

## Building climate change adaptation strategies of agriculture through forecasting weather patterns with behavior of animals: a study based on the village of Ralapanawagama, Anuradhapura district in Sri Lanka

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### Abstract

It is obvious that Sri Lanka experiences remarkable climatic variations under global climate change. The greater impact of climatic variation is on agriculture, water resources and the people who involve in the agricultural activities. Agricultural land use agricultural production and survival of the peasant community will be the focal point of concern in the future agricultural development efforts. There are so many research undertaken on climate variation and impact on agriculture but the adaptations has been out of concerns. Most adaptations are modern technologies that are problematic in many ways. Sri Lankan peasant community have so many traditional views, attitude, concepts, knowledge and customs related to agricultural activities. Their scientific significant and effectiveness have not been adequately subject to study. This study attempts to fill this research gaps. According to the ongoing climatic variations it apparent that by 2025 this kinds of strategy would be very essential in the Sri Lankan context.

**Keywords:** climatic variation, adaptation, agricultural activities

### 1. Introduction

Climate change is a natural phenomena that people are not able to control. But there is a possibility of mitigating its impacts adopting suitable strategies. In mitigating impacts modern techniques are too much problematic, and inappropriate.

Most of the modern technical solutions taken to minimize issues arisen from current climate changes have been failed to follow sustainable initiatives. It has created more social and environmental complexities. For example, new plant varieties can sustain with less water and a solution to water scarcity created by climate change. But in long term, new varieties have many problems. Similarly although the modern technology is capable of create an artificial agriculture environment in greenhouses by altering the original agricultural environment, the issues created by it is high. Chemical fertilizers used for cultivation is ever increasing. The modern society faced with many issues created by it. As a side effect of this number of people in the dry zone in Sri Lanka are suffering from various illnesses due to high consumption of chemical fertilizers. In addition to Sri Lanka, other third world countries as well as developed countries too are experiencing dangerous consequences of modern technology. Drought, floods and insect epidemics that can not to control by farmers have created problems in a new form. Accordingly, current technical initiatives have paved the way for questionable situations.

On the other hand, the other issue faced by today's farmers is the inability of proper agro- meteorological forecasting. Sri Lanka does not have facilities and expertise to forecast agro – meteorological status in agro-ecological zones. Also, it is an issue how practical is it to catch rapidly changing environment conditions in these areas. Capturing changes is not an easy task since Sri Lanka is a tropical country with many agricultural zones.

The traditional knowledge is thing that farmers practiced through years of experience, living with the nature. It is not harmful to the nature. The prime aim of it is to enhance the feasibility of win over the nature while live in harmony with the changes in the environment. However, today the traditional knowledge is overpowered with modern scientific knowledge. There is lack of interest among the young generation to take forward the traditional know-how due to the popularity of modern technology.

Sri Lanka had so many traditional adaptations applied in the agricultural activities. However, most of them are not popular or not have been given attention of the future planners. Therefore under present day climatic variation these indigenous methods have a significance that should be taken into consideration, when future planning of agriculture development strategies are made. But in the Sri Lankan context, indigenous methods used by people in this field have been focused less attention. Instead mega projects and modern techniques are used. On the other hand the scientific relevance of indigenous adaptation is needed to be emphasized when such strategies are formulated. In this context it is very important to identify three aspects one, what are the traditional adaptations assist in relation to climatic variation in the Agricultural sector in relevant area, two how their scientific relevance and three, the fact that whether there is a possibility of developing such adaptive techniques an the field of Agro climatology

### 2. Theoretical Framework

The influence of a climate in agriculture sector is altered by a change in the climate state and has indicate impacts on physical and social systems. The outcomes can be complex, resulting from direct and indirect effects of several climate and non-climate factors. The level of impact is modulated by the

adaptation strategies. Here is more valuable Indigenous adaptation strategies, most of their adaptation result of interrelationship with environment. Indigenous Adaptation to Climatic Variation in Relation to Agriculture Activity is a

function of their knowledge, experiences, degree of exposure environmental indicators, sensitivity of the system, and the capacity for adaptation (Figure 01).

