INDIGENOUS THE PEST THE DRY ZONE

Introduction

After the introduction of High Yielding Varieties (HYV), crop damage by pest has become a very serious problem in the paddy producing sector of Sri Lanka.. Consequently, the use of chemical pesticide has become inevitable. Now, Sri Lanka is one of the major pesticide users in Asia. However, there is a growing recognition that the heavy use of pesticide bring ill-environmental effects, and also the escalating price of pesticides adversely affect the farmers income. Therefore, there is a need to look for alternatives to these conventional pesticides. In this case, it is advisable to explore the indigenous knowledge of pest control because the traditional pest control methods which have been used for centuries are time-tested, ecologically sound, economically viable, and therefore they have greater potential for sustainability. This study is an attempt to explore the indigenous knowledge of pest control with respect to the paddy cultivation in Sri Lanka.

Traditional pest control methods which have been used for centuries are time-tested, ecologically sound, economically viable, and therefore they have greater potential for sustainability.

APPROACH TO MANAGEMENT HAZARDS IN OF SRI LANKA

ROHANA ULLUWISHEWA
Associate Professor
Sri Lanka Resource Centre for Indigenous Knowledge (SLARCIK)
Department of Geography
University of Sri Jayewardenepura

Methodology

The methodology adopted to collect data for this study involved discussions with old aged farmers, group discussions, interviews with key informants, and direct observation. Informants were selected from Ratnapura, Badulla and Hambantota districts in consultation with field officers of the Department of Agriculture. Published data was also used on supplementary basis.

Results and Discussion

Indigenous knowledge is a sum of experience and knowledge of a given ethnic group that forms the basis for decision-making in the face of familiar and unfamiliar problems and challenges (Warren, 1988). In the face of the pest problem, the traditional paddy farmers made decisions on the basis of the knowledge and experience which were brought down from generation to generation over centuries. They used various botanical, biological, and mechanical pest control methods which were developed on the basis of the indigenous knowledge. They were aware of a wide range of plant species with pesticide effects, and animal species which predate on harmful insects. They were also aware of various materials and devices which could be used to trap, chase or destroy the pests or to keep the pests away from the crops. Besides, they performed some religious ceremonies to protect their crops from pests. Although these practices are purely religious, close observations reveal that they have some practical values. It has been evident that some of these religious ceremonies have botanical, biological or mechanical pest control effects. All the indigenous pest control methods can be categorized as (1) botanical methods, (2) biological methods, and (3) mechanical methods.

Botanical Pest Control Methods

Many plants have a natural protective mechanism which assists them in resisting and repelling pests. Some plant species produce substances which repel or poison the insects. The traditional paddy farmers possess a sound knowledge about such species. They identify a wide range of plant species which can be used effectively to control pests. Most of these plant species are naturally grown in jungles and scrublands on communal lands. They use various products of these plants i.e. fruits, leaves, bark, seeds etc., in various ways to control pests. They identify which parts of the plants contain substances which have repelling and poisoning effects. In some cases, leaves or barks are used, in some other cases fruits or seeds are used. While such vegetative matter of some species are

incorporated into paddy soils,Some are added to the standing water in paddy fields. In some cases, they hang leaves or twigs of some plant species around the affected paddy fields to control pests.

Among the species which are added to the standing water of the paddy fields to control pests, *Derris scandens* (Kaluwel) *Lycopersicon esculentum* (Tiththawel), Pineapple leaves and *Euphobia antiquorum* (Daluk) are common. These vegetative matter are chopped crushed and placed at the point of impounding water (*wakkada*) so that their poisonous substances spread everywhere in *liyadde*. While the first three species are believed to be effective in controlling the flies such as *Orceolia oryzae* (Gop Massa) and *Atherigona exigua* (Kanda Massa), the last is believed to be effective in controlling *Tryporisa insertulas* (Puruk Panuwa). Furthermore, to control a certain kind of pest (Madarilla), *Derris uliginosa* (makkala wel) and *Entada phaseoloydes* (Pus wel) are kept on the point of impounding water (*wakkada*) and crushed. The farmers believe the seeds of *Garayota urents* (Kitul) has pesticide effect. They crush the seed of this species and add it to the impounded water in the field to control pests. The plant called 'Mahapatta' is used in the same way to control hoppers. To destroy worms which cause damage to the paddy plants, leaves of *Cinnamomum campohora* (Karadha) are underearthned at the time of land preparation. It is widely believed that the *Cinnamomum campohora* (Karadha) leaves develop some poisonous effect to worms. In some cases, dried leaves of *Croton laciferus* (Keppitiya) are added to the paddy soil to control pests.

