UNIVERSITY OF AGDER

Master Thesis

Title:

Kandyan Forest Gardens (KFGs) for Sustainable Development

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This Master's Thesis is carried out as a part of the education at the University of Agder and is therefore approved as a part of this education. However, this does not imply that the University answers for the methods that are used or the conclusions that are drawn.

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30.05.2013

To

People of Meemure...

Abstract

The Kandyan Forest Gardens (KFGs) Has been a basis for not only the stable agricultural livelihood of the community living in Tropical hills of Sri Lanka but also for the maintenance of biodiversity and equilibrium of the environment in these regions for an excitedly long period. Over the last several decades various social, economic and political changes have been brought about in these KFGG. The direct cause behind the above modifications was the forest conservation and management policies implemented in the area in question. These policies were put into effect with a view to keeping the peripheral community away from the forest yet without success. Those who made such policies were not mindful of thoughts, aspirations and the lifestyle of the community. This study tries to identify the potential KFGs have as a means of protecting the forest and their biodiversity on the one hand and by using the same as a community management approach for the development of the community. The village *Meeumre* lying in the middle of the Knuckles Range is the study area of this research and a methodology of both quality and quantity has been used to achieve its objective. The conclusion we can arrive at through the results of the study is that it is the KFGs have a rich potential, and people living in these peripheral villages should be mobilized for the conservation. To accomplish this task the community forest management approach will be an excellent medium. It will not only enable maintain the agriculture based livelihood of the community sustainably but also will contribute to the management of the forest in a more fruitful way. It is a realization of the concept of sustainable development at a regional level.

Acknowledgements

I must take this opportunity of recording my deep sense of gratitude to Professor Aake Bjoerke of the University of Agder in Norway, Supervisor of this thesis who contributed to the enhancement of it by correcting many a lapse. Undoubtedly this thesis is the result of the excellent teaching and guidance of all my teachers led by Professor Aren Olav Øyhus (Påsan). I must express even here my deep gratitude to Jannick Stolen Timenes who facilitated my works right through its course. My heartiest thanks also go to all those friends from all quarters of the world for the encouragement they have given.

Professor D. Atapattu of the University of Ruhuna gave me much courage and so did the Lecturer H.I. G.C. Kumara and Mr.B.A.U. Priyankara. I acknowledge with thanks the help Professor M. Rathnayake of the Department of Geography, University of Ruhuna extended to me by scheduling the timetable necessary for my fieldwork.

I am grateful more than I can express to Professor H.M.G.S.B. Hitinayake of the Department of agriculture, Dr. Thilak Bandara of the Department of Geography, both of the University of Peradeniya, and my friends Bandula, Sampath, Dhammika and Roshan who readily supplied the reference books I needed. My thanks also go to Pradeep, Chaminda, Anura, and Manjula my students whose excellent effort which made my fieldwork much easier than it would have been otherwise. I benefited very much from discussions I had with Mr. Rathnayake, the Grama Niladhari of Meemure , the Venerable Kosgoda Punna Thera, the chief Incumbent of the Meemure Temple and the villagers of Meemure.

My thanks go to my teachers and friends Dhanushka Bandara, G .W. Nandisena and Barbara Harrison (Washington, U.S A.) for correcting my English. Finally, I express my thanks to my parents and two sisters who always encourage me in spite many obstacles.

All those referred to in this thesis should be entitled to whatever appreciation it deserves. All mistakes remain my own.

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List of Abbreviations

AGAD – Assistant Government Agent Division

CBFM – Community Based Forest Management

CFM- Community Forest Management

CPFM- Community Participatory Forest Management

FAO- Food and Agriculture Organization

FMA- Forest Management Approaches

FMP - Forestry Master Plan

FSMP - Forestry Sector Master Plan

GIS- Geographical Information System

GND - *Garama Niladari* Division (Village Government Officer Division)

IUCN – International Union for Conservation of Nature

JFM- Joint Forest Management

KFG – Kandyan Forest Garden

KHG - Kandyan Home Garden

MDG – Millennium Development Goals

NGO - Non-Government Organization

NTFP- Non-Timber Forest Products

PFM – Participatory Forest Management

PRA – Participatory Rural Approaches

UNEP – United Nation Environment Programme

WCED - World Commission on Environment and Development

WCS - World Conservation Strategy

WWF – World Wildlife Fund

Chapter 01

Introduction

1.1. Introduction of the Research

Rain forests of the wet zone in Sri Lanka are rich in biodiversity, and have been utilized by its peripheral community for various needs for a period beyond record. Further, due to the influence of colonialism, wet zone mountainous forests underwent the most severe sway. To date mountainous forests are the more threatened relative to the Dry Zone. In consequence the spread of these forests seem to lie in the form of isolated strips among/ and along the mountains. Peripheral villages surround the forest. The best known example is the Knuckles Range, one of the world's heritages in the region of Kandy. Nearly so villages surround this range (Forest Department ,2007). Community traditions of these villages are essentially attached to the forest, and people subsist mainly on basic agricultural activities (Rajapaksha, 2007).

Colonialism and subsequent forest management policies, however, have enforced a ban on the community utilization of the forest. The outcome of this ban is the community tendency to fulfil their needs for forest products, animal husbandry and economy by developing Kandyan Forest Garden (KFG) which has been maintained through traditional knowledge.

KFG owes its formation to a creative activity based on a scientific approach according to which the community extends their gardens not horizontally but vertically (Perera and Rajapakse, 1991). Utilizing the maximum amount of the sun these gardens receive, like in a tropical rain forest, each layer of the forest has been introduced to a particular crop or a tree species peculiar to it. Consequently a layer system similar to that found in the surrounding jungle also can be seen in these gardens. The main difference between the two is that on the one hand they differ from each other specie wise and on the other hand the community gets direct socio-economic benefits out of their gardens Whereas from the forest they obtain much less benefits.

That is why these forest gardens (KFG) are of significance in the management of tropical rain forests. Modern forest management approaches are not isolated from goals such as community and rural development. Steps are taken to realize both these objects by means of the community participation forest management approach in which methodologies typical of or peculiar to each zone or region are being adopted. Traditional KFGs found in the region of Kandy in Sri Lanka

can be identified as an illustration depicting such a local individuality. In other words it possesses a potentiality which is capable of improving on KFGs as a community forest management approach. By this means at one and the same time sustainable forest management objects as well as rural development objects can be achieved. Nevertheless, no forest management projects implemented to date have paid attention to this aspect. As a rule the two objectives have been regarded as two separate entities. The result has often been a depletion of the forest and oppression and destitution of the community.

Accordingly this study identifies the potential KFG has as a community forest management approach for environmental substantiality and for sustainable development through realization of the goals of rural development.

1.2. Hypothesis

I. KFGs are capable of fulfilling the needs of Non-timber forest products.
II. KFGs are able to satisfy both socio-economic needs and environmental objects.
III. Forest management or agricultural projects active in the region have understood the importance of KFGs and have obtained the active participation of the community in those projects.
IV. KFG as a community Management Approach has a high potentiality which could be utilized for modern sustainable management and rural development.

1.3. Research objectives

1.3.1. Main Objective

- To analyze the economic and ecological role and function of Kandyan Forest Gardens as an instrument for socio-economic development.

1.3.2. Specific objectives

- To evaluate the socio economic development potentials of Kandyan Forest Gardens.
- To identify the potentials of Kandyan Forest Gardens for forest and biodiversity conservation.
- To explore features, strengths, weaknesses and historical perspectives of the Kandyan Forest Gardens.

- To identify the special characteristics of the community involved in Kandyan Forest Gardens and their potential as a community forest management approach.
- To explore the challenges faced by Kandyan Forest Gardens such as modernization, individualism etc.

1.4. Research Questions

- What are the impacts of the Kandyan Forest Gardens on achieving socio-economic development goals?
- What are the characteristics of Kandyan Forest Gardens for forest and biodiversity conservation?
- What are the features, strengths, weaknesses and challenges faced by Kandyan Forest Gardens?
- How did Kandyan Forest Gardens originate and how important are they in the contemporary socio economic and environmental context?
- What is the potential of Kandyan Forest Gardens as a community forest management approach?

1.5. Problem statement

KFGs have contributed towards conserving biodiversity and bringing economic outcome for the people in the country by protecting the forest cover for a long time. But most studies conducted on the KFGs have been based on natural sciences .This is an obstacle when striving to gain a wider knowledge about them. However, this study tries to analyze it from a social science perspective.

Most of the forests in Sri Lanka are located in remote villages. Welfare programs implemented by the government in order to uplift the standard of the lives of the people living in the periphery have not been successful. But an agro forestry approach, with which people are familiar, could contribute toward improving their livelihood.

The forest department complains that lack of labour is the main obstacle to a Community Based Forest Management (CBFM) approach. However, the issue of the lack of labour will not be a problem in KFGs because they depend largely on the labour from the family itself. Therefore they should have good potential to be extended as a CBFM approach in developing regions.

Even though KFGs have a long history, some adjustments have to be made so that they may suit the contemporary socioeconomic and environmental needs. Comparative studies based on both natural and social sciences are needed for that purpose. This study may fulfill that need to some extent.

KFGs have potential for mitigating the effects of climate change, biodiversity degradation, forest degradation and deforestation, soil erosion, poverty, starvation and gender discrimination, etc. Therefore they could be an ideal rural development approach for the developing countries suffering from the above issues. All these facts justify the rationality of the research.

1.6. Challenge in the field

Meemure is a remote rural village in Sri Lanka. It is situated within the Knuckles forest, a mountain area. It is a geographically isolated location, and dense forest cover creates several challenges for this research. Accordingly, transport and accommodation are problematic, and the threats of wild elephants are among the main challenges. Since the mixed methodology is used in the research, the process of collecting data without any knowledgeable research assistants will also is a big challenge. Time bounds and the lack of funds will also be obstacles to the research. However, the Village government officer (*Grama Niladari*), the head priest of the village temple and all villagers helped to overcome these challenges and limitations of the research.

1.7. Structure of the thesis

The first chapter describes that research objectives, research questions, and hypothesis, rationales of the study as well as challenges and limitations of the study.

The second chapter contains the literature survey and the conceptual framework of the study.

The third chapter contains research methodology which includes determination of research methods, primary and secondary data collecting methodology, data analyzing as well as presentation of data.

The fourth chapter provides a description of socioeconomic, environmental and other factors concerning the study area.

The fifth chapter contains findings based on data collection with respect to the process of Kandyan Forest Gardens (KFGs) utilization of the *Meemure* village.

The sixth chapter focuses on the effectiveness of Kandyan forest garden as a Community Forest Management approach. The chapter is based on the results of primary qualitative data, which is community mapping and case studies

The seventh chapter comprises detailed research findings and hypotheses testing.

The eighth chapter concludes with conclusions remarks.

The Appendices one shows that multiple utilization of KFGs.

The appendices two provide that sample Questionnaire and interview guide.

The appendices three some pictures related to data collecting process.

Chapter 02

Literature review and conceptual framework

2.1. Introduction

This chapter consists of literature review and the conceptual framework. The evaluation process of Sri Lankan forest policy with periodical changes is presented here. Furthermore a closer attention is paid to global development and natural resource management discourses which had a great impact on the process. Secondly, being based on global and national discourses, the appropriateness of community forest management as a sustainable forest management approach and the importance of Kandyan Forest Garden (KFG) as an agro-forestry tool are presented. Finally, the conceptual framework has been developed so that the rationality of the study could be justified through the literature review.

The Knuckles forest (*Dumbara* Forest) is a tropical rain forest in Sri Lanka which is rich in bio-diversity. People living in the periphery have used the forest for centuries to fulfill their needs. However a number of forest management problems have arisen due to the rapid growth in population, being compelled to expose to the outer world and because of the negligence of the community by forest conservation and management approaches. Therefore, in the modern context, it is accepted that sustainable forest management must occur with community participation. For this purpose the needs of the community needs and their potentials and base of resources have to be identified. Forest Management approaches must be concerned about this. This research focuses on how to develop Kandyan Forest Gardens (KFGs) which is an agro-forestry tool, as a community participatory forest management approach. A long history of the evolution process of the forest management policies and discourses in relation to this can be identified.

2.2. Nature of Forests: global and local context

"Forests play a crucial role in terrestrial ecosystems and provide a multitude of services" (UNEP,2004). Historically, forest has been under pressure due to increasing demands for multiple human needs. In recent decades this pressure has increased due to rapidly increasing of human population ,Agricultural lands expanding and bio-fuel production, rapid urbanization and development of physical infrastructures and increased global demand for forest products on the

other hand forests also under increasing pressure from natural factors such as climatic changes (Allen et al. 2010 cited from UNEP,2004) .Forest degradation and deforestation has already become a pressing problem in the world (Adams, 2009). Not only is it an environmental issue but also has devastating socio economic political and cultural effects. Crass consumerism, political prejudices, rapid growth in population, poverty, disasters, etc. have caused deforestation and forest degradation (Adams,2009).

FAO (2011) points out Forest cover just over 4 billion hectares 31 per cent of the world's total land area. The majority of these are boreal forests. Tropical rain forests which included rich biodiversity are facing at risk (UNEP, 2004). According to WWF (2012) "12-15 million hectares of forest are lost each year. This is equal to the loss of 36 football fields per minute". It also emphasizes that forest degradation and deforestation directly give rise to bio diversity reduction, greenhouse effect, water cycle disruption, soil erosion and the collapse of lifestyles. "About 1.6 billion people depend in some way on forests for their livelihoods, and wood and other goods removed from forests are valued at US$122 billion in 2005 (World Bank 2004, FAO 2010).
There are various reasons for forest degradation and deforestation in various regions in the world. The main reason for it in Latin American region is over grazing and as far as the south Asian region is concerned, it is agriculture. The number of forests in Asia Pacific region has dramatically decreased over the last two decades.

> *"In the 1990s, the region experienced a net forest loss of 0.7 million hectares per year, while in the last decade the forest area increased by an average of 1.4 million hectares per year" (FAO, 2011, p.x)."At the global level, it decreased from an estimated 16 million hectares per year in the 1990s to around 13 million hectares per year in the last decade" (FAO, 2011, p.3).*

WWF (2000) points out that the world has 10% forest reservations. However they exist as isolated forest patches and consequently they cause biodiversity degradation and deforestation. This emphasizes the importance of Community Based Forest Management (CBFM) to conserve them. CBFM has enormous potential for eradication of poverty in developing countries (FAO, 2011, p.82).
In Sri Lanka, the above mentioned world trends can also be seen to some extent. The history of forest management in Sri Lanka can be divided into three periods. They are pre- colonial era,

colonial era and post-colonial era. In pre-colonial era, it was the king who had the responsibility to manage forests. Respecting Buddhist philosophy and traditions, the king did not consider himself to be the owner of the land and was merely the temporary guardian of it (Karunaratne,1987).

In the colonial period (1505-1948), especially during the British rule two thirds of tropical rain forests, that were very rich in biodiversity, were destroyed for the cultivation of commercial crops (Karunaratne,2009,p.53). However, even the British had realized the importance of protecting the higher mountain catchment areas (Neela and Raheem, 1993). The following table shows the comparative reduction of forest cover with the population growth.

Table 2: 1 Forest cover changing in Sri Lanka

Year	Population (Million)	Forest Cover (%)
1880	3.5	70
1953	8.1	50
1983	15	26.6
1992	17	23.9
2002	18.5	22

Source: Central environmental Authority, 2006 Cited from Karunaratne, 2009.