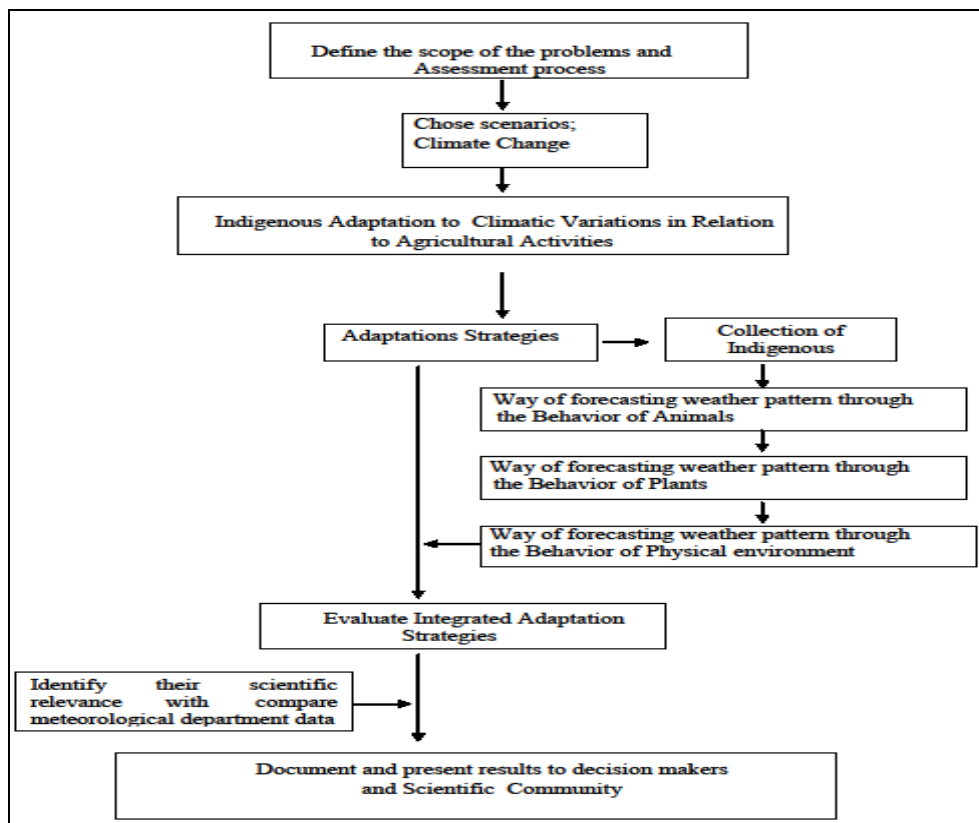


Fig 1: Conceptual framework

### 3. Methodology

#### 3.1 Study area

The study areas were, Anuradapura district and Monaragala districts, In Anuradhapura *Ralapanawagama* village (8<sup>0</sup> 05' 30.72" N, 80<sup>0</sup> 08' 05.07" E) was selected in the Dry zone. This village climate is typical of that of the Dry zone of Sri Lanka which receives less than 1400 mm average rainfall during whole of the year (Figure 01)

#### 3.2 Objective

In this research main objective is to prepare indigenous adaptation methods use by the farmers to identify Climate Variation in Anuradhapura and Monaragala districts.

#### 3.3 Hypothesis

In accordance with the research objectives following hypothesis are formulated to be tested.

1. Indigenous knowledge and customs practiced in agricultural systems of Dry Zone of Sri Lanka have a significant reality.
2. Indigenous knowledge and customs practiced in agricultural systems of Dry Zone of Sri Lanka have not significant reality.
3. Such practices can be develop as future agricultural strategies.
4. Such practices can not be develop as future agricultural strategies.