Figure 1: Owls control rats in paddy fields.

The traditional farmers identify some plant species which have a repelling smell. *Cycas circinalis* (Madu) and *Cymbopogon citratus* (Seru) are examples in this regard. They believe that the *Cycas circinalis* (Madu) flower generates a repelling smell, and therefore they plant *Cycas circinalis* (Madu) trees near the paddy fields. In some cases, *Cycas circinalis* (Madu) flowers are cut into pieces and joined to sticks which are planted in the paddy fields. Branches of *Cymbopogon citratus* (Seru) which generate a repelling smell are hung in and around the field. They also believe that insects dislike yellow colour flowers,and therefore such plants are planted around and near the field to repel the insects. Although its effect is not clear, it is worthwhile to mention that some farmers hang *Areca catechu* (arecanut) flowers and young *Cocus nucifera* (coconut) leaves on ropes used to demarcate the insect affected area.

Damage to the harvest by rats is a serious problem during the ripening period. To control rats, raw papaya is chopped, and pieces are spread in the paddy fields. It is believed that the raw *Carica papaya* (papaya) has a chemical substance which causes wounds in rats mouth when they eat it. When rats eat the pieces of raw papaya., their mouth gets wounded so that they cannot eat paddy any more. Farmers can harvest the paddy yield before the rats wounds are recovered. Wood ash is popularly used by traditional farmers to control a wide range of pest species. In this case ash is put into a clothe bag, and it is tied to the end of a long stick. Then the ash bag is held over the crop and ash is sprinkled on the crop by beating the stick with another. The farmers believe that the ash of cymbopogonnardus plants are particularly effective in controlling *Spodoptera mauretia* (Godawella). To protect the field from the wild boar, some farmers crush *Coleus amboinicus* (Kapparawalliya) leaves and keep them around the field. It is believed that the wild bores do not approach the field due to the strong smell spread from the crushed Kappara leaves.

Biological Pest Control Methods

The farmers identify a large number of vertebrates, reptiles, birds and mammals predating on pests. They, therefore, protect the habitat required for these beneficial species. Birds are the major biological agents which traditional farmers use for pest control. They have developed various methods to attract birds which feed on harmful insects to attract such beneficial birds to the field, places are provided for the birds to perch in the field. In this case, either coconut fronds larger ends up or sticks joined to the coconut husks are planted so that the birds can perch on them. It is believed that these methods attract owls which feed on rats (Figure 1). Supply of food for birds is another method to attract the benefical birds to the field. For instance, to attract the bird called 'Seven Sisters' (Demalichcha), coconut refuse is crushed and spread in each corner of the paddy field. This bird would come to feed on the crushed coconut and at the same time would eat paddy hugs and worms that happen to be living around. They also protect the habitat required for these beneficial species. Big trees are allowed to grow in and around the paddy fields to provide nesting places and safe breeding grounds for the beneficial birds.

Apart from these devices, it has been found that some religious practices that they perform to protect their crops from pests, also attract such beneficial species to the field. A few examples are given below.

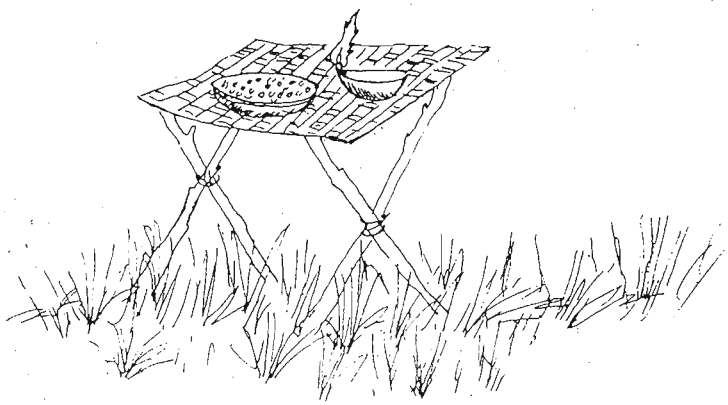


Figure 2: Offering to local deities has practical values.