In the post-colonial era up to the 1980's the government policy contributed towards encouraging the maximum utilization of forest resources for developmental purposes. As a result tropical rain forests in Sri Lanka were further destroyed (Abewickrama,2003).A large number of acres of forests are being cut down a year due to various reasons (Ariyasena,2006,p.172). Consequently, only 8.25% of forest cover still remains as primary forests (Legg and Jewel,1994). They can be seen as isolated stripes in the mountain region in the wet zone where the population density is much higher (Karunaratne,2011).76 % of the land in the wet zone is used for agriculture while only 15.9% of it is allocated for forests and wildlife. Higher population density poses a serious threat to the existence of forests. According to Department of Census and Statistic (2001) 83.70% of Sri Lankans are living in rural areas and 9.4% of them are suffering from poverty. There is a close relationship between poverty and forest degradation (Kaimowitz and Angelsen,

1998 cited in WWF, 2011, p.5). In the 1980's almost all the world devoted a greater attention to the environment and consequently it was accepted that development should be eco-friendly. The Brundtland report (1987) was a turning point in this regard. As a result of it, the idea of using the forest resources carefully and the importance of community participation in forest management gained acceptance.

In 1995 Sri Lanka introduced 'Forestry Sector Master Plan' which provided legal framework to achieve the above goals. Now anthropogenic factors play a major role in forest conservation and management in Sri Lanka (Wickramashinha,1997). As a result, researchers and policy makers focus on reforestation, agro forestry, analog forestry and establishing forest buffer zones. However KFGs, which have led to forest conservation and protecting biodiversity for a long time, have not yet been taken into consideration sufficiently. Therefore focusing on the importance of these gardens is a need of our times.

Historical profile of forest management and conservation in Sri Lanka will be discussed in the next section.

2.3. Historical profile of forest management and conservation in Sri Lanka

The Relationship maintained by the oriental communities with nature was eco-friendly and Cosmo-centric (Herath,1998). In this context the components of nature were as important as human beings. Forests were indispensable and respectable parts of this concept. Sri Lanka has a long history of forest conservation and management. It is based on feudalism, believes, customs, norms, traditions, etc . Besides, the community held the forest in awe and it was considered sacred as well. It was believed that forest or there are certain divide beings in forests and trees as well. According to folklores Forests also be infested with evil spirits and people especially the Veddhas people (indigenous people) still believe in such ghosts. The arrival of Buddhism in Sri Lanka made a huge difference to the history, which was both physically and spiritually more effective. "The forest is a peculiar organism of unlimited kindness and benevolence that makes no demand for its sustenance and extends generously the products of its life's activity; it affords protection to all beings, offering shade even to the ax man who destroys it" (Nanayakkara,1987:16). In the feudal society with the religious influences there were *Gabada Gam, Devala Gam, Ninda Gam and Vhara Gam* in which forest woodlots were maintained as

Arama and *Thanhanchi keke*. (Codirington, 1938; cited Kumara,2010:05). Nanayakkara (1981) and Gamage (2010) points out that legislation which was practiced from the period of king Vijaya (543 B.C) to the collapse of kingdoms in Sri Lankan history have contributed towards the development of forest management in the country. Forests were conserved and maintained and reforestation activities were implemented for multitude purposes. The whole process was maintained by 'The Rajakariya " based on caste system. Ainslie (1920) note that Sinhalese kings appointed 'Kele Koralas' (forest officers) in order to conserve forests and to provide the palace with NTFPs Besides, there were king's forest as well. *Udawatta Kele* is such an example for this in the Kandyan period (1514-1815). This traditional forest management approach has contributed toward forest management and conservation over a considerable period of time with colonialism. This system began to deteriorate and new legislation and traditions were implemented to forest management. Consequently, the land use patterns changed altogether and it has affected the forest management process for a long time. Particularly, this had a direct impact on Upcountry tropical rainforests and the lifestyles of the community living in the periphery. For example Dumbara forest was renamed as the Knuckles.

2.4. Forest policy interventions in Sri Lanka

A long term evolution process could have been identified in forestry field of activity. This process clearly show the way up to a community participatory forest management approach and in such a context local agro forestry approaches such as KFGs emerge and also their potential for fulfilling the needs of contemporary society is prominently displayed. According to Kumara (2010) there are three main phase forest policy intervention in Sri Lanka. These are as follows;

1) The first phase of policy interventions (colonial period)
2) The second phase of policy interventions (post independent)
3) The third phase of policy interventions `(comprehensive policy interventions from 1980 to 1995)

2.4.1. Colonial Era (1505-1948)

There is no concrete proof that the Portuguese were engaged in forestry but the Dutch were employed in reforestation in low- country areas (Gamage,2010). The British rule, which began in 1796, firstly destroyed Kandyan forests so that they could easily invade those areas and then they were largely wrecked for the cultivation of commercial crops such as coffee and tea (Karunaratne,1987). The British passed laws such as Crown land ordinance of 1840, Temple land ordinance of 1856, Waste land ordinance of 1897 and Grain tax ordinance of 1872 in order to obtain lands to cultivate commercial crops (Ariyasena,2006). However, they later (after 1900) paid their attention to forest conservation (Nanayakkara, 1987; Karunaratne,1987;Bharathie,1987;Gamage,2010). In 1929 policies were made for the utilization of forest resources. The main objectives of those policies were;

1. Make the island self-supporting in timber (including fuel) and other forest produce, by systematic exploitation of existing natural resources and the artificial reforestation of selected areas;

2. Provide for export such timber and forest produce that have a world market

3. Conserve water supplies and prevent erosion; and

4. Co- ordinate forest operation with the requirements of the preservation of the indigenous fauna and flora

(Forest policy framework, 1929; cited in Wikramashinghe, 2001: 144)

Those policies were for the sake of colonial needs. They were under the name of 'Crown forest' and the local communities had not been given an opportunity of utilizing the forests nor contributing towards forest management process (Nanayakkara, 1987:23).

2.4.2. Post independent Era (1948-1980)

Sri Lanka gained independence from the British rule in 1948. A national policy on national forestry was proclaimed again in 1953 (De silva,1954). It was more attentive to local needs and forest conservation than that of 1929 (Wickramasinghe,2001). Particularly, it turned its attention to the conservation of Kandyan (up country) forests. In addition there are four major facts of this policy as follows;

1) To maintain, conserve and create forests for the preservation and amelioration of the environment's soil and water resources and for the protection of the local fauna and flora when required for aesthetic, scientific, historical and socio-economic reasons;

2) To ensure and increase as far as possible the supplies of small wood for agricultural requirements and fuel wood for domestic consumption;

3) To maintain as far as possible a sustained yield of timber and other forest products for general housing, industrial, communication and defense requirements of the country.

(Wikcramasinghe, 1997:165-166)

During the period forests were considered to be a source of development. In other words, the process of clearing forests was justified in the name of development. Forests were cleared for development projects and there were no strict restrictions for the communities to obtain forest areas for their agricultural activities. However, when compared to the 1929's forest policies, more impressive and positive strides have been made later with regard to forest conservation and management (Wikcramasinghe,2001).

2.4.3. Comprehensive policy interventions from 1980 to 1995

In 1980 a new national policy (Forestry Master Plan-FMP) on forests was proclaimed and it emphasized the importance of the sustainable management of the supply of timber and fuel wood and of the participation of communities in the establishment of private and agro-forest farming through social forestry programmes (Nanayakkara,1982). This series of policies was highly concerned about the contribution of forestry towards environmental conservation and development. The significance of community participation in forest management and conservation had also been taken into consideration.

The 1980 national forest policy was;

1) To maintain, conserve and create forest for the preservation and amelioration of the environment soil and water resources and for the protection of the local fauna and flora when required for aesthetic, scientific historical and socio-economic reasons;

2) To ensure and increase as far as possible the supplies of small wood for agricultural requirements and fuel wood for domestic consumption;

3) To maintain as far as possible a sustained yield of timber and other forest products for general housing, industrial, communication and defense requirements of the country.

4) To work the forest to the highest possible economic advantage as it is consistent with the foregoing objectives; and

5) To involve the local people communities in the development of private woodlots and forestry farms through a programme of social forestry.

(Wikramashinghe, 1987:25)

However, since this policy had given priority to the utilization of forests for economic purposes, environmentalists were highly critical of it (Kotagama,2003). This took place due to the global forest conservation and management influences. Based on new global trends, the Forestry Sector Master Plan (FSMP) was introduced in 1995 and it is this plan which is currently being implemented. There are three major objectives of this national policy as follows;

1) To conserve forests for posterity with particular regard to biodiversity, soil, water and historical, cultural religious and aesthetic values;

2) To increase the tree cover and productivity of the forest to meet the needs of present and future generation for forest produce and services;

3) To enhance the contribution of forestry to the welfare of the rural population and strengthen the national economy, with special attention paid to equity in economic development.

(Wickramashinghe, 1997:166)

This series of policies approves of community participation and responsibility towards forest management and conservation and has created a broader opportunity for a community based forest management approach to be implemented. It also pays attention to rural development by means of the capabilities of the community and to the contribution of the NGOs and the private

sector for achieving this. Here the potential of Agro Forestry as a community participatory forest management approach has been made prominent (Forest Department,1995:35). According to Wickramasinghe (1997a) anthropogenic factors play a main role in tropical forest management process in Sri Lanka. Thus, she emphasizes the importance of the woman's role (Wickramasinghe,1997a). Maddugoda (1991) points out that the history of Sri Lankan community based forest management goes as far as back as the Vijaya's tenure as king (543 BC). This approach has been used in different contexts in different periods of time. Moreover he said that the most developed tool is Home Gardens. They define it as an agro forestry approach.

> "Chronicles mention that village communities were well organized and home gardens were planted with flowering and fruit bearing trees. People at that time achieved self-sufficiency in food, practiced agro-forestry in home steads and also lived in harmony with a neighboring forest environment" (Maddugoda,1991:155).

In 1950 the 'Taungya system' was introduced to the Dry climatic zone in Sri Lanka as a community based forest management approach. However, Community Forest Management (CFM) theoretically came into existence after 1980. The world's CFM history goes as far back as 1978 when the 'World Forestry Congress' was held in Jakarta (Fisher et all,2007:3 cited from IUCN,2011:7). Based on this global forest management discourse, the government has identified two major issues in relation to the forest sector. They are;

I. A shortage of energy supplies, particularly for the rural population and

II. Rapid denudation of forest cover caused by commercial extraction, chana cultivation and illegal fallings (Maddugoda,1991:156).

In order to overcome these challenges, five projects have been implemented and 'Agro Forestry' is one such major tool. Particularly the importance of this approach for the home gardens periphery villagers in the wet zone has been taken into consideration for a long time (Dayananda,1987). A local approach like KFGs with which those periphery people have been familiar for considerable period of time is more important because it could be more effective and

efficiency. This approach is more suitable for a village like *'Meemure'* which is situated in the periphery of tropical rain forest in Sri Lanka.

2.5. Rise in the concept of sustainable development and forest management (after 1980)

The beginning of the 1980s was a turning point in the discourse upon the world's development (Adams, 2009). The United Nations Conference on the Human Environment held in 1972 laid the foundations for this. The world turned its attention to the devastating consequences of the developmental strategies which had been used up to then (Adams, 2009). As a result, the idea that development should be eco-friendly was put forward after 1980.

> "The idea of environmental limits or constraints on development was explored by number of authors around the start of the 1980s under the label of 'eco-development' (Sachs, 1979; 1980; Riddell, 1981; Glaeser, 1984 cited in Adams, 2009), and it was a central concept in the world conservation strategy (WCS) published in 1980 (IUCN, 1980 cited in Adams, 2009). Most importantly, it was the foundation of the report of the World Commission on Environment and Development (WCED) seven year later (Brundtland, 1987 cited in Adams, 2009). At its launch in April 1988, it was claimed that this report, "Our common future", set out a global agenda for change. This agenda soon began to command attention in the core of the development universe: in major shift of culture and policy, the president of World Bank spoke in May 1988 of the links between ecology and sound economics in a major statement of the Bank's policy on the environment (Hopper, 1988). The idea that development thinking needed to be 'greened' was a changing idea in the 1980s (Harrison, 1987; Conroy and Litvinoff, 1988 cited in Adams, 2009). In the 1990s this argument became stranded, the starting point for countless political speeches and student essays (Adams, 2009:03).

According to the Brundtland Report proclaimed in 1987, it was believed that environmental and developmental challenges could be overcome by sustainable developmental concepts. In the 1980 s this became a trend at international, national and local levels (Adams, 2009, p.?). The proclamation of environmentally sensitive economic development was issued in 1992 with the collaboration of representatives from 170 countries. Sri Lanka has also entered into it. Since then international organizations, NGOs and governments have been working towards achieving

sustainability in socio-economic and environmental contexts (Adams, 2009, p.?). However, some criticisms were made that this was not a panacea for all problems (Adams, 2009, p.5-7).

Nevertheless, it is already accepted that the utilization of resources must be managed properly and methodically (Adams, 2009, p.87-88). This process should be able to achieve multiple objectives, i.e development and conservation. These ideas have taken centre stage through the developmental concepts like Green Economy (UNEP, 2011). Such global discourses in the 1980s have had a direct impact on the management policies of periphery countries. Sri Lanka is no exception.

2.6. Community forestry and agro-forestry: under the concept of sustainability

According to sustainable development discourse, development should be sustainable in socio-economic and environmental contexts. "Humanity has the ability to make development sustainable to ensure that it meets the needs of the present without compromising the ability of future present generation to meet their own needs" (Brundtland,1987:action 27).

Here, ideas emerge in relation to the forest management;

1. Forest utilization
2. Forest conservation and
3. Forest management with a view to achieving the above two properly.

Community based forest management is one of the most popular forest management approaches after the 1980s. CFM is use by the community for tropical rainforest management in Asian, African and Latin American countries (FAO,2011). Particularly, this approach is widely practiced in tropical Asian region (Seelend and Schmithusen, 2003).

Community Participatory Forest Management (CPFM) approaches have been categorized by Ottiger (2003) according to the extent of community participation. Among them are Participatory Forest Management (PFM), Joint Forest Management (JFM) and Community Forest Management (CFM). Ottiger (2003) states that it is CFM which requires the widest contribution of the community.

> "Community Forest Management (CFM) is the case where the community takes the lead, managers the resource while the government is a passive supporter or observer (Rural Litigation and Entitlement Kendra, 1997:39). This type of management is strongly advocated by environmental and social activities and NGOs representing the interests of tribal and other forest –dwelling peoples, together with scientists dealing with ecological, social, environmental aspects. However, there are few forestry projects giving that much control and free play to local communities" (Ottiger, 2003:132).

However, there is no definite agreement on this categorization (Nair, 1993). CFM provides a wider opportunity of developing home gardens in the periphery as a buffer zone around the forest and as a land where the needs of the community for Non-Timber Forest Products (NTFPs) can effectively be fulfilled. Agro forestry can be used as a tool for this. According to FAO (2011) and WWF (2002) a number of benefits could be derived from CFM yet states that there is a close relationship between (Millennium Development Goals) MDGs and forests (FAO,2005). However, Nair (1993) shows how agro forestry varies from CF, FF and SF.

> "The major distinction between agroforestry and these other terms seems to be that agroforestry emphasizes the interactive association between woody perennials (trees and shrubs) and agricultural crops and/or animals for multiple products and services; the other terms refer to tree planting, often as woodlots. As several authors have pointed out (e.g., Dove, 1992; Laarman and Sedjo, 1992), all these labels directly or indirectly refer to growing and using trees to provide food, fuel, medicines, fodder, building materials, and cash income. Only blurred lines, if any, separate them and they all encompass agroforestry concepts and technologies. No matter what the experts may say, these terms are often used synonymously, and sometimes even out of context, in land-use parlance" (Nair, 1993:17).