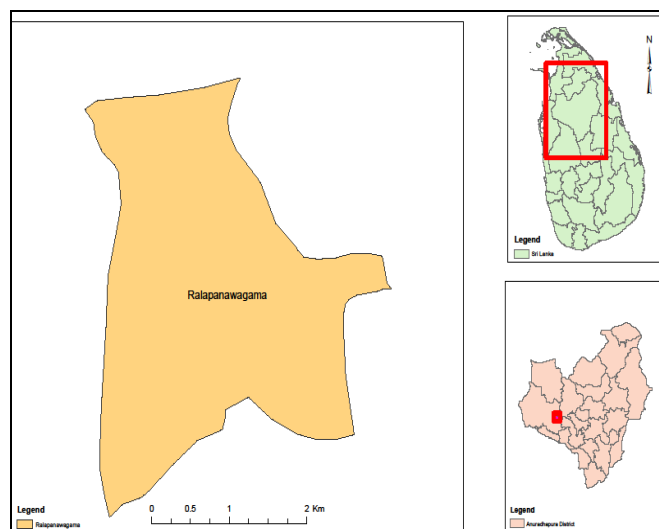


Fig 2: Study Area in Anuradhapura District

#### 3.4 Selection of Sample

According to snow balling method, firstly, visited the field and met the Grama Niladhari of the area and explained to him about this aim of this study. Then met people in the area who are with experience and can understand weather patterns based on the changes in the environment. In the exercise according to the sample method, information was taken from each person and with the guidance of the Grama Niladhari 50

people were selected in respectively both villages. Priority was given to the elders with many years of experience.

### 3.5 Analysis of Data

Four methods were used to analysis data. Based in the data collected on the field how they adapt to the changes in the climate were directly noted while preparing a document categorizing the factors that helps to forecast the weather as through the behavior of animals, changes in the trees and plants and changes in the physical environment. A quality initiative was built for the data analysis through sketches according to the information given by them adaptation according to the changes in the environment. Secondly, to analysis qualitative data mainly consist event history of the farmer's in the study areas. Thirdly according to farmer's view, to measure the scientific relative of indigenous adaptation, basically their adaptation strategies were compare with the annual

meteorological station data where they are so closed and instant of that the historical newspaper article found to prove the statement according the historical experiences

### 4. Results

#### Ways to forecast weather patterns through the behavior of animals in Anuradhapura district Freshwater Crab (*Pastilla dacuna*)

Many old farmers have shared their experiences about how freshwater crabs were able to forecast weather changes through its behavior. Freshwater crabs live close to wet areas, thus it respond to rain more than other climate changes. Humidity depends on the gauge of rainfall. Freshwater crab's behavior provides a successful forecast about the rain. During long drought seasons the crab lives in a hole dug deep inside. When the rain season stars the crab dig the earth in a U shape and come out from a different place (Figure 03).