(1) Offering to local deities : The offering consists of a mixture of roased pulse, food, flowers, and lighted oil lamps. While the roasted pulses and food attract birds, the lighted oil lamps attract insects (Figure 2). Then birds feed on insects, reducing the insect population.

(2) Offerings of food and lighted oil lamps are placed on unstable plantain disk fitted to a stake (Figure 3). When the birds attracted by the food and light attempt to perch on the plantain disk, the food falls. Then when the birds go after the fallen food, they find caterpillars, and eat them.

(3) To control worms which eat paddy leaves, the farmers boil a pot of milk before the sun rise, and milk-rice is prepared. Then the milk-rice is spread in the affected part of the paddy field. The birds which come to the field to eat milk-rice, tend to eat the harmful worms too.

The traditional farmers recognize the *Ptyas mucosus* (rat snake) which feed on rats as a beneficial creature. In fact, the farmers welcome the snake as it comes into the fields at grain ripening time to feed on rats and mice. It has been estimated that a single rat snake can consume over twenty rodents per month (Senanayake, 1983). This snake has been deemed as one of the most important biological control agent of the small mammalian pests of paddy farmers. The snake which is non-venomous is always left unharmed by the farmers, and

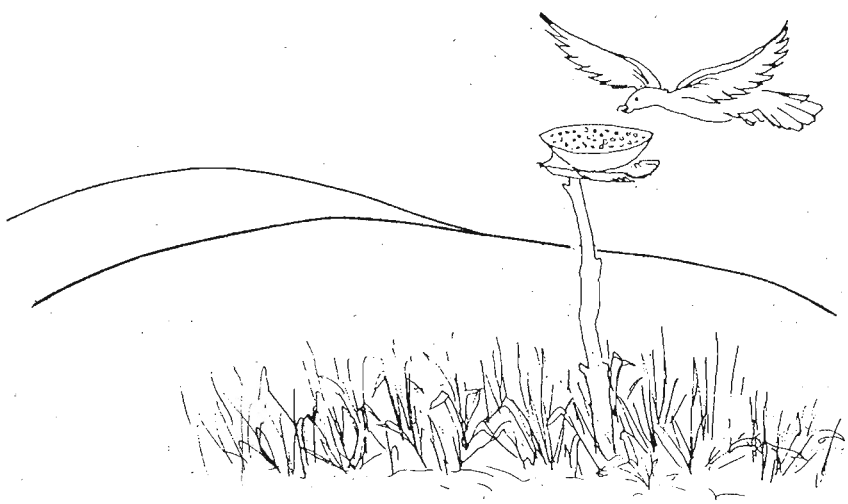


Figure 3: Offering attract beneficial birds.

also they maintain the habitat required for breeding of this snake. The rat snake is incapable of breeding or maintaining its population in paddy fields and open areas. It requires a wooded habitat or dense thicket to serve as a safe nursery area for the juveniles. Such a habitat is found around the pool which was maintained at the end of paddy tract where the water drained from the paddy tract was accumulated. This same habitat is used by the lizard *Varanus salvator* which feed on the fresh water crabs that weaken and destroy the bunds of the paddy fields.

The farmers encourage the growth of aquatic fauna in paddy fields. Paddy fields are normally kept flooded during the early stage of the growing season, and this practice provides a habitat required for a large number of fish species. The pool that farmers maintain at the end of the paddy tract contains water throughout the dry season and it contributes to the continuous existence of fish in the paddy fields. As the paddy fields dry out completely during the harvest season, majorityof the aquatic fauna in the paddy fields die out. At the onset of the rains the fish in the pool migrate upto the newly formed streams to breed. The juvenile fish quickly colonize all the paddy fields and grow to adulthood during the paddy growing period. The insectivorous fish species act as a biological agent control pests. Speiders are also allowed to survive in the paddy fields so that spiders would catch insects into their webs. The farmers also encourage the growth of frog population in the paddy fields since they feed on a wide range of harmful insects. It is said that some farmers catch frogs when they happen to find them elswhere, and throw the caught frogs to the paddy fields. The farmers consider Order passeriformes (Wehi Lihiniya) as another beneficial species because it feed on *Nilapawata lugens* (Keedewa) which cause serious damages to the paddy plant. When the farmers notice that these birds are in their paddy fields, they keep away from the paddy fields to allow the birds to feed on the pest without any disturbances.