KFGs with both these characteristics are a traditional and sustainable FMA well as an agro management approach (Maddugoda, 1991). In other words, they have enormous potential to make the sustainable developmental concept in the tropical region become a reality.

2.7. Kandyan Forest Gardens (KFGs) as an Agro-Forestry tool

Sri Lanka has a long history and a wide range of experiences in relation to the CPFM and agro forestry (Maddugoda,1991;Wickramasinghe,1997;) . Pawlick (1989) has shown that "agro forestry is very social science" (Cited from Wickramasinghe,1995:64). Wickramasinghe (1995) shows the importance of social science researches for agro forestry.

i. The farmer's behaviors is selecting and maintaining crops, trees and animals or any combination of two these elements structures the system;

ii. Production and service function are regulated by the people managing the system;

iii. As the system have been evolved over generations, with or without modifications, systems cannot be understood without communication, interaction, observation, listening, dialogue and more strongly without having a greater inputs the people:

iv. It is essential to begin the process from society as success or the filature of agro forestry depends on the acceptance of the system by the people who puts the system into practice and makes it a part of their survival system;

v. Being a land-use system it uplifts the living conditions of the land users so the engagement of the people and their impact are the key to success;

vi. The cultural context, norms, economy and structures cannot be understood without having suitable facts. The lack of understanding of people's needs, the utilization practices and local initiatives are recognized as reasons for poor popularity and adaptability (Wickramasinghe, 1995:64-65).

According to this wider interpretation, local agro forestry approaches like KFGs are socio-economically and environmentally more effective. Social science researchers should contribute towards this in a wider manner (Wickranasinghe, 1995; Weerawardana, 1995; Vadasinghe at all; 1995; Perera, 1995; Hitinayaka,2009). This study will be able to fill the intellectual gap to some extent in the relevant field of activity.

2.8. Kandyan Forest Gardens (KFGs)

"Home gardening has a long tradition in many tropical countries" (Nair,1993,p.85). This practice is seen best in south and southeast Asia (Soemarwoto,1987) and Sri Lanka is no exception (Perera and Rajapakse,1999,p.296). This study is based on KFG, which is a traditional agro forestry approach in Sri Lanka.

The Kandyan Forest Gardens (KFGs) is a unique ecosystem which has positive environmental benefits and at the same time is productive and economically beneficial (Silva and Hitinayake, 2009, p.120). Premaratna and Premalal (2006, p.10) point out that KFGs is an agro forestry system that is effective and efficient in conserving biodiversity and achieving rural development. Nair (1993, p.19) has introduced KFGs as a home garden system which is a combination of woody plants and agricultural crops. Moreover, this system has given rise to new forest management approaches such as 'Analog Forestry' in which some elements of KFGs can be seen (Both ENDS, 2000, p.3). Accordingly, KFGs can be identified as a specific, sustainable and useful land use model which addresses the above mentioned issues more effectively. In this study a closer attention is paid to exploring, analyzing, restoring and identifying the effectiveness and efficiency of KFGs within the context of sustainable development.

These gardens have traditionally been dominated by food trees which are subsequently replaced to some extent by cash crops. Their role within the farming system is normally supplementary to production of the staple paddy (Hitinayake and Silva, 2009, p.120). Moreover, Hitinayake and Silva (2009) and Sinclair (2000) say that a typical Kandyan Forest Garden varies in size from <0.1 ha to >2 ha, most being at the lower end of this range. Some recent studies have identified higher numbers of tree species in multiple layers on KFGs (Hitinayake and Silva, 2009).

Attygalle (1998) and Jayawardena and Jayatilake (1998) state that KFGs contribute towards family nutrition. According to results of the research he has highlighted the importance of KFGs to overcome food crises and other related issues.

According to the above facts KFGs can be described as a unique agro forestry system that is environmentally friendly and economically beneficial. This is very close to the concept of sustainable development in practice.

2.9. KFGs: Agriculture and Forestry for Sustainable Development

In regional and global contexts, the agriculture and forestry sectors have faced multiple challenges. Therefore a collective approach to both these sectors is needed to achieve sustainable developmental goals in developing countries. Agro-forestry can be an alternative to face achieving those challenges. Not only above agriculture and forestry sectors but also many socioeconomic, political and cultural issues in particular regain. Umrani and Jain (2010) and Pandey (2005) point out that agro forestry as a traditional land-use adaptation may potentially support livelihoods improvement through simultaneous production of food, fodder and firewood as well as overcome poverty and gender issues and uplift people quality of life. They have explained many successful cases from Africa and South Asia.

Home gardens are a main agro forestry tool and the word "Home Garden" varies from region to region. "Home garden has a long tradition in many tropical countries (Nair, 1993, p.84). Moreover Nair (1993) states that it's a combination of the whole crop-tree-animal unit managed by family labour (Fernandes and Nair, 1986 – sited from Nair, 1993, p.85). On the other hand he has pointed out the diversity of practices and socioeconomic and environment benefits of tropical home gardens. According to his analyses Kandyan Home Garden (Kandyan Forest Garden-KFG) are a more effective agro forestry approach than the others.

> *"Forest – garden farms may be an old as the human race itself. They originated in prehistoric times along jungle – cland river banks and in the wet foothills of monsoon lands. In the gradual process of family or clan's improvement of its immediate .environment useful tree and vine species were identified, protected and improved while undesirable species were eliminated (Mcconnell,1992,p.1).*

KFGs were made in the same manner. However British colonialism had quite an impact on it. Under the Crown Land Ordinance (1840) the British snatched lands from the locals for the cultivation of commercial crops. As a result most Kandyan people were deprived of their traditional lands. Nevertheless they did not like to work as labourers in the estate sector and therefore tamil labouers from south India were brought into the country by the British rulers .Simultaneously forest cover in Kandy was gradually being destroyed and local people were deprived of their livelihoods. KFGs were an ideal solution to these problems. Since the local people did not have much room for agriculture they began to experiment with the vertical layer

system that was much more exposed to the sunlight and adapted to the law of nature. The new system strengthened their economy as well. And it also increased biodiversity. The British realized the economic significance of KFGs and during the 1817 - 19 uprising they ordered their soldiers to act as follows

> *"All men above 18 were to be killed, all houses pulled down and burned ; all trees bearing fruits of use to human beings felled; all grain destroyed and confiscated; all irrigation tanks and canals breached; and all cattle belonging to the people which were in excess of the requirements of the army should be destroyed"*
> *(Vimalananda,1970,p.13).*

Even after that calamity, some Kandyan Forest Gardens sustained Tennents (1859) points out. Robert Knox (1681) who was a prisoner in Kandy before the British rule states that there were many fertile home gardens even in that time. "The forest garden farmers of south and southeast Asia represent one of the classical agriculture systems of the world" (Mcconnell, 1992, perface). He further points out that these KFGs with huge biodiversity and maintained by the family labor and knowledge create a new socioeconomic and ecological system which leads to sustainability. Perera and Rajapakse (1991) say that they have an identity of their own in physiognomy, utilization and management and that they can bring a higher income even though there are no hybrid plants and use of fertilizers in the system.

In addition, MENR, (2001) points out that there is higher fauna diversity in this system. The system provided 'shelter' for the animals like amphibians that were deprived of their habitats during the British rule. What is more, KFGs did act as 'forest bridges' for the animals to travel from one isolated forest patch to another.

KFGs are an effective way of resolving issues arising in the sectors of agriculture and forestry and effectively contribute towards sustainable development.

> *" as global concern grows over the destruction of tropical forest, the loss of biodiversity and the need for sustainable development agriculture for small farmers ,forest garden system deserve more careful consideration" (Mcconnell,1992.preface,).*

KFGs are an approach that has been used for thousands of years and has enormous potential for resolving contemporary issues. It is therefore obvious that this approach holds true to this day. Academics have a disagreement over the due place of KFGs in the hierarchy beginning with Monoculture and ending with Natural forests. A great majority consider this to be an agro forestry approach while the others tend to associate it with analog forestry. In fact KFGs have characteristics relating to both these sectors. Therefore they must stand by themselves with their identity in the hierarchy.

2.10. Conceptual framework

Based on the research problems a conceptual framework has been developed (Figure 2:1). It covers four major areas as follows.

i. Utilization of forest resources

ii. Conservation of forest resources

iii. Management of forest resources

iv. Community development

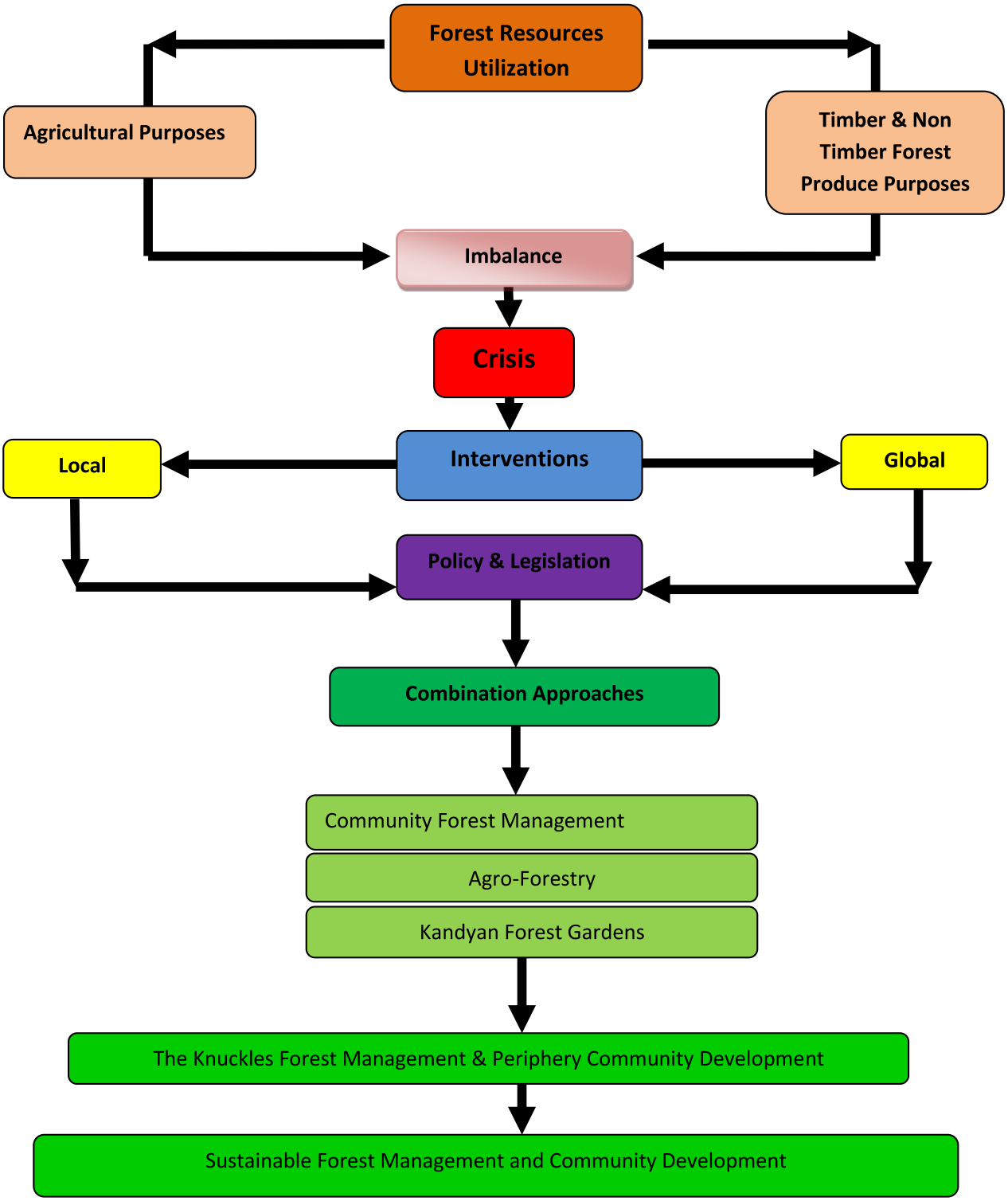
There are 88 villagers around the Knuckles forest (Forest Department,2008). The community in the periphery has used the forest for their day to day needs for a very long time (Forest Department,2008). These needs can be divided into two categories;

1. Daily need for timber and non-timber forest products.

2. Needs in subsistence farming and commercial agriculture.

During the pre- colonial era this forest was conserved because it offered natural protection for the Kandyan kingdom (Forest Deapartment, 2008). It was also a source of providing herbs for traditional medicine (Forest Department, 2003&2008). However, much of the forest was destroyed for the cultivation of commercial crops (coffee and tea) during the colonial era (Forest Department, 2003&2008). This area is especially suitable for the cultivation of cardamom. In 1960 large areas of this forest were leased so that cardamom could be cultivated (Forest Department, 2003&2008;Bandaratilake,N.B).

Figure 2:1 Conceptual framework



As result, the forest was largely damaged and the periphery community's traditional utilization process of forest resources collapsed altogether. Such collapse in the equilibrium of utilization and conservation leads to issues like forest degradation and deforestation. This area is now encountering a number of difficulties with the rapid growth in population. Due to being exposed to the external society from the colonial era to the 1980s, the periphery community was considered to be an obstacle for the conservation and management process in forest management approaches.

By the 1980s, policies and legislations were introduced in the relevant field of activity at national levels parallel to the now global trends in forest management. Management captivities in the Knuckles began in 1975 (IUCN, 2009). However, the gap between the community and the authorities was an obstacle to obtain an active community participation in the process of forest management even though the new legislation had provided a great opportunity for it (IUCN, 2009). Therefore, a more intimate methodology is needed to attract community participation (IUCN,2009). The use of developed agro forestry tools like KFGs as CFM is a more sustainable forest management approach for this area because they are closely associated with the community's agricultural lifestyle. Problems of land, labour, capital, knowledge and immaturity arise in the other CPFM approaches would not come up in this KFG participation approach. KFGs crop diversity and its capability for livestock's could improve the economy of the community (IUCN,2009). This approach is therefore capable of making both sustainable forest management and community development become a reality in the tropical region.

Conclusion

The evaluation process of the policies in forest management in Sri Lanka has had an impact on the utilization and management of forest resources and community participation as well. The Knuckles forest in no exception Policies which was practiced from the colonial era to the 1980s was highly centralized and top to bottom. After 1980, it was accepted that forest management should be accompanied by community participation, but it didn't become a reality at ground level. The lack of proper methodologies is the reason for this. KFG, which is already popular with the community, has enormous potential to be developed as a community participatory forest management approach. It leads to sustainable forest management as well as community development.

Chapter 03

Methodology

3.1. Introduction

This chapter focuses on defining the research methodology. This research mainly focuses on ecology and socio-economic gain of the KFG. According to these elements some mixed methodology (Bryman, 2008, p.603) will be selected as follows. It consists of both qualitative and quantitative methods. The methodology is of four sections. The first part is about determining the research methodology and selecting the tools and techniques. This part is mainly based on pilot and literature surveys was and shall help identify research problems and hypotheses. The second treats data and information collection. In this research, both primary and secondary data as well as quantitative and qualitative data were collected. Primary data was collected by questionnaire surveys, PRA tools, case studies, participant observation, key informant interviews and semi- structured interviews, while secondary data was collected through publications, related and internet sources , unpublished documents and records, maps etc… the data analysis is based on PRA diagrams and community maps, statistical analysis and case studies. The Forth section handles data presenting. In order to deal with this, tables, texts, figures, photographs, maps, diagrams etc were made.