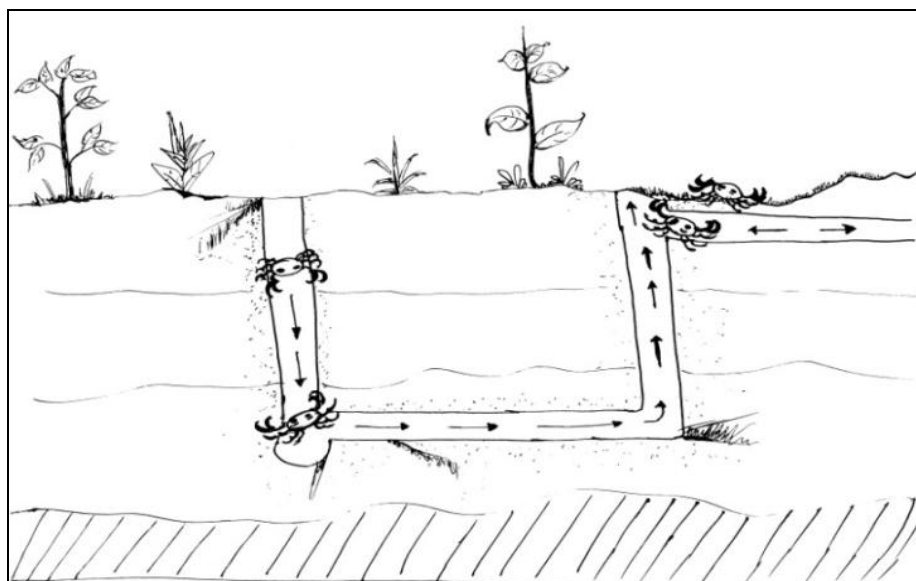


Fig 3

The route the crab is taking to come out is very important to farmers when gauging the amount of rainfall. Much rain cannot be expected if it comes to the surface of the earth. But if it stops within 3 or 4 inches inside the earth then the rainfall will be heavy. Farmers say when a normal weather pattern prevails, the crab dug five or six inches inside the earth and heading through a horizontal direction. This is one of the most accurate forecasts. Because since the crab is very sensitive towards humidity if it's position is closer to the surface of the earth, or if it digs deep inside the earth or if it positioned horizontal to the earth clearly shows the close connectivity between the humidity and the environment.

#### Large – billed Crow (*Corvus Levaillantii*)

Farmers can successfully forecast upcoming weather patterns according to the number eggs at the crow nest. Villagers say if there are eggs more than two then the rainfall will be heavy. Since it is dangerous to peep into the crow nest to count the

number of eggs, what people do is to inspect the fallen eggshells near the nest (Figure 04). This way one can have an idea about the rain.

*Speaking on this Secretary to the Farmers' Association in the area Mr. Athauda Hettigoda said that what in fact happens here is not the crow laying more eggs. It is the increase in the number of Asian Koel (Eudynamys Scolopaceus) who migrate from North to South due to cold. Koels come with the help of Northeast wind. When the wind is powerful they come in large numbers to Sri Lanka (Figure 05). Normally Koels migrate in April but if you spot them during March that means a heavy rainfall can be expected. Similarly, when the winter is severe in the North the number of birds who migrate to South is high. Koels lay their eggs in the crow nest and crows drop these eggs from their nests. So, even if people think these eggs belong to crows they are actually Koels' eggs. But their predication is 100 percent accurate.*

