry Zone agricultural lands under the guidance of Department of Agriculture. Therefore at the end of awareness

program field programs should be organized to visit such important places where indigenous technologies implemented in the area.

Positive thinking on indigenous farming method also must be further built up among farm families to motivate them for traditional farming patterns to have healthy food products and income from their harvesting.

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