3.1. Determining the methodology

Selecting the tools and techniques for data collecting, analyzing and presenting In order to collect data, both pilot surveys and literary surveys were used.

Literature Survey

As an early part of the research, a number of publications related to the field of Kandyan Forest Gardens (KFG) practices and its ecological and economical effectiveness and efficiency were studied. As a traditional agro forestry tool, the role of the KFG to achieving sustainable development goals at the local levels was studied. KFGs as a community forest management strategy were also comprehensively studied with the purpose of determining research problems as well as identifying the study area.

Pilot Survey

A pilot survey was carried out in order to determine the research area and methodology.

Figure 3:1 Research Methodology

<table>
<tr><th colspan="2">Mixed Methodology</th></tr>
<tr><th colspan="2">Determining the methodology</th></tr>
<tr><td>Literature Survey</td><td>Pilot Survey</td></tr>
<tr><th colspan="2">Data Collecting</th></tr>
<tr><td>Secondary Data</td><td>Primary Data</td></tr>
<tr><td rowspan="3">Grama Niladari Reports
NGO's Documents
Government Documents
Petitions
Maps
Research, Books and Publications
Internet</td><td>Qualitative</td></tr>
<tr><td>Participant Observation
Key informant interviews
Semi-Structures interviews
Case studies
PRA tools</td></tr>
<tr><td>Quantitative
Questionnaire Survey</td></tr>
<tr><th colspan="2">Data Processing and Analyzing</th></tr>
<tr><td>Qualitative</td><td>Quantitative</td></tr>
<tr><td>Case studies
Community maps with PRA tools</td><td>Data tables
Percentages
Graphs</td></tr>
<tr><th colspan="2">Data Presenting</th></tr>
<tr><td>Qualitative</td><td>Quantitative</td></tr>
<tr><td>Case studies
Images
Figures
Diagram
Maps
Community maps</td><td>Data tables
Graphs
Charts</td></tr>
</table>

3.2. Data collecting

3.2.1. Participant observation

To ensure the most accurate understanding of the livelihoods of the villagers in the area, the use of *participant observation* will be employed. The researcher becomes a part of the culture/social life that is being studied (Bryman, 2008, p.401), and it provides the researcher with a chance to look at the interaction between different parts of society from within, as well as the importance of the KFG. On the other hand this method is helpful to understand the current situation of the KFG and their distribution.

This method has used to identify flora and fauna species in the KFGs.

3.2.2. Key informant interviews

"This research method requires a great deal of time for data collection, in rural villages. This is much more effective than any other research method" (Kumara, 2009, p.17). Thus these interviews will be useful to collect particular data from well-experienced, knowledgeable (traditional knowledge) villagers and other informants. Bryman (2008, p.409) has also recommended this method as a more effective qualitative collecting method.

3.2.3. Semi-structured interviews

Farmers, village chiefs, government officials, former researchers, NGO workers and other workers from development agencies and environmentalists can be used as interviewees. Bryman (2008, p.438) states that these interviews are suitable for collecting qualitative data effectively and for handling the interviews flexibly. The purpose of the interviews is to get a broader understanding of KFGs, their ability to improve villagers' livelihoods, the forest garden system's operational difficulties and peoples' adaptation interactions between community and environment (See appendance three no 4 & appendance two no 02).

3.2.4. Case studies (Oral history interview)

This method is used for qualitative data collection. Under this method, home garden owners will be randomly selected and interviewed on related topics in order to collect data about the deeper experiences of their lives (Bryman,2009,p.196). Data is expected to be collected about the history of KFGs, their utilization and effectiveness and the villagers' role in the relevant field. A

tape recorder will be used to collect the responses of the villagers properly. Case studies will be useful to reflect ground level reality without any bias (by quoting their own words). This will lead to the justification of research findings.

3.2.5. PRA Methods

According to Adebo (2000, pp.8-9), participatory rural appraisal (PRA) is a more effective and efficient method for data collecting and analyzing on forestry and agricultural studies. This method is important because it enables the community to recognize their potentials all by themselves.

Under the PRA method the following tools will be used for the research;

* **Transect walk -** A transect is a walk or a series of walks through an area with local informants to learn of the range of different conditions, problems and opportunities in each of the areas. This research used one transect walk to cover the study area from one side to the other side of the village.

* **Resources flow diagram** – this technique was helpful to identify the resources based on households and villages. According to Wijeratne (2005) this is very important to understand recourses background of the community and to plan how to use them properly (See appendance three no 01).

* **Benefits chart** – this chart shows the relationship between KFGs and the community and their socioeconomic practices.

* **Crops calendar -** it helped to demonstrate agricultural activities over the year. This calendar shows community activities related to KFGs.

* **Seasonal calendar -** it attempts to establish regular cycles or patterns of activities and occurrences within a community over 12 months (Mikkelsen,1995). This tool shows that *Meemure* seasonal calendar is related to KFGs.

* **Male and Female daily routine-** this chart depicts male and female daily activities on KFGs. This daily routine gives an idea about the labour force of the KFGs.

* **Historical profile charts-** these charts are used to identify the evolution of KFGs, population and households, animal husbandry, harvest, forest utilization and government institutions. Wijeratne (2005) points out that it is very useful for planning.

* **Venn Diagram-** A Venn diagram shows the relationship between individuals, groups and institutions in a community as perceived by the people (APO,1994). It is made up of touching or overlapping circles of various sizes, with each circle representing an individual or institution. The size of the circle indicates their importance and the overlap indicates the degree of contact or inclusion in decision making (Adebo,2000). This helped in the formulation and implementation of forest policies at the local level, as well as in identifying community involvement for forest projects.

3.2.6. Questionnaire Survey

This is the main method for collecting quantitative data and it may play a supportive role in this study. According to Bryman (2008, p.230) a questionnaire survey as a quantitative data collection method is helpful to collect numerical data from the people. In this study it will help to collect and measure villager's income, harvest of KFG, agricultural seasons, land size and relationship with other variables etc. Twenty (20%) out of the total 115 households will be covered under this method. Twenty tree (23) questionnaires will be distributed among the households (See appendance three no 02 & appendance three sample of the questioner). The simple random sample type will be used to select the households (Bryman, 2008, p.171). The selection will depend on the list of the households issued by the GN officer (Village Government Officer,2012).

Simple random sampling technique is used for the questionnaire survey. According to simple random sampling technique "each unit of the population has an equal probability of inclusion in the sample" (Bryman, 2008, p.171).

3.2.7. Secondary data sources

For this research secondary data are very important. Literature, like government and local documents, documents from NGOs or other organizations that have partly been responsible for

the management of the KFG systems at one time, and other literature from previous researches on this topic, would also provide interesting and possibly important information relating to our research topic.

3.3. Data processing and analyzing

This research mainly depends on primary data which is collected from qualitative tools. However quantitative tools will also be important to reflect the findings of the research in a more effective manner. Questionnaire survey and quadrate method are used to collect data and SPSS 14 software to analyze them.

Arc View 3.2 (GIS) software is used to analyze data through maps to identify the study area and related phenomena. CorelDraw drawing software used to draw household plans, community maps and diagrams to portray the forest gardens and related location.

As a method of qualitative data analysis, case studies are used within the box under the particular topics.

3.4. Data presenting

Maps, data tables, charts, diagrams, figures, pictures, and community maps and diagrams come from PRA used to present the analyzed data properly.

Conclusion

The research methodology includes qualitative and quantitative methods. Hence, the research methodology can be enlisted neither as qualitative nor as quantitative, but as a mixed method research. Thus, it comes under combining qualitative and quantitative research (Brymen, 2009: 602-659). The Research methodology chapter comprises of four main sections, namely, determination of the research, the data collecting process, the data analyzing process and data presenting**.** Both pilot survey and literature survey are used to determine the research and subsequently research area, research problems, data collecting methods etc., were designed. The two components of the data collecting process, primary data collecting, and secondary data collecting reveal how information was gathered. Primary data is collected through questionnaire survey, PRA methods, case studies, and participatory methods while secondary data is collected through publications, maps, reports and other unpublished documents, and sources from internet.

Statistical analysis methods, and selected case studies are used for data analyzing process and maps, figures, table, pictures, etc., are used to present data.

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Chapter 04

Study area

4.1. Introduction

This chapter consists of three main parts, (i) Village *Meemure* (ii) Kandyan Forest Gardens (KFGs) and (iii) *Dumbara* Reserve which surrounds the village referred to in above. These three zones which interconnect with one another have contributed in time immemorial to the living conditions of Kandyan communities owning gardens and on the other hand have conserved the forest. Moreover, customary practices directly joined together with the forest and the Kandyan gardens in the community. This chapter deals with physical, socio-economic and cultural backgrounds of the region.

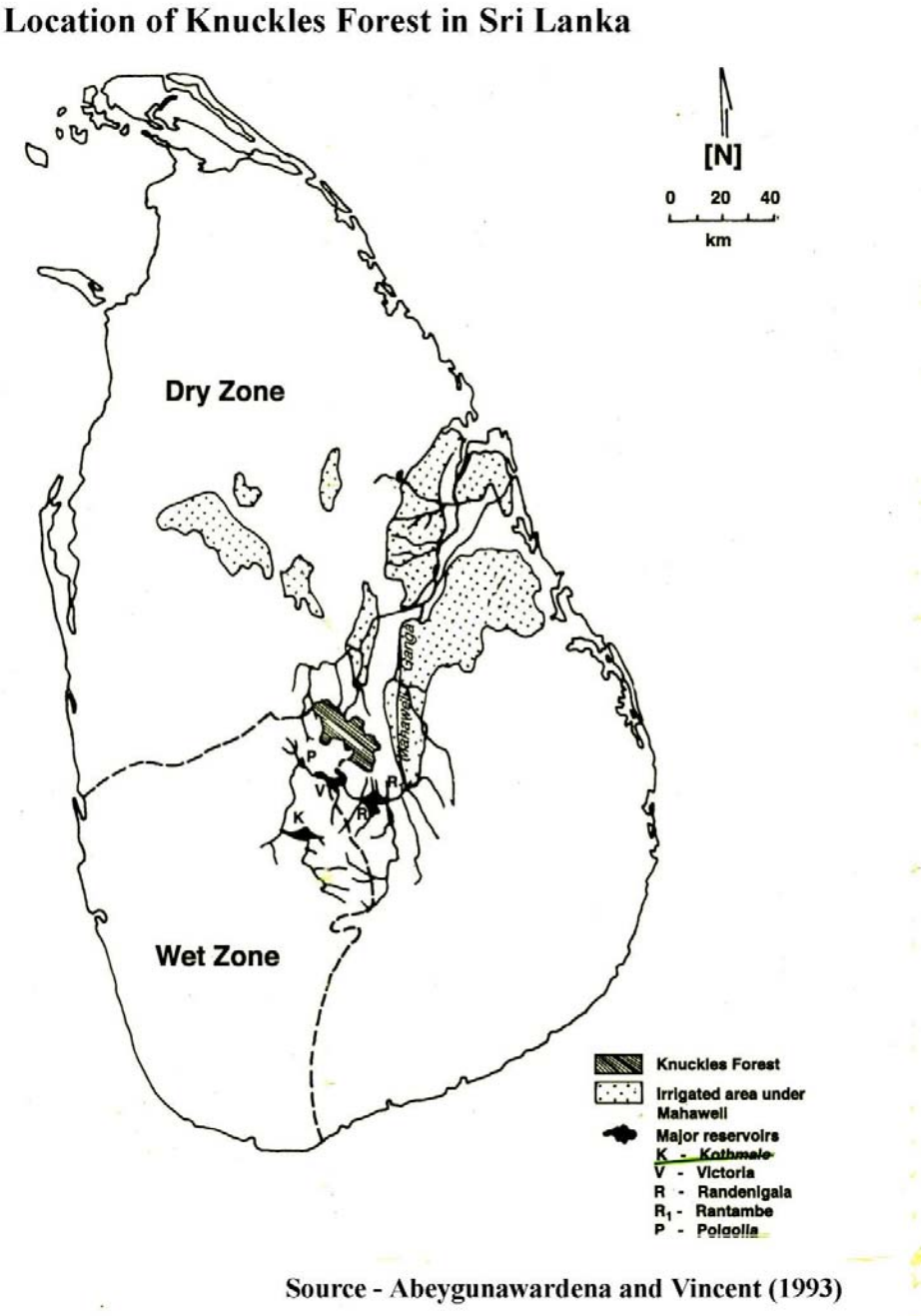
4.2. Village Meemure

Meemure is one of the most remote villages in Sri Lanka and is situated 14 km from the town of *Loolwatte*. This village is the study area for the research. The practice of KFGs still remains unchanged in this village and a large number of people cultivating staple crops like pepper, cardamom, paddy and ginger, depend on it.

Meenure is a *Garama Niladari* division (GND-893) situated in the *Udadumbara* assistant government agent division (AGAD) in Kandy district in Sri Lanka. It is located within the Knuckles Forest Reserve. *Meemure* is a typical traditional Sri Lankan village with an exceptional natural beauty. 'the simple architecture of the houses with thatched roof and granaries to store their gain harvest ,traditional home gardens that emulate the forest , and the beautifully terraced paddy field are typical of the landscape in these villages' (Forest Department,2003).

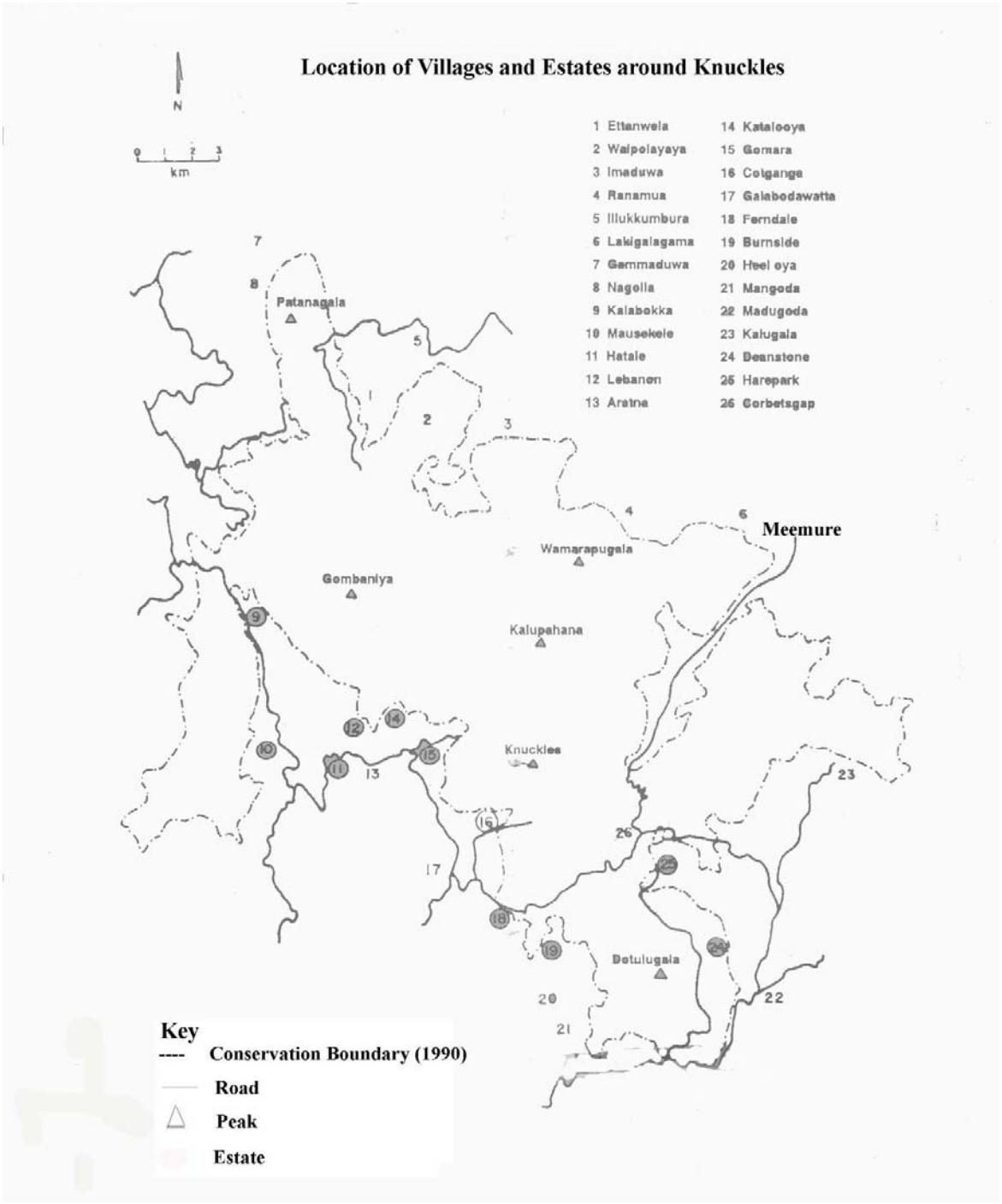
Picture 3.1: Landscape of *Meemure* Village

Map 4:1 Location of the study area I



Source - Abeygunawardena and Vincent (1993)

Map 4: 2 Location of the study area II



Source: Forest Department,2007

The total population of the village according to reports of the Grama Niladhari (2012) is 334. Total number of families is 115 and the number of houses occupied by them is 96. Analysis of population data shows a considerable decrease in population of children. The standard of education indicates that the majority lacks formal education.