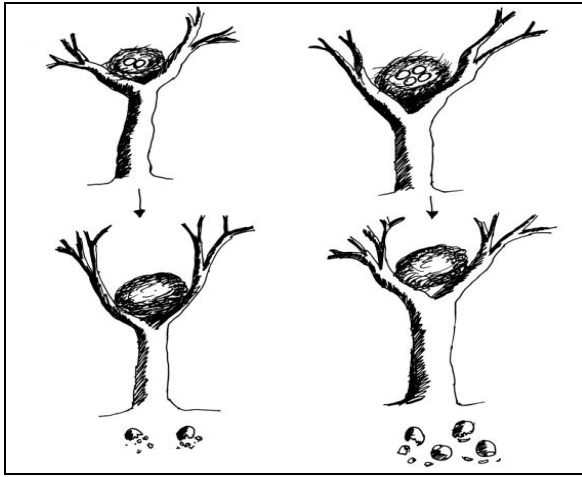


Fig 4

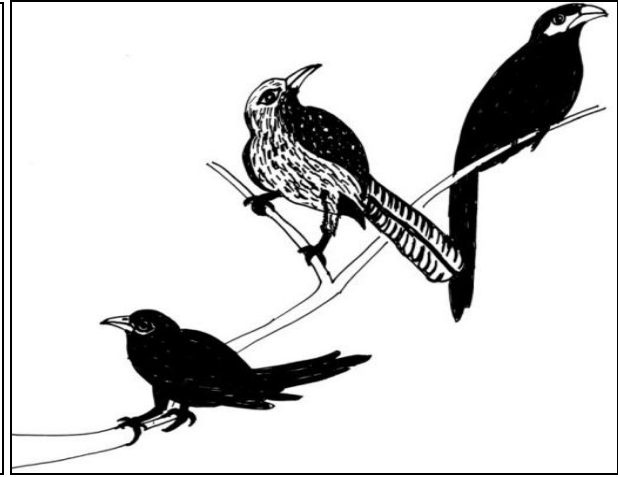


Fig 5

**Baya Weaver (*Ploceus Philippinus*)**

Baya Weaver is a bird who is very sensitive to the rain. According to the farmers in the area who has so many years of experience, behavior of this bird is very useful to forecast the rain. They are best known for their hanging retort shaped nests woven beautifully from leaves it is amazing to see how it select the most suitable place to build its nest, the right direction, entrance to the nest etc. It knows the humidity of its nest depends on the humidity of the atmosphere and the humidity of the atmosphere is decided by the gauge of the rainfall. Hence their nests are often built near water or hanging over water. If it has built its nest at the top of a tree closer to a

water source then it means a heavy rainy season is near (Figure 06(a)). During that period the humidity in the atmosphere is high. If the nest is built in a middle level then a normal volume of rain can be expected (Figure 06(b)). If it is a dry season then the humidity is low and then nests will be built very closer to water to maintain humidity (Figure 06(c)). If it builds nests in bushes or near a quagmire instead of tall tree that means certainly a drought season is ahead. Baya Weaver always build its nest and place its entrance opposite to the wind direction. This makes very easy for the farmer to know the direction of the wind.



Fig 6: (a)



Fig 6: (b)



Fig 6: (c)

**Red-wattled Lawping (*Vanellus Indicus*)**

According to villagers Red-wattled Lawping is also sensitive to rain. A major part of the bird's life spent in wetlands. It chooses the closest wetland to breed. But if it lays eggs far away from a wetland that means an unexpected rainy season is ahead. Also, if it had laid eggs near a lake or a stream that means a dry season is on the way. If it had laid eggs far away from a lake then it suggests a heavy rainfall. Farmers who study the behavior of Red-wattled Lawping closely plan their cultivations accordingly in the upcoming harvesting season.

**Hollow-snouted Shrub Frog (*Pseudophilautus cavirostris*) Kelaart's Dwarf Toad (*Adenomus kelaartii*) and Greater**

**Coucal (*Centropus Sinnensis*)**

According to the farmers if a Hollow-snouted Shrub Frog (*Pseudophilautus Cavirostris*), or a Kelaart's Dwarf Toad (*Adenomus Kelaartii*) or a Greater Coucal (*Centropus Sinnensis*) reside near a green shrub during the dry season then there will be a very refreshing water stream nearby (Figure 07).

**Greater Coucal (*Centropus Sinnensis*)**

According to most of the elders in the area if this bird is crying throughout the morning it is certain to rain in the evening or at night (Figure 08). Farmers can predict about the strength of the rain depending on the variation of this bird's cry.

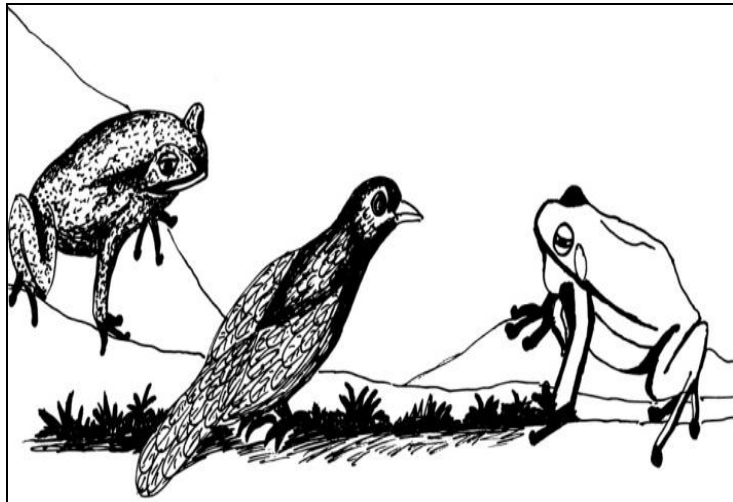


Fig 7



Fig 8

5.2.2 Ways to forecast weather patterns through the behavior of animals in Monaragala district

**White Browed Fantail (*Rhipidara Ourcoda*)**

Elders in the area appropriately express how to identify changes in the weather by observing this bird's behavior. This bird is very common sight in a normal environmental

conditions (Figure 09(a)). But they can only be seen once a week or once in every fortnight (Figure 09(b)). If the dry season continues this bird will migrate to another area (Figure 09(c)). In summary, this bird cannot be seen in long dry seasons. You can spot it occasionally during heavy rainy seasons.