Mechanical Pest Control Methods

Food traps and light traps are major mechanical methods which are popularly used to control pests. Rodents which damage paddy are controlled by the use of food traps, while insect pests are caught in light traps (Widanapathirana, 1983). In the case of light traps, a bright light is used to attract insects to a certain point where they can be trapped. A light trap consists of an oil lamp which is hung on a container of water, placed out in the field (Figure 4). In the night insects attracted by the light get trapped in water surrounding the oil lamp. The farmers set light traps in various ways to control harmful insects. Some of these methods are as follows:

(1) A oil lamp is hung upon a lower point in the field which is filled with water. The insects attracted by the light get trapped in water under the lamp.

(2) A oil lamp is kept in a big pot with a lot of holes on it, and the pot

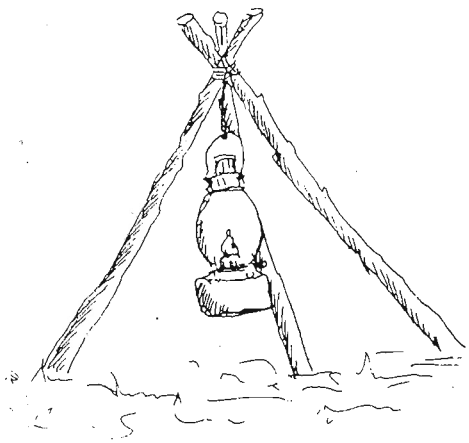


Figure 4

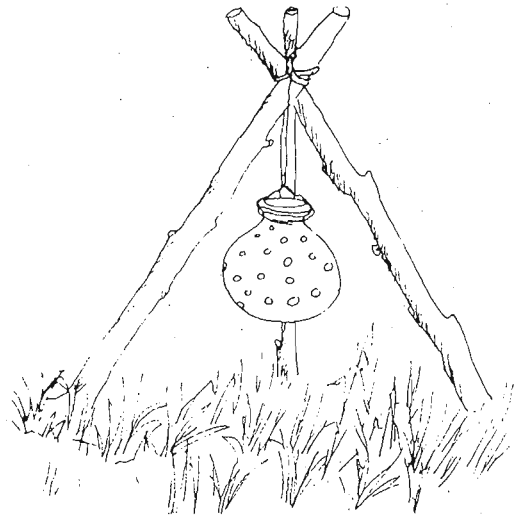


Figure 5

Insects attracted by the light get trapped.

is hung somewhere in the field. The rays of light which spread from the holes attract the insects into the pot where they eventually get trapped (Figure 5).

(3) Oil lamps are kept around the field, and the insects resting on paddy are chased by dragging a long rope across the field. The insects which rise into the dark are attracted by the light and get destroyed.

(4) The litter around the field are collected and burned at night. The light of the burning litter attract the insects and destroy them, and also it clears the breeding grounds of the insects.

Lighting oil lamps has a religious significance too. The vilages offer oil lamps in the shrine of the temple and around the sacred Bo tree. In the same way, when their paddy harvest is threatened by pests, they light oil lamps in and around the affected area of the paddy field in the night, and pray. In this case, Mee oil, oil extracted from the seeds of Mee tree *(Madhuca longifolia)* and wicks made of saffron robes are traditional used to light the oil lamp. In some cases, a flame which is made by tying up pieces of saffron robes soaked in Mee oil is lighted in the affected area. In both cases, the use of saffron robes accentuates the religious background of these practices, However, these practices are said to be effective in controlling insects. It seems that the bright light of the oil lamp and the flame attract the insects and destroy them.

They also use a very sticky substance derived from *Artocarpus heterophyllus* (Jak) to destroy some harmful insects. To control flies, they apply this sticky substance on the winnowing fan and it is dragged along on the crop so that flies get stuck on it. This has to be done twice a day every morning and evening during the grain ripening period. It is, therefore highly time consuming, and not practical in the case of large fields. In such cases, a long rope impregnated with the sticky substance is dragged across the field so that hugs in the field get stuck to it (Figure 6). The same substance is applied on sticks which are planted in the field to get flies stuck on them. The farmers are also in the habit of causing physical disturbances to chase the harmful insects. To chase flies, they brush the standing crop with a rough large broom made of bamboo tops or strong twigs. In some cases, to chase flies, a long bamboo is drawn across the field by two persons who walk on both sides of the field. The farmers are very much affiliated to the village temple, and they believe that the sand collected from the base of the sacred Bo tree in the temple is effective in controlling insects. So, they throw such sand at the crop and control insects. The truth behind this may be different. When sand is thrown hard at the crops, insects may fall into the water and die.