Table 3:1 Population profile and education level of *Meemure*

	Age level and education level			
01.	Age Category	Male	Female	Total
	0 -5	06	08	14
	5 – 15	20	22	42
	16 – 29	30	32	62
	30 – 60	75	79	154
	Over 60	29	30	59
02.	Education level			
	No Schooling	29	30	59
	Grade 5 – 7	22	25	47
	Grade 8 – 9	31	36	67
	Grade 10	40	44	84
	O/L	19	20	39
	A/L	11	15	26
	University Education	1	0	1
	Total	313	341	654

Source: GN Reports, 2012

This state of affairs has directly affected the profession. While the majority is engaged in agriculture and traditional rural employments the rest which comprises those who hold state and private sector employments are the least paid. Even the industrial sector is immediately connected with occupations of agriculture and traditional ways of wage-earning. In consequence agriculture occupies an important position in both these fields.

Table 3:1 Occupation profile of *Meemure*

01.	**Occupation Profile**	**Job Opportunities**
	1. Government Jobs	8
	2. Agriculture	250
	3. Kithul related industries	15
	4. Private Sector	25
	5. Mason	12
	6. Traditional industries	10
	7. Tourism	4
02.	Industries	Families
	1. Traditional industries	10
	2. House Hold industries	15
	3. Rice Mills	2
	4. Tourism	04
	5. Sowing Garments	02

Source: GN Reports, 2012

4.3. Use of land and animal husbandry

This village lies in the Knuckles Forests Reserve. As a result the area belonging to this Grama Niladhari Division is comparatively large. The land this division possesses can be divided into two main sectors. Namely it includes the state owned land and community-owned land.

Table 3:2 land use pattern of *Meemure*

01.	**Government Lands**	**Land Cover (Acores)**
1.	Reservation Forests	4000
2.	Pathana (Savanna)	500
3.	Forest Plantation	05
4.	Land that under the Rule of District government officer	50
02.	Common Land use Pattern of the Area	Land Cover (Acores)
1.	Forests	4400
2.	Forest Plantation	05

3.	Territorial Cultivated Lands	600
4.	Cultivated Paddy Lands	200
5.	Uncultivated Paddy lands by Personal Owners	150

Source: GN Reports, 2012

The community-owned land is diminutive relative to the natural reserve. It is utilized for growing various crops. These crops can be divided into two kinds i. e. permanent and temporary.

Table 3:3 Agricultural land use pattern of *Meemure*

	Type of crops	**Land Cover (Acores)**
01.	Permanent Crops	
	1. Pepper	150
	2. Coconut	50
	3. Cardamom	150
	4. Beatle and Palm	15
02.	Seasonal Corps	Land Cover (Acores)
	1. Paddy	180
	2. Kurakkan	05
	3. Manioc	03
	4. Banana	25
	5. Corn	10

Source: GN Reports, 2012

"Kandyan forest gardens" comprise crops of both these kinds. Not only crops but also a multitude of various other wild tree species can be pound in these gardens. The same pattern of land use has favored even the needs of rearing animals.

Picture 3:2 People of *Meemure*

Table 3:4 Horticulture practices of *Meemure*

	Type of Horticulture	Amount of animal
1.	Water Buffalos	350
2.	Cattles	40
3.	Poultry	About 50
4.	Bee keeping	About 11 Bee colonies

Sources: GN Reports, 2012

It is the water buffaloes that yield the fundamental needs of agriculture, of labour and of food habits depending on milk. Due to geographical isolation and also due to arduous road systems buffalo bulls are being utilized for transport of goods. Bee-keeping is found but infrequent.

4.5. Water sanitary Facilities

Out of 115 families almost 113 have water closets. Most of them have been constructed especially by intervention of the state. While spring water is used for the purpose of drinking and washing 10 protective wells also have been dug. In addition to this rivers and other streams common in the area too fulfill the needs of the community. Some houses have independently obtained their supply of water in private directly from the reserve by means of pipes. Nearly 70 houses in the locality receives electricity by means of a small Hydroelectric power station and a biogas power station. As regards the other houses sources of energy include Solar cells, Kerosene, and firewood.

4.6. Other resources and community organizations

As the road system is troublesome in the area one has to travel 33km to reach the nearest town. Almost every road found in the village is a foot path. However, the community has ability to accomplish their transport facilities. The following table shows their capacity.

Table 3:5 Transport facilities by people in Meemure

	Vehicle type	Number of vehicle
1.	Motor bicycle	08
2.	Three wheelers	06
3.	Van	01
4.	Cabs	01

Sources: GN Reports, 2012

Principal government offices in the village include Meemure Primary School, the office of the Grama Niladhari and that of samurddhi Niladhari. Though there is also an office of Agriculture Research and Production Assistant the community has not received any expected benefit out of it. Apart from these three offices the community has set up about 9 community organizations, a majority of which deals with agricultural activities of the village.

4.7. Socio-cultural background

The history of the village Meemure, which is geographically isolated, goes back to pre-historic times. Despite its geographical seclusion the village has had relations with almost every ancient kingdom in the island. (Gunasekara,1959,13; Davy,1815,22-25) (Lowrie, 1889,59v), (Corray,1998,. Again it is for the geographical isolation that the locality shows unusually distinct cultural identity which is of course absent in the major culture (Rajapaksha, 2007). This distinction is clearly seen in language, beliefs, customs and pursuits of agriculture and animal rearing .Moreover, among these people distinctions in socio-cultural identities are clearly manifest. The Devalaya and the temple dedicated to the *Kande Deviyo* (the god of the hill) display the nature of their spiritual obligations and in turn they are directly linked together with their consumption which is agriculture and of forest resources (Rajapaksha, 2007).

Picture 3:3 *Kadulla* (Traditional Gate) and *Kande Davalaya* (the God of the hill temple)

Source: Karunaratne, 2013

4.8. Kandyan forest gardens: Meemure

A study of forest gardens of Meemure will enable one to identify the changes that took place in Kandyan forest gardens (KFG's) since their very inception up to date. Characteristics of Kandyan forest gardens can be identified out of the remainder of Kandyan forest gardens of Meemure. Kandyan forest gardens of this village has two main features,

01. Kandyan forest gardens with houses (K H G)
02. Kandyan forest gardens without houses (K F G)

Some researchers have tried to present this as two separate concepts(Wickaramasinghe,1990; Bandara,2000), determined by them as (i) K F home gardens with a house KFG,s and (ii) gardens without a house KFG,s (Hitinayake,1999;Perera and Rajapakse,1991). In Meemure one finds gardens of both these types and KFG has been used without distinction to denote both of them. The reason being that the fundamental characteristics very often happen to be one and the same.

KFG,s of Meemure consists of three main components,

01 house
02 gardens
03 fields

The land comprising, these components does not exceed 60 perchs in extent. (Petition submitted to the government by villagers,09.01, 2011). This extent corresponds to the previous study of KFG,s.

4.9. Development of KFG,s ,Meemure

A number of stages with regard to this development can be identified. By 1950 Chena cultivation (local shifting cultivation practice in the forests) pursued in the forest was the major source of livelihood. With the ban enforced by law of forest conservation on the use of land chena cultivators' emphasis came to be paid more on KFG. Because they did not have other suitable lands to fulfill their needs. In consequence all food crops, medicine, timber and Non Timber Forests Products (NTFP's), animal husbandry came to be restricted to KFG.

This situation had been predominant until 1990 following when "pepper" was introduced as an economic crop in these home gardens. As a result crop diversification which had been typical of the past was replaced by concentration of agro- economic activities on a single crop. By now (2013) the major crop grown in these gardens has become "pepper" in which cultivation primitive features can still be found. By this time these gardens have faced the danger of fragmentation owing to population explosion.

Highlighting of the potential of KFG for the purpose of rural development and conservation is a timely need which must be accomplished as a prelude to agro-forest cultivation on the basis of principal characteristics of KFG, i. e. economic, social, cultural and environmental factors.

Conclusion

This area is a locality with an economy based on agriculture, and KFG is its principal component. Further, modernization , increase in population and monoculture have threatened KFG's. Direct relation between the laws of conservation and KFG also can be identified. Ban on chena cultivation has attracted the community more towards KFG. A better background through KFG can be identified in this locality as a village lying in the forest where community participation, forest management and rural development are concerned.

Chapter 05

Utilization of KFGs

5.1. Introduction

This chapter identifies the current utilization of the Kandyan Forest Gardens (KFGs). It is described under five main divisions and sub-divisions. The chief classification includes cultivation, animal husbandry, timber, non-timber forest products (NTFPs) and non-domesticated flora and fauna. Under each section utilization is presented broadly where in the capacity of KFG for producing environmental, social and economic stability is made clear. Finally it has discussed community ideas on KFG and its effectiveness and efficiency.

5.2. Cultivation

Cultivation in the area is of three kinds, namely,

* Gardens (KFGs)
* Fields
* Chena and other

While 100% the community owns forest gardens, only 78.26% of the population owns fields. In other words 18 families only own fields. Traditional Chena cultivation is no more practiced in the region but picking of crops is occasionally done in the abandoned chenas. The term "other" mentioned under 03 above stands for common pastures meant for animal husbandry created by clearing and burning the forest and then by supply of water.

The table No.5.1 given below present major crops of village Meemure , labour utilized and income gained.

Table 5:1 Cultivation types of KFGs

Type of Cultivation	Labour force*	Community involvement	Purpose**	Annual Amount***	Annual Income (Rs.)***
Paddy	F	78.26%	S	1000kg	NA
Pepper	B	73.91%	M	100kg	30000
Betel &Palm	F	63%	B	1000 nuts	2000
Coconut	F	71%	S	NA	NA
Other	F	30.34%	S	NA	NA

Source: Questionnaire survey data Analysis,2013

Key;

***F-Family labour only**
B- Paid labour force

****S- substitute only**
M-market only
B-above both

*****NA-not analyses**

According to these data the majority of crops are used for daily consumption. Pepper and Areca are the only economic crops. Minor crops such as plantain and clove etc are given under "other". These crops are maintained by family labour and thus involve lesser cost.

5.1.1. Paddy cultivation

78.26% villagers are engaged in cultivation of a paddy. Four families out of the above are half – share farmers. It is an old feudal system based on land utilization. Paddies are cultivated twice a year, i, e. *Yala* season and *Maha* season in "terrace" fields prepared according to the slope of land. Both water buffaloes and manual labour are employed to prepare land and in addition traditional exchange of manual labour also exist.

Picture 5.1 Terrance paddy lands and plough

Source: Karunaratne, 2013

Traditional seeds, organic methods of cultivation and old methods of control of pesticide which were employed in the past are the least in use now. As a result the cost of production of paddies has greatly increased. In consequence there is an aversion on the part of the farmers towards paddy cultivation. The old paddy land called *"Dandenikumbura"* has already been abandoned (Forest Department,2003). Paddy fields in Meemure are found joined with the garden. It is a notable ecological system of its own created by man in accordance with variant topography and correlation.

5.2.2 . Pepper

This is the most prominent and noted economic crop found in gardens at present. Once a year it yields crops of which the annual income is about Rs.30,000/=. The income depends on the extent and maintenance of the garden. Pepper was introduced in the early part of the decade 1970 and it directly diminished the diversity of crops existed in old gardens. Insecticide, weed killer, and fertilizer are integral parts of their cultivation. Hence the cost of production is very high. Another tendency that exists at present is utilization of labour invading wages to cultivate extensive fields.

5.2.3. Areca nuts

This area has been celebrated for Areca from the distant past (Karunarathne,2013) . Areca is a common palm tree found on garden boundaries, on both sides of roads, and on peripheries of forests. The crop is used for daily consumption (chewing betel) as well as for sale. Areca mainly yields once a year. Except for preparation for sale cultivation of the crop it involves no cost. In consequence the profit is net.

Picture 5.2 Mixed crops and Areca

Source: Karunaratne, 2013

5.2.4. Coconut cultivation

This is the very example expressive of the great antiquity of gardens. Almost every garden has several old coconut trees. Although the growth is not fertile the yield is enough for daily consumption.

5.2.5. Other crops

Domesticated minor export crops and other food crops are presented under this category. While jackfruit, Breadfruit, Manioc (Cassava) Kiriala,(Yam)etc. are major food crops Clove, Ginger, Turmeric, and cardamom are treated as minor export crops. These are grown in gardens as minor crops and mostly meant for subsistence.

Picture 5.3 Forest and KFG green cover/Pepper cultivation

Source: Karunaratne, 2013.

5.3. Animal husbandry

This can be divided into four main sections, namely

- Water buffalo farming
- Rearing cows
- Rearing domestic fowl
- Bee keeping

56.52% of total households are engaged in animal husbandry.

The table 5.2 given below presents fundamental information about the animal husbandry in the study area. All these modes are based on gardens.

Table 5:2 State of animal husbandry of KFGs

Type of Animal	Labour force*	Community involvement	Purpose**	Annual Amount***	Annual Income (Rs.)***
Buffalos	F	90%	1	NA	NA
Cattles	F	10%	2	50*l*	NA
Poultry	F	11%	4	NA	NA
Bee Keeping	F	8%	3	50*l*	5000/=

Source: Questionnaire survey data Analysis,2013

Key;

***F -Family labour** ****1-labour and curd** **3-Sale**

*****NA- Not analysis** **2 – Milk** **4- Egg and meat**

According to this table 90% of the persons rear water buffaloes to utilize their labour to grow paddy and to obtain milk and manure. Other modes are but minor and fulfill daily objects of consumption. They are managed by the labour of the family.

5.3.1. Rearing of water buffalo

Although the farming was carried out at the beginning (prior to 1980) on patana land (Savanna)of the reserve now it has been shifted to gardens. Every garden has a shed and a storehouse for fodder for water buffalos. Dung is used as manure in the garden while milk and curd meet needs of the family. Some public dispatch the animals to forest after ploughing and get them back again when in need.