Fig 9: (a)



Fig 9: (b)

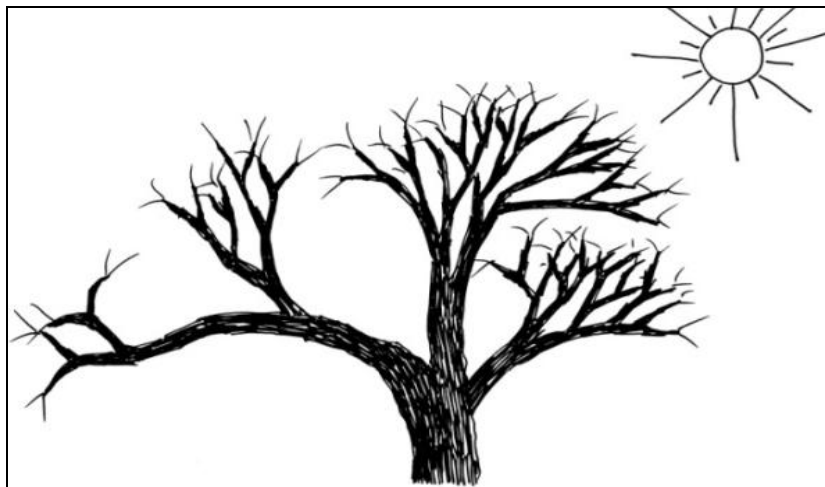


Fig 9: (c)

**Hump-nosed Lizard/Lyre-headed Lizard (*Lyriocephalus scutatus*)**

According to a farmer called Mr. Senarath Nimalsiri if a Hump-nosed Lizard cry continuously, then it is a definite sign of rainfall (Figure 10). The rhythm of their cry is an important factor here. If they cry only during in the evening rain will come within a week or so. If they cry continuously in the

morning and evening then heavy rain will fall within two days.

**Southern Indian Jackals (*Canis aureus indicus*)**

Describing a similar incident, Mr. Mendis said if Southern Indian Jackals crying in the evening is an indication of rain in the following day (Figure 11). Here the jackals will cry continuously.



Fig 10

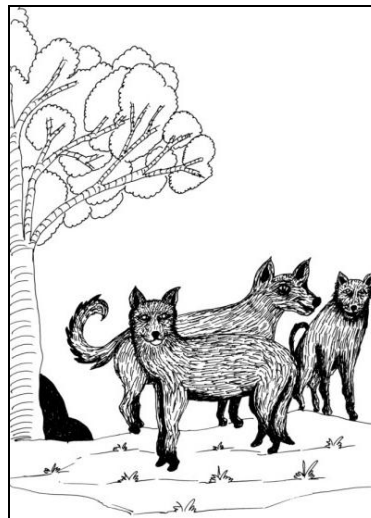


Fig 11

**Weaver ants (*Oecophylla*)**

Elders in the area say according to the behavior of Weaver ants changes in the weather can be explained well. Ant can feel the rainy season approaching in advance. It works very hard to store food for the rainy season. Similarly they expand

the anthill to store food that are brought from outside. They place the clay that are been removed from the anthill in a form of a ridge. What is more important is that they build this ridge in the direction of rain (Figure 12).