The traditional farmers have developed various devices which provide frightening sounds to chase harmful animals. While some of these devices are operated by the power of blowing wind, some are operated by the power of flowing water. For example, the Water Ghost (Sulang holmana) is operated by the blowing wind, the

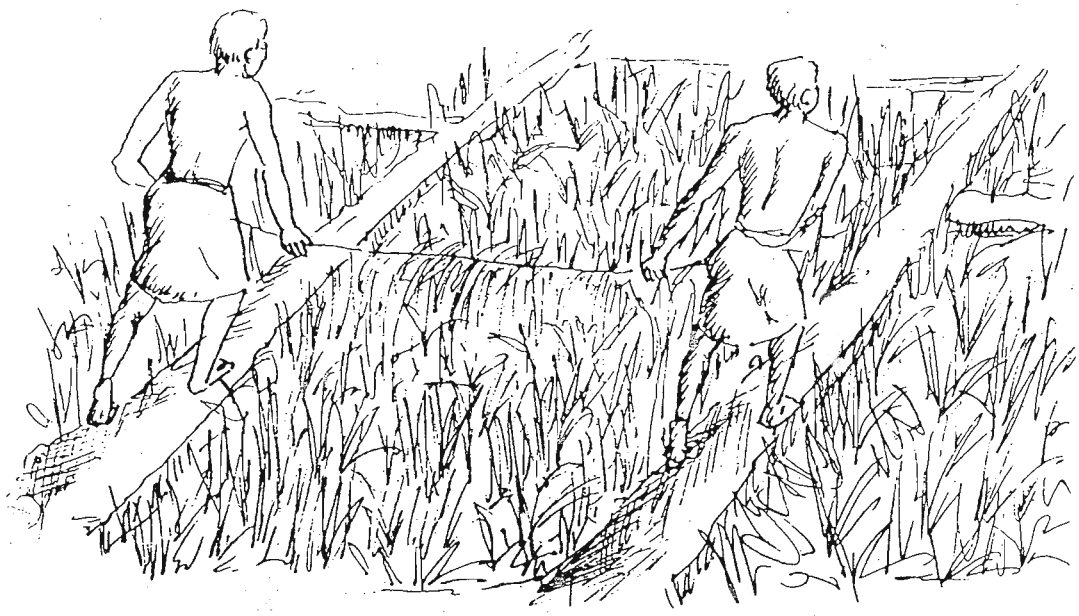


Figure 6: Controling hugs by dragging a rope impregnated with a sticky substance.

Wind Ghost (Diya holmana) is operated by flowing water (Figure 7). Both provide an intermittent beat that scares rat and birds. To frigthten hamful birds and rats, the farmers keep puppets or scarecrows on the field. While some puppets are given human appearance, some puppets are given the appearance of the natural enemies of some pests. For example, cat-like puppets are kept in the field during the grain ripening period to frighten and chase rats. To chase wild boars, some specific methods are adopted. One of these methods is to draw a twine rubbed with sulphar around the farm. It is believed that sulphar generates a repelling smell which keeps the wild boars away from the farm. In some cases, a black twine is drawn around the farm. It is said that the boar refrains from entering the farm fearing it to be a death trap. In the same way, to keep rats away from the field, pineapple leaves are kept around the field. The farmers believe that the rats see the pineapple leaves like snakes which feed on rats, and therefore they refrain from entering the farm. The farmers also often walk through their fields in order to observe the insects in their fields, and to chase other harmful animals.

Indigenous Approach and Sustainability

The indigenous methods of pest control which have so far been discussed, had been in use over thousands of years and have proven their efficiency. The long existence of these methods itself prove their validity. Even today, some old aged farmers are quite confident in the effectiveness of these traditional methods. It is evident that most of these methods are in consistence with the natural ecological processes. For instance, while some methods make use of natural enemies of pests some methods make use of the repelling effects which have naturally developed in certain plant species. In contrast to the modern chemical pesticides, the traditional methods do not generate poisonous substances. Therefore, use of traditional pest control methods keep the environmental pollution at the minimum level. For all these traditional methods, locally available materials are used. Most of the herbs which are used for pest control are locally available within the village. Hence, these methods do not involve any cost, and therefore they are economically viable. All these characteristics inherent in traditional pest control methods contribute to the sustainability.