5.3.2. Rearing cows

About 10% of the total families rear cows to transport goods (by caravan) and for milking. For keeping these animals gardens are being used instead of the patina (Savanna). These cows are pure-bred local ones and though the yield is less, interviews have revealed that the animals are subject to disease in the least because of their good treatments based on local knowledge.

5.3.3. Keeping of domestic fowls

These animals are local and they fulfill nutritional needs of the family. They freely move about in the garden and are usually not kept in a cage. Their source of food is the garden itself.

Picture 5.4 Buffalo hut and beehive

Source: Karunaratne, 2013

5.3.4. Bee keeping

This is accomplished by means of traditional knowledge and experience. No methodological way of bee-keeping is followed. Instead of “logs of Jaggery palm trees “with both ends covered are placed on trees to which bees attract. The harvest is gathered once a year (in May) . Although there is a high potential for bee keeping in forest gardens no interest has yet been taken to do so.

Spread of bee keeping makes both pollination swift and harvest richer. 17.39% of the local families are engaged in this vocation.

5.4. Timber production

Gardens provides about 50% of the Sri Lanka's demand of timber. (Parackrama, 1996) In this locality almost 100% of timber needs are fulfilled by gardens. The necessary permits for felling timber are obtained from the Grama Niladhari of the division. Timber thus obtained in no circumstance is sold elsewhere but utilized for the needs of the particular family. Table 5.3 provides detailed information on timber coming from gardens. Trees which give timber have been introduced to gardens.

Table 5:3 State of timber utilization of KFGs

Type of Timber	Labour force*	Community involvement	Purpose	Annual Amount***	Annual Income (Rs.)***
Planks	F/B	100%	1	NA	NA
Other Timber	F/B	100%	1,2,3	NA	NA
Rods or sticks	F	73%	1,2,3	NA	NA
Other	F	32%	1,3	NA	NA

Source: Questionnaire survey data Analysis,2013

Key;

***F-Family labour only**
F/B-Family and paid labour force
*****NA-not analyses**

1- Constriction of houses
2- Making furnitures
3- Agricultural needs

Trees commonly used as timber include Mahogany *(Swietenia macrophylla),* Jackfruit *(Artocarpus heterophyllus Lam),* Liyang*(Homalium zeylanicum),* Milla *(Vitex pinnata L)* etc. "Mahogany" is the commonest tree grown in gardens at present.

5.5 Non-Timber forest products

The topic is presented in three sub-topics according to the nature of application of the product, i.e.

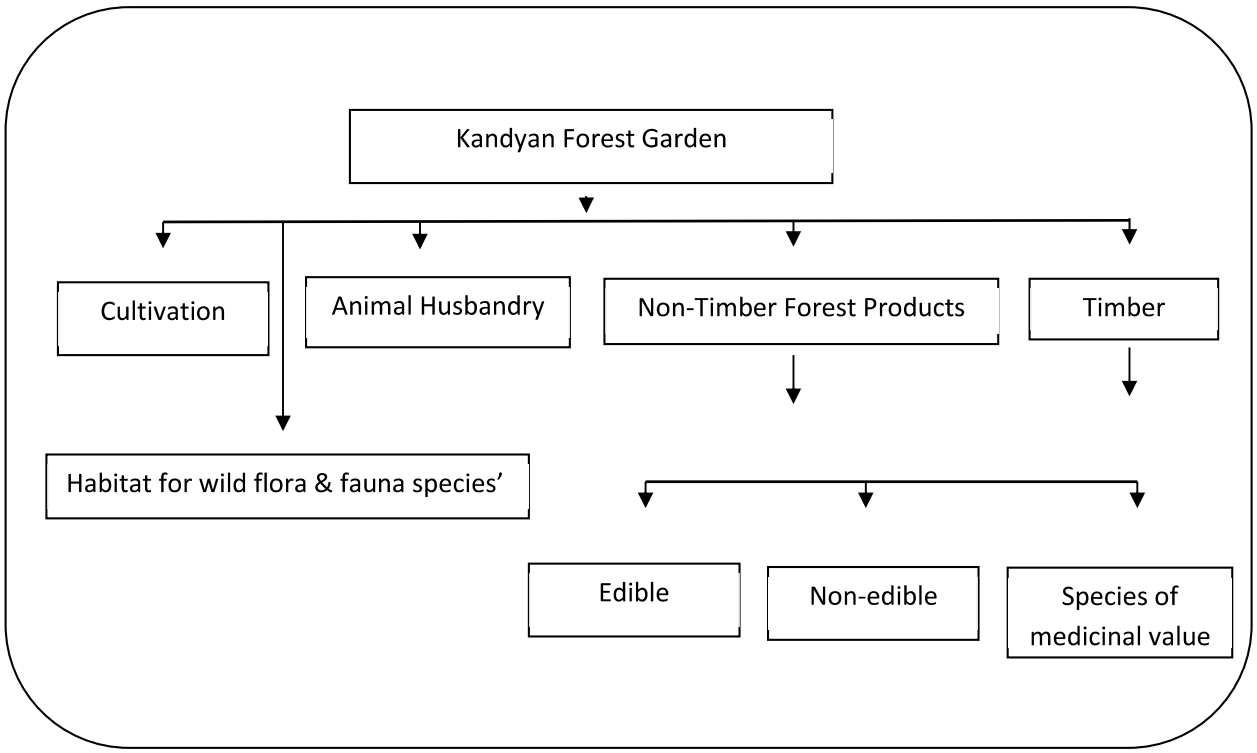
i. Edible products
ii. Non-edible products and
iii. Products of medicinal value.

Each is once again sub-divided under a classification of its use.

5.4.1. Edible non-timber forest products

This category is again sub-divided into five sections; quantitative analysis of data pertaining to this classification is dealt with under figure 5.1. Each of these sub-divisions are shown separately (See appendance one more details).

Figure 5.1 Divisions of Edible non-timber forest products in KFGs



Source: Questionnaire survey data Analysis,2013

Table 5:4 Non-timber forest utilization of KFGs

Type of NTFP	Average of community involvement	*Labour force	Collected material	Products	**Purpose	***Average of produced amount	***Average annual income (Rs)
Kithual Palm	65.22	F	Sweet toddy	Jaggery	M	40Kg	20000.00
		F	Sweet toddy	Treacle	M	60*l*	20000.00
		F	Sweet toddy	Toddy	S	NA	NA
Condiments	73.91	F/R	Mature fruits	Pepper	M	50Kg	15000.00
		F/R	Mature fruits	Cardamun	M	30Kg	24000.00
		F	Ripped fruits	Goraka	S	70Kg	NA
		F	Fruits/barks	Spices	B	NA	NA
Green vegetables	52.17	F	Leaves	Vegetables	S	NA	NA
		F	Fruits	Vegetables	S	NA	NA
		F	Other	Vegetables	S	NA	NA
Fruits	78.26	F	Fruits	Ripened fruits	S	NA	NA
			Seeds	Ripened fruits	S	NA	NA
			Other	Ripened fruits	S	NA	NA
Substitute food for staple food	30.43	F	Fruits	staple food	S	NA	NA
		F	Seeds	staple food	S	NA	NA
		F	Roots	staple food	S	NA	NA

Source: Questionnaire survey data Analysis,2013

Key;

***F-Family labour only**
R- Labour from rent

****M-Marketing**
S-Substitute
B- Both

*****NA- Not applicable**

5.5.1.Tapping of Jaggery palm (*Kithul Tapping*).

Toddy tapping is one of the oldest industries in Sri Lanka. It is strictly speaking an industry depending on traditional knowledge of the community and on the distribution of the palm tree. In Sri Lanka toddy tapping of Jaggery palms can be identified as one of the main sources of income of the community living on the wet rain forest boundary (Premakumara et al.,1996; Kumara,2010 Karunarathne,2009&2012; Wickramasinghe,1991).

Even when community participated forest management programmes are introduced remarkable attention is being paid to tapping of Kithul(Jaggery palm) toddy (Karunarathne,2009;Kumara,2010). The Sri Lankan Government is also making provision so as to develop Jaggery palm related products as a rural economic development strategy (Department of Jaggery Palm development,2012).

Meemure has been famous for Jaggery palm tapping (industry) since ancient times (Rajapaksha, 2007). The reason why it is so is that, the place is abundant in distribution of the tree and also the community possesses the necessary knowledge as to utilize it.

Picture 5.5 Kithul tapping and its products

Source: Karunaratne, 2013

Because the jiggery palm products have a great demand and are given the patronage of the state the community is further encouraged in toddy tapping. These trees are found in their gardens. The distribution of the trees is a natural occurrence. 65.22% of the community is engaged in tapping the kitul (jaggery palm) toddy. The necessary knowledge and labour needed for the task come from the family itself. Toddy tapping is usually done by the husband. The role of the wife is to prepare toddy as treacle or jaggery. In addition toddy is made as a medicine and liquor but not for market Provided there is no obstacle, say of climate changes of animal damages who take a fancy to toddy or of the like and thus the tapper could continue his task the annual yield of a single palm tree will be around Rs.75,000-100,000. But as the person responsible for this industry is taking a great risk it involves both peril and impermanency. Exploitation on the part of the middleman and withdrawal of the young from the industry has become obstacles to it.

The Kithul (Jaggery palm) tree which has naturally distributed over the Kandyan forest gardens has directly contributed to economic needs of the community.

5.5.2. Condiments

Pepper, Cardamom and Goraka (dried fleshy fruit used in cooking) can mainly be identified in forest gardens. Pepper was introduced as an economic crop after 1970. In addition, trees such as clove also can be found in forest gardens. It has been found that 73.91% of the community fulfill their needs of spices out of forest gardens, i . e. for both purposes commercial and daily family consumption. The daily need of spices does not obviously involve a cost of production since it is fulfilled by the forest garden. In return the cost thus saved can be invested in something else.

Picture 5.6 Cardamom bushes, Coffee and Cinnamon

Source: Karunaratne, 2013

5.5.3. Green vegetable

These are simply for daily needs of food. Green vegetables include Green leaves, Various kinds of Yam , Mushroom, and other vegetables. While 78.26% of the community depends on various kinds of Yam coming from forest gardens, 52.17% and 30.43% of them get respectively green leaves and mushroom out of them.

All these food items are available right through the year and even if there is a shortage of major kinds of food the former will suffice for subsistence. The reason is the diversity of food crops in these gardens. It is the most remarkable feature of Kandyan forest gardens (KFG's).

Picture 5.7 Green vegetables and Mushrooms

Source: Karunaratne, 2013.

5.5.4.Fruit

78.26% of the community annually picks fruit from their gardens. The common kinds of fruit include Pineapple, Papaw (Papaya), Orange, Narang, (a kind of orange smaller in size), Himbutu (a fleshy plum- like fruit) native to Sri Lanka, Plantain and great variety of other forest nuts. Even these are not meant for sale but merely for daily consumption.

Picture 5.8 Jack fruits, dry jack fruits and dry breadfruits

Source: Karunaratne, 2013

5.5.5.Substitute food and staple food

Jackfruit, Breadfruit, Wild breadfruit, (Keledel), Madu (*Cycus circinalis L*) and cereals other than rice include these crops. The cereals other than rice are grown in forest gardens but to a lesser degree amounting to 17.39% . They include Maize, Kurakkan, Amu (*Paspalum scrobiculatum*), and Meneri (Millet). The community meets its needs of Breadfruit and Jackfruit from forest gardens. Madu- Cycad- is very common in the region and its tender leaves and seeds are a nutritious food. The community makes use of its traditional knowledge of this tree so as to prepare a variety of dishes from it. Jack fruit, Bread fruit and Cycad become the communities' main dishes during prolonged wet weather. However with the tendency to destroy the Cycad in preference to pepper which has now become the major economic crop both food production and the conservation process based on the former has faced the danger of collapse.

Picture 5.9 Cycad (Madu)

Source: Karunaratne, 2013

Picture 5.10 processed Goraka, Cinnamon and Pepper

Source: Karunaratne, 2013

5.6.Non-edible forest products

100% of the community meets its NTFs needs from its forest gardens. It is possible that the forest garden attracted the special attention of the community with the ban enforced by the government on the use of the forest surrounding the village. The use of forest gardens is divided in to five kinds.

Picture 5.11 Cane is a main resource for handicrafts

Source: Karunaratne, 2013

Table 5:5 State of Non-edible forest products of KFGs

Type of NTFP	Labour force*	Community involvement	Purpose**	Annual Amount***	Annual Income (Rs.)***
Fuel Wood	F	86.96%	S	NA	NA
Binding Materials	F	65.22%	S/M	NA	NA
Resin or Oil	F	34.78%	S/M	NA	NA
Agriculture Needs	F	86.96%	S	NA	NA
Shelter	F	43.48%	S	NA	NA

Source: Questionnaire survey data Analysis,2013

Key;
***F- Family labour **S-Subsistence**
M-Marketing
*****NA-not analysis**

Firewood, various creepers, used as binding materials, resins or oils, tools used in agriculture and thatching and construction. Each of these is dealt with as follows;

5.6.1.Fire wood

It is again the forest gardens which determine 87% of the communities' firewood needs. The tree called "Ginisirsya" is the principal source of fuel besides the dried trees and branches of forest gardens. In consequence the community is able to fulfill its cooking needs of fuel easily and shortly without turning on the forest. Collecting, arranging and storing of firewood seem to be a women's job.

5.6.2.Binding materials

Wild binding materials needed for construction of houses, temporary huts and cottage industries can be had from forest gardens. Bamboo and Cane are fore most in this regard. Productions of various tools meant for domestic use by means of these binding materials are of common occurrence. 65% of the community collects these materials from its gardens.

5.6.3.Resins and Oils

As folklore alludes the name of this village itself is suggestive of its immemorial reputation for the production of "Mee thel" (Mee oil) i.e.Meemure (Rajapaksha,2007) Unusual techniques of

making these oils peculiar to the region are in use even today. Oils thus obtained are used for cooking as well as a source of producing light.
Collection of resins right through the year is not found. The resin secreted by the tree Kakuna is used not only for lighting lamps and torches but also as a source of incense. But at present simply 5% of the community collect these things.

Picture 5.12 Collecting firewood, vines and pest control trap made by bamboo

Source: Karunaratne, 2013

5.6.4. Production of tools necessary for agriculture

98% of the equipment especially used in agriculture are made of timber. The villagers know the kind of timber suitable for each particular tool. The timber needed for these tools comes from forest gardens. Even the tools meant for protection of crops are made of timber. 87% of the community collects wood, binding materials etc. necessary for various agricultural activities from the forest garden.

5.6.5. Thatching materials

Materials employed in thatching include Straw, Mana (kind of grass) , and Iluk (a kind of grass). Use of Straw for this purpose is naturally restricted to the period following harvest. Mana and Iluk are obtained from pastures lying on the peripheries of the forest.
These items of grass are frequently used for thatching storehouses of firewood, cattle sheds etc.. These materials which once served as roof coverings are historical now.

5.7. Plants of medicinal value

Robert Knox remarks that Kandyan people are exceedingly skilled in medicine and all what they need is a few leaves and the bark of a tree and the forest is the storehouse of medicine of the Sinhalese (Karunaratne,2003).
The village Meemure has been famous since ancient times for traditional medicinal practices such as Snake physiology, Oculistic science and Osteology. This traditional indigenous medicine is handed down from father to son or from generation to generation and thus the

subject is not been taught to the non-member of the family. As the use of the forest which once yielded medicinal herbs trees has been banned a tendency has emerged among the community to grow the same in their own gardens. Table no 5.5 indicates the number of tree species used by the community under each category coming under the classification.