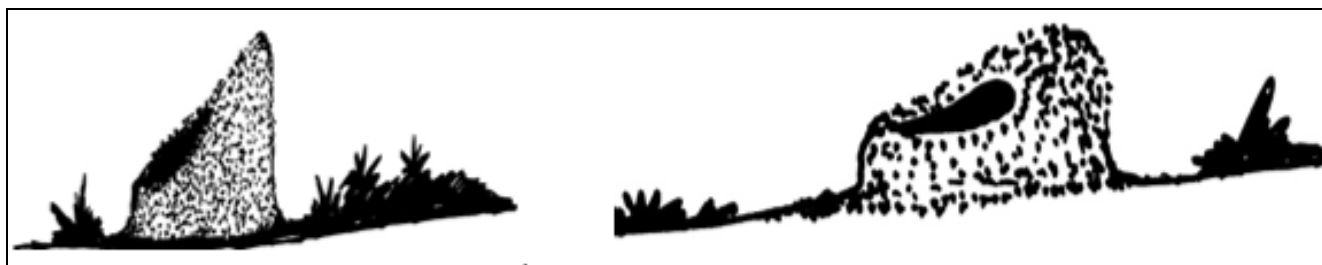


Fig 12

**White ants (*Isoptera*)**

White ants have a tremendous talent in recognizing climate Changes. White ants build their houses before rain comes and store food for the rainy season. Thus they start to build larger their anthills before the rain. If they speed up their building process then it means rain is coming soon. Similarly if the anthill goes high in a rapid speed then it is a sign to say the rainfall will also be high (Figure 13). If the anthill is rising with wet clay in the dry season then it shows the groundwater level has risen due to the effect of the moon. It is a fine example to say there will be rain on upcoming Poya day.

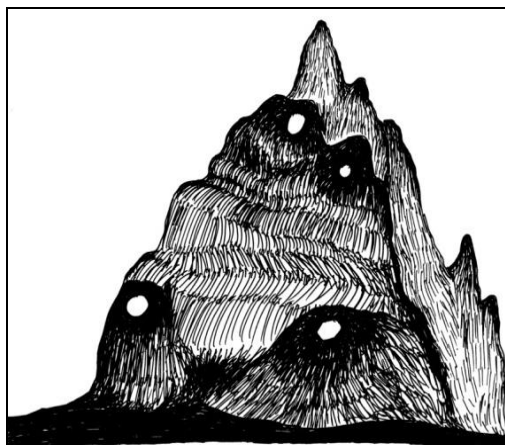


Fig 13

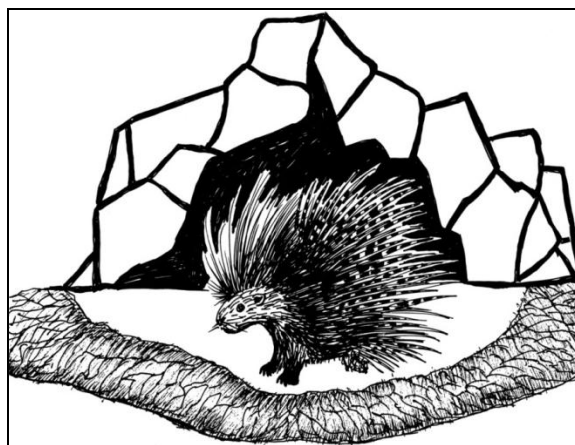


Fig 14

**Sri Lankan Porcupine**

From their statements it is clear that most of the traditional farmers in the area very well observe changes in the weather according to the behavior of Sri Lankan Porcupine. If you look closely at the hole where the porcupine reside, you can have a fair knowledge on when the rain is going to start. Porcupines have a habit of cleaning their holes before the rain. That is to protect themselves better during the rainy season (Figure 14).

**5. Conclusion**

Most of indigenous adaptations strategies depend on last generation of community in Anuradhapura and Monaragala districts when end of this generation the wide range of indigenous knowledge will comes to end. Most of adaptation strategies had been changed as results of change natural environment. Monaragala and Anuradhapura districts has some similarities and changers of adaptations strategies through forecasting weather pattern with behavior of animals. Indigenous knowledge has to powerful advantages over outside knowledge it has little or no cost and it is readily available. 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.

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