It is evident that although the traditional methods of pest control were efficient to control pest in the past when old rice varieties were planted, they are inadequate to deal with present pest problem because now almost all paddy farmers plant HYVs which are highly vulnerable to pests. Therefore only the chemical treatment can control the present pest problem. The modern chemical pest control methods are effec-

Figure 7: Water Ghost.

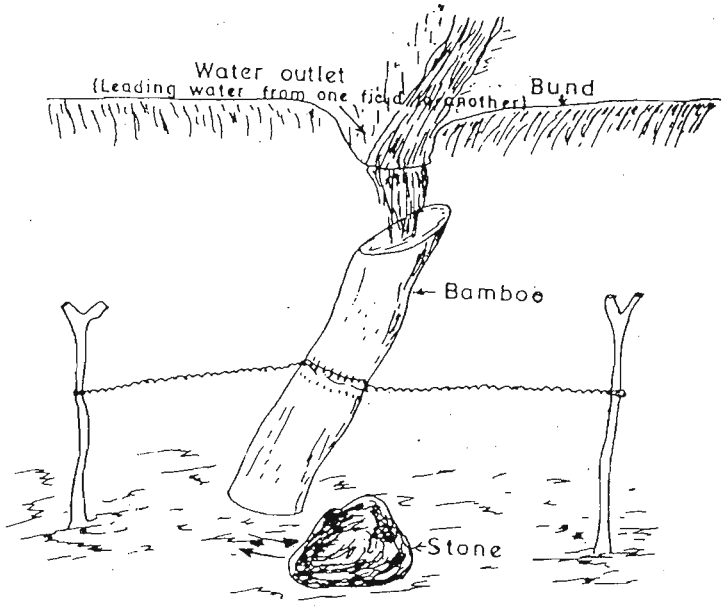
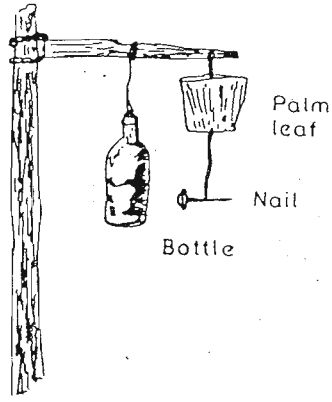


Figure 8: Wind Ghost.



tive but ecologically disastrous. On the other hand, the traditional methods of pest control are ecologically sound but less effective under present circumstances. Therefore, some sort of combination of modern and traditional methods of pest control may lead to an effective and ecologically sound alternative. Integrating new technology into indigenous knowledge would increase the effectiveness of the latter. For instance, modern technology, i.e. machinery and sprayers, could be used to process and spray the traditional botanical pesticides in a better way. In the same way, modern technology could be used to promote the efficiency of traditional mechanical and biological methods of pest control.

Conclusion

The indigenous knowledge which has been brought down from generation to generation has now reached to its end because it is now suppressed by the modern scientific knowledge. The present young generation who are already accustomed to the modern technology are not prepared to carry the indigenous knowledge to hand over to the next generation. Therefore, in view of its value with respect to the sustainability of the farming systems, immediate steps should be taken to collect, document and to preserve the indigenous knowledge relating to all aspects of farming. Such steps will permit to use the traditional wisdom to establish sustainable farming systems.

Acknowledgements

The author wishes to thank Mr. S. Rajapakse and Mr. Rodrigo Seneviratne who have helped with the data collection.

The modern chemical pest control methods are effective but ecologically disastrous. On the other hand, the traditional methods of pest control are ecologically sound but less effective under present circumstances. Therefore, some sort of combination of modern and traditional methods of pest control may lead to an effective and ecologically sound alternative.

References

Senanayake, R. (1983). The ecological, energetic and agronomic systmes of ancient and modern Sri Lanka. *The Ecologist.* **13**(4).

Warren, M.D. (1988). *Indigenous Knowledge for Sustainable Agriculture and Rural Development.* IIED, London.

Widanapathirana, A.S. (1983). Mechanical and cultural methods of pest control. *Economic Review.* January, People's Bank Colombo.