Table 5:6 Medicinal plant usages of KFGs

Type of Flora	Average No. of species	Labour force*	Use parts of the plants** (%)					
			1	2	3	4	5	6
Trees	30	F	45	77	22	16	12	63
Shrubs	38	F	30	80	29	39	74	89
Creepers	12	F	5	44	0	8	0	93
Vines	20	F	9	39	0	30	22	78
Other	19	F	55	74	20	49	21	51

Source: Questionnaire survey data Analysis,2013

Key;

***F-Family labour **1- Fruits 2- Leaves 3-Bark 4-Flowers 5-Roots 6- All parts**

According to this table it is pretty obvious that a great deal of tree species belonging to each of these strata is being used by the community as medicine. Actually speaking not only the native physician but also the ordinary villagers possess the necessary knowledge and skill using native medicine treatment.

Table No 5.7. Traditional knowledge associated with Medicinal plant usage

Purpose	No of Responds	Average of community involvement
1. Snake bite	6	26.08%
2. Remedy for minor injuries	23	100%
3. Medicine for Tonsillitis	18	78.26%
4. Medicine for Diabetes	12	52.17%
5. Remedy for skin diseases	16	69.56%
6. Remedy for eyes	11	47.82%
7. Medicine for Diarrhea	9	39.13%
8. Medicine for child diseases	17	73.91%
9. Medicine for pregnant women		
10. Bone injurious	21	91.30%
11. Veterinary	22	95.65%

Source: Questionnaire survey data Analysis,2013

Table 5.6 shows each of these medicinal herbs obtained from the home gardens and for which particular disease, injury, or calamity it is meant. These medicinal herbs are being used to treat not only humans but also animals.

Picture 5.13 Medicinal plants *(Pancratium zeylanicum L,Mumronia pumila White & Zeuxine regia)*

Source: Karunaratne, 2013

As the Sinhalese native medical practice essentially depends on these medicinal herb and trees the service the forest garden has to render is immensely important. It is the indigenous medicine which maintains a healthy labour force. One must not forget the amazing suitability of this medical practice in an area entirely cut off not only from town but also from country.

5.8. KFG by way of habitat of fauna and flora

Early on attention was paid to the socio-economic factors of KFG. But in case of the concept of sustainable development the “environmental factor” too has been unintentionally added.
KFG is a unique manmade ecosystem comprising various layers analogous to biodiversity of the forest types found in the region. The uniqueness of this ecosystem is that the species of fauna and flora necessary for various needs have been microscopically most sensitively introduce by man into each of those strata of which it consists. As a result an observer who is at a distance cannot distinguish the forest from the forest garden. Hence on this periphery of zones forest gardens act as a forest buffer zone. These forest zones have a great potential which could be used to develop community participated forest management programmes.

Here our attention is drawn to a few wild fauna and flora species we observed in KFGs. We had better first discuss about the tree species.

Table 5:8 Wild flora species of KFGs

Type of Flora	Average No. of species	*Purpose of utilized (%)					
		1	2	3	4	5	6
Trees	41	79	60	19	39	57	80
Shrubs	12	0	55	14	89	11	23
Creepers	8	0	0	5	67	22	8
Vines	6	0	0	35	55	70	76
Other	21	0	0	17	49	0	0

Source: Questionnaire survey data Analysis,2013

Key;

***1-Timber 2-firewood 3-Foods 4-Medicine 5-Agriculture 6-Binding and constructing**

The relevant table presents an abstract of data collected out of six gardens that were observed. Here the table shows wild floral species found in each layer subject to plant classifications. In fact this is similar to the layer of the forest.

Picture 5.14 Wild flora species *(Osbeckia octandra,Polypodium quercifolium C & Ocimum sanctum L.)*

Source: Karunaratne, 2013

Table 5:9 Wild fauna species of KFGs

Type of Fauna	Average No. of Species	6 a.m. - 6 p.m.	6 p.m. - 6 a.m.
		Day Time	Night Time
Mammals	6	4	2
Birds	18	16	2
Reptiles	9	9	-
Amphibians	2	-	2
Other	2	1	1

Source: Questionnaire survey data Analysis,2013

Picture 5.15 Wild fauna species *(Gallus lafayetii ,Cerves unicolor,Trachypithecus velutus)*

Source: Karunaratne, 2013

Table 5.9 gives an account of faunal diversity based on observations carried out day and night in six gardens referred to above. This clearly shows that KFG offers a direct support to conservation of the bio- diversity. This is in addition to socio- economic factors referred to above. Yet another significance attached to these gardens lies in the location of the village Meemure,i.e. The village is located as a strip of land in the middle of the forest. This kind of location naturally obstructs animal migration. But on the other hand owing to the presence of these gardens animals can proceed with their migration through them. It checks fragmentation of the forest. On the other hand animals while they are migrating do not risk to be wiped out.

Accordingly it is quite obvious that KFGs are not only of social, economic and environmental stability but also inherent in them is a remarkable potential which can be utilized for sustainable development.

5.9. Development potential of KFG as a community forest management approach.

Now it is generally accepted that good forest management cannot be accomplished without the participation of the community and that the active interaction of people is essential (FAO,2013). It is as a result of this issue the community forest management approach (CFM) sprang up:- "Community forest management refers to community – based activities which are geared towards the sustainable of forest" (Asia Forest Network,2010). Accordingly, it is clear that the approach in question has a remarkable capacity for development.

"Community Forest Management (CFM) is defined as all forms of forest and forest products managements by the communities applying traditional methods, organized into a community unit, a community-based business unit (cooperative in wider sense) or an individual (house

hold), with small scale up to medium scale, conducted in sustainable manner in their relation to production, ecological and social aspects (LEI, 2009:02)"

According to this definition CFM approaches vary from place to place. This approach can distinctly be identified in social, economic and environmental spheres and in turn it contributes to the sustainable development. Finally it fulfills the purpose of sustainable development. Hence two major fields are being covered by a fruitful and efficient community forest management approach.

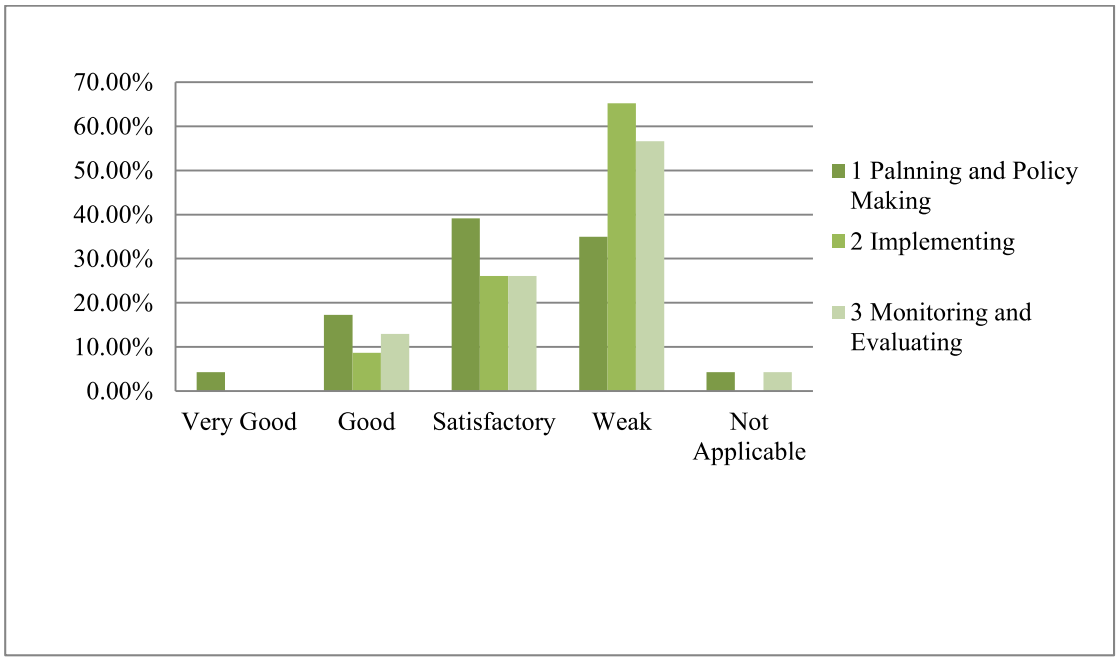
1. Sustainable Forest Management
2. Community Development then finally,
3. Sustainable Development

For the sustainment of the fields mentioned above efficient contribution of the community is expected by the CFM and it spreads out through a wide range commencing from policy making up to reaping of the outcome.
Kandyan forest gardens in Meemure which lies as a village in the jungle possess a great potentiality of improving up to Community Forest Management Approach. The reason is that KFGs owe their development to the close contact they had with the community for an exceedingly long time also gaining a direct knowledge of it.
How to adjust these gardens to modern needs is to be studied. To do so it is necessary to identify the relationship the community has with the KFG and their attitudes towards it. The following is such an analysis of attitudes arrived at a survey done by means of questionnaires.

.

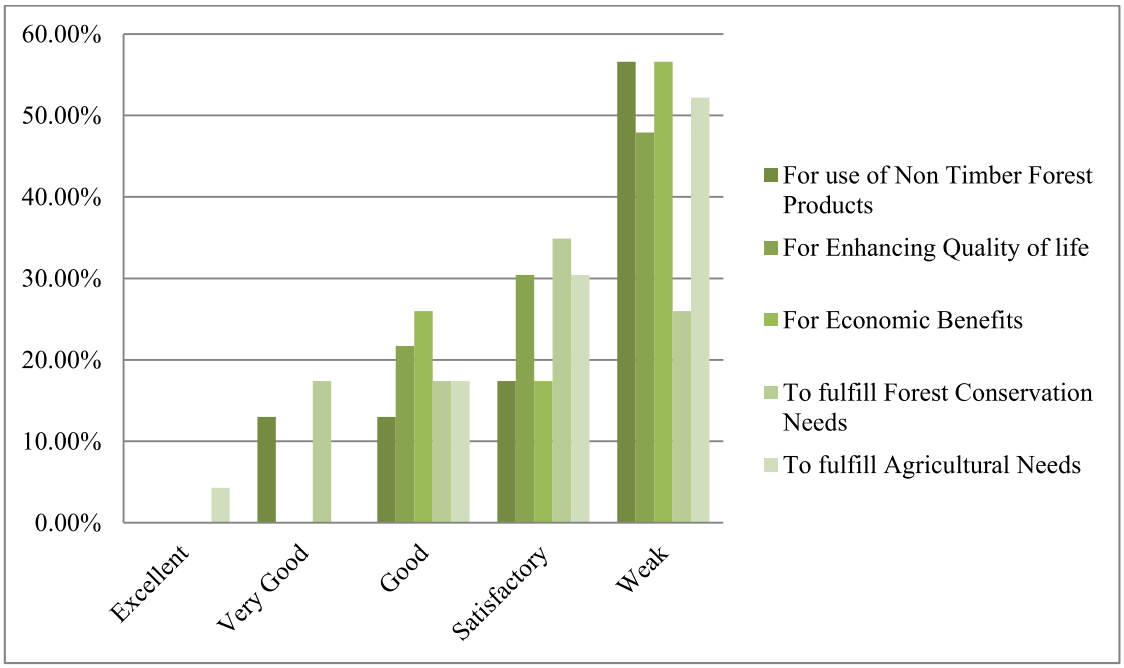
First, let us consider the conservation and management projects that were already there. Over 90%of the community is already aware of it. Yet these programmes indicate that they are incapable of inducing community participation at each and every stage of the project (See Graph 5.1).

Graph 5.1 Forest Management Projects and Community Involvement in Meemure



Therefore, whether these projects have fulfilled the expected objectives is a matter open to dispute. However, 61% of the community admits that these projects had (something to do with) put some KFG plans in to effect. It clearly shows that the importance of KFG has been realized even by pioneer forest management projects. However, the attitudes of the community towards the fruitfulness of these projects are rather negative.

Graph 5.2 Relationship between Forest Management and Kandyan Forest Gardens in Meemure



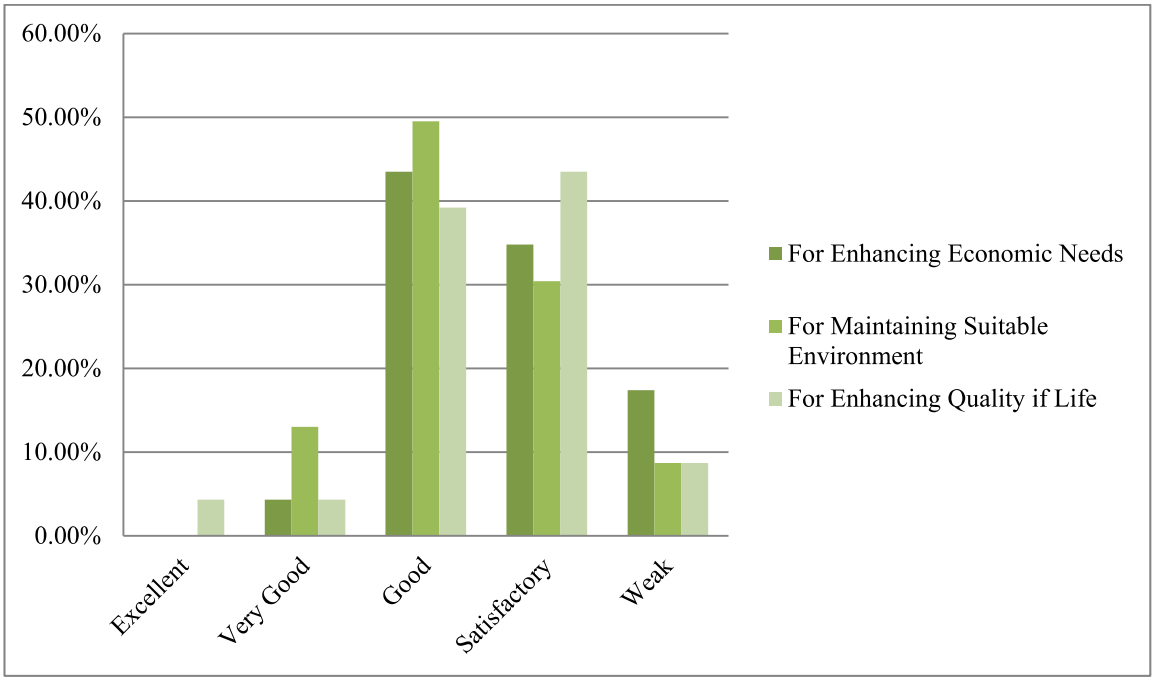
Graph 5.2 demonstrates that the expected benefits out of those projects have not been yielded. According to these data the projects in question have been simply favorable to "conservation" . The reason is that those forest conservation projects had merely been focused directly on forest conservation. So it is evident that the concept of "benefit to community" has slipped these projects. Lack of sufficient and active community participation was behind the failure of such projects. But it does not demean the potentiality of improving KFG as a community participating forest management approach.

Second, what is discussed is the opinions of the community on how far the KFG helps them too fulfill their needs of food, of forest products, of medicine, of animal husbandry, of agricultural and of suitable environmental conditions etc. According to graph (5.3) it is clear that.

Graph 5.3 Kandyan Forest Gardens and Community Needs I

KFG provides the community with a direct and generally known service in fulfilling their needs, i.e. needs such as food, medicine, animal rearing and agricultural activities.
Graph (5.4) shows the assistance KFGs give in order to maintain economic needs and suitable environmental conditions and to increase living conditions of the community.

Graph 5.4 Kandyan Forest Gardens and Community Needs II



Sour

These graphs help us to conclude the attitude of the community towards KFGs. In other words their attitude forms the fundamental basis necessary to develop KFGs up to community forest management approaches. Here we are now in a position to add "community development" factor which has been slipped. It will help sustainable development.

Conclusion

Applicability of KFGs is a widely social, economic and an environmental phenomenon. By now although certain social, economic and political meddling has brought about changes in the use of it they are not so serious or tend to collapse the set up. On the other hand physical surroundings as well as attitudes of the community favorable for improving KFG as a community forest management approach can be identified in the study area.

Chapter 06

Effectiveness of KFGs Sustainable Development

6.1. Introduction

This chapter deals with the effectiveness of KFGs for sustainable development. In addition its potentiality is too considered in particular. For this analysis qualitative data have been obtained through three methodologies PRA tools, case studies, and interviews. The possibility KFGs have of making sustainable development a social, cultural, economic and environmental reality at regional level is discussed in this chapter each sub-section.

6.2. Sustainable development and KFG.

The fundamental essence of the concept of sustainable development is to achieve a human progress which is non-excessive. While it accepts the right for other life forms to live on each on the other hand it expects the cooperation of all human beings to make a social economic and environmental stability based on it. What the concepts of Green Economy echoes again and again is the need of global unity for that purpose.

It is through the realization, as realities on regional basis, of these concepts open to global discussion that the expected result can be obtained. To do so typical of each zone , region must be used. Here once again we have to give attention to "Traditional Kandyan Forest Gardens found in the region of Kandy where a tropical climate is found. These gardens have contributed a long-standing help towards social, cultural, economic and environmental stability and maintenance of the same" (In the foregoing chapter current utilization of KFG has been discussed in detail). These utilizations seem fruitful even in current context of social, economic and political needs of the people the main reason being the particular adaptability of KFG in case of consumption of natural resources at regional level. The major source of energy of KFG is the sun. So KFG s which are usually diminutive in extent have been framed in such a manner that the sun they receive is utilized to the full in fulfilling the community's daily needs. On other wards they let their small garden spread not horizontally but vertically. As a result a layer system is to be identified in these gardens. There are four layers in Meemure KFGs. (see Figure 6.1) Hitinayake (2009) has categorized those layers based on human utilization. According to him they are as fallows;

- Upper story trees that primarily produce fruits: coconut, areca nut, jak ;
- Upper story trees that primary produce timber: jak, gini-sapu, halmilla and mahogany;
- Shade tolerant beverage shrubs that are in the under story: coffee, cocoa, and tea;
- Mid-layer , high value, spice crops , not necessarily shade tolerant and possibly casting heavy shade themselves: cloves and nutmeg;
- A miscellany of mid –layer plants that are difficult to classify: pepper, banana, and *Gliricidia sepium* (Hitinayake,2009:121). This structure is common to Meemure KFGs also.

Figure 6.1 Layers of KFG in Meemure

Source: Karunaratne,2013

It is obvious that this layer system is a result of an exceedingly long observation made on the part of the land owner (Senanayake,1987). The germinal stage of the modern concept of "analogy forestry" is to be found in these Kandyan forest gardens (Senanayake,1987). These gardens are distinct from forest only in three modes.i.e,

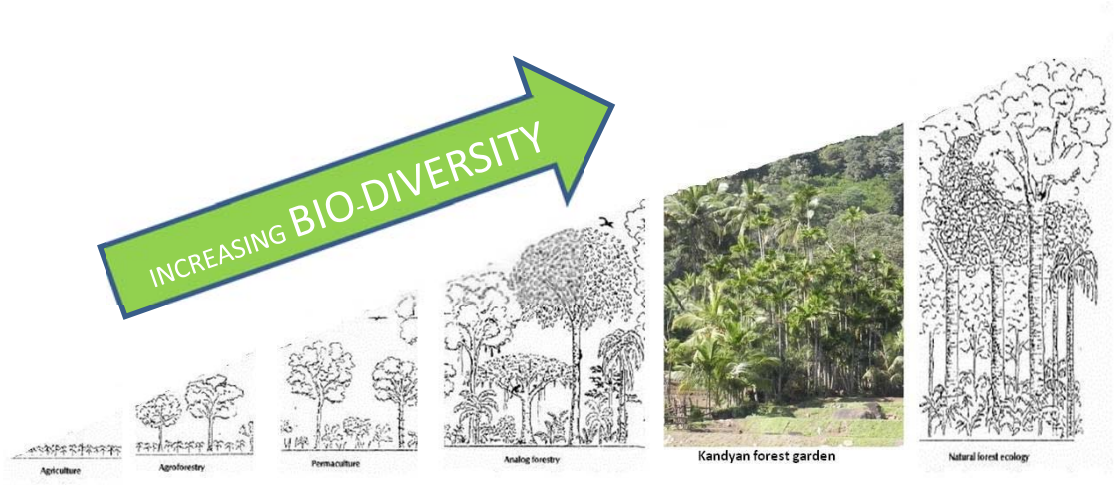
I. The garden unlike forests has the residential house in it.

II. Layers in forest contain merely wild species where as that of the forest gardens are to a greater extent equipped with plants man needs.

III. Maintenance and management is totally different in a Kandyan forest garden from that of the forest.

When KFG compare with other agriculture and agro forestry types, it is very close to natural forest from services and structure (See figure 6.2).

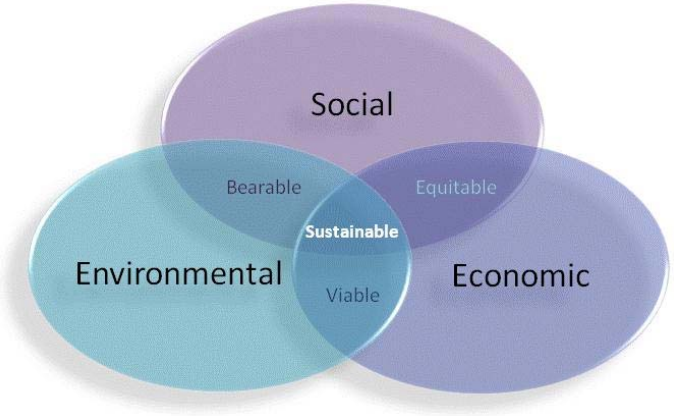
Figure 6.2 Compare: KFG and other agriculture and agro forestry models.



Source: Karunaratne,2013

Actually speaking it is difficult for a distant observer to distinguish the forest from these gardens. The forest garden makes the surrounding a broad green cover which contributes to the social and economic development of the community. As means of solving global warming and allied environmental problems and socio-economic difficulties such destitution, hunger, shortage of food etc nothing will be more effective than KFG. Fruitfulness of KFG as means of attaining sustainable development is discussed below under social, economic, and environmental aspects which are the elements of Susbstantial Development Concept.

Figure 6.3 Sustainable development Concept.



6.3 Effectiveness of KFG for economic sustainability

Other studies done on KFG have examined merely its economic aspect whereas some others have given attention only to its aspects of biodiversity. Though those studies reveal identifies relevant to the particular fields of KFG they do not give a knowledge of entire worth of all in all. To attain such a comprehensive understanding of KFG s an analytical study based an all three aspects i.e. of economic, socio-cultural and environmental must be done. Here the analysis is concentrated on economic out book. Other aspects also will be considered next. Community maps prepared by the community will be made use of adopting PRA tools.

6.3.1. Resources foundation of Meemure Village

The following map (See resources flow diagram I) shows what the community has identified as resources of their region. These resources can be identified under main categories.

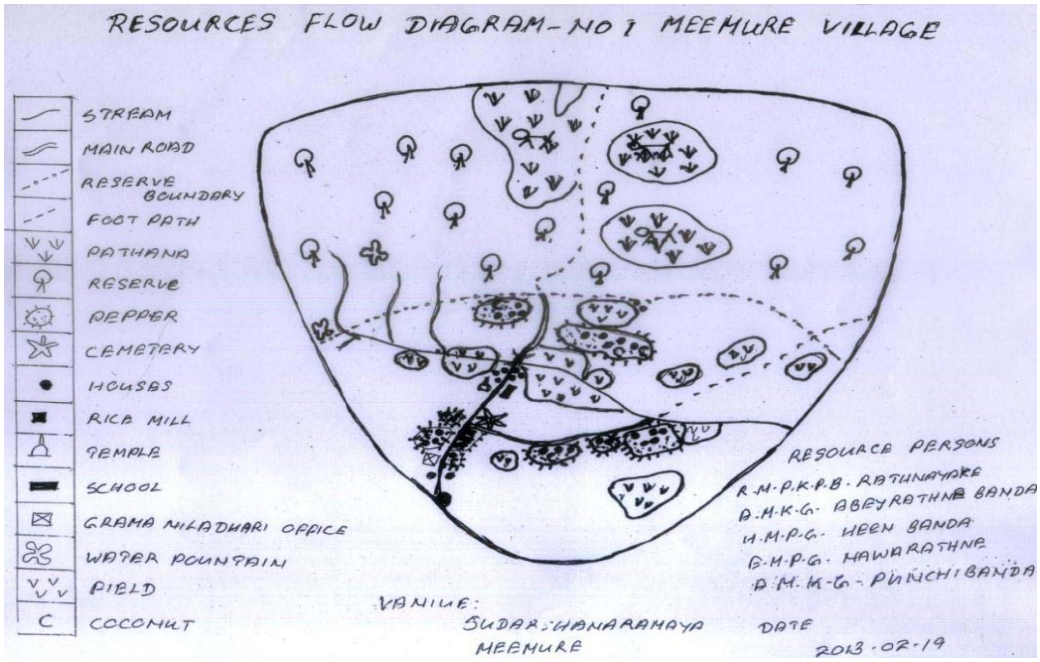
- Public property belonging to community –temple, cemeteries, The patanas.
- Public property belonging to the state-school, office of Grama Niladhari, Insurance office
- Private property- houses, market, cultivated lands.

Under this classification attention is paid to the category number three KFG belongs to the above classification. Although the Grama Niladhari Division spreads out the village is relatively small in extent. The reason why it is small is that the boundary of the reserve is located surrounding the village. Therefore, the village cannot be widened further. That is why the community is keen

on extending the forest gardens vertically so that the maximum possible use can be had out of the limited plot of land which is their precious wealth. Houses and KFG occupy hillsides and hillocks while fields are found on lowlands. Streams arise from the hills in the reserve. Though the road which leads to the village is arduous within the village only foot-paths are found. As a result agricultural activities are hampered to a considerable extent. These facts are confirmed through the petition of the villagers that was forwarded to the government.

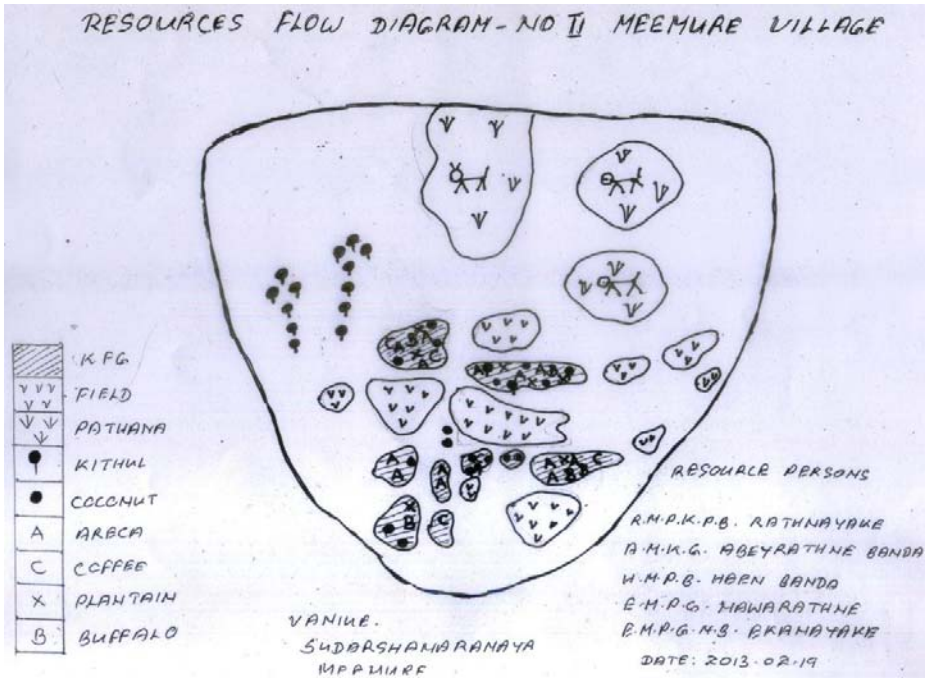
Once crop cultivation and animal husbandry are segregated from the resource base of the village Meemure, the significance value of KFG within the former will naturally be highlighted. (See resources flow diagram - II) According to this map, it is clear that in addition to crops such as areca, coffee, plantain, coconut, pepper, etc. three species of economic value also scatter in these gardens. On the other hand , water buffalo husbandry, cow husbandry, and bee keeping also have been shifted to these gardens. In other words the whole ranges of their agricultural activities are centered on their garden present. It proves the fruitfulness of KFGs.

Figure 6.4 Resources flow diagram – I



Source: Karunaratne,2013

Figure 6.5 Resources flow diagram – II



Source: Karunaratne,2013

Resources of the village

Sudarshana Bandara (56) a farmer

"Wealth! This is the village where we were born. All these things are our wealth Water, paddy fields, our animals, all these things. The greatest wealth which we had was the chena cultivation. Now it is banned. Even the entering in to the forest is banned. We are not to lead even a cow to a pathana. Now those resources are not ours. If we had them we won't be like this"

Resources problems of the village

Ananda Wijekoon (53) a farmer

"The main problem is the lack of land. The boundary of the reserve is set up almost on the foot of our land. They (government) took over all our chenas and pathanas as part of the reserve. We do not have any land to give our children. The yield we get from what we have is not sufficient to live till the next harvest. You can see that no roads! No electricity! In case of emergency no place to go for treatment. We live in this country but it seems we have been left out. Is it because they want to show us to foreign guests forever?"

6.3.2. Meemure- Crop calendar and labour used for cultivation

The map demonstrates the manner of performing cultivation during the year in Meemure. Accordingly cultivation of paddy takes place twice a year while harvest of pepper and that of orange is gathered once a year. Areca, coconut and plantain produce harvest right through the year and so does toddy tapping (Kithul) . Pepper alone has become the major commercial crop which however, has created a risk of economic unsteadiness. To overcome this risk an attention must be given to introduce additional economic crops. The income from areca and kithul (tapping toddy) is uncertain but (they involve no cost of production) as their growth is involuntary it includes a profit.

Figure 6.6 Crop Calendar in Meemure village

Crop calendar - Meemure Village

Crops	Time - Months											
	1	2	3	4	5	6	7	8	9	10	11	12
Paddy	×	×				×	×	×	×	×	×	×
Pepper							×	×				
Arica				×	×							
Coconut	Throughout the year											
Orange					×	×						
Banana	Throughout the year											
Kithul	Throughout the year											

Date : 19.02.2013

Location: Sudharshanarama Temple, Meemure village

Resourse persons:

Rev. Kosgoda Punna

D.W.M. Ananda Wijekoon

A.W.K.G. Sudarshan Banda

E.M.M.G. Senavirathna

E.M.P.G.N.B. Ekanayaka

Source: Karunaratne,2013

Secondly, two distinctive features connected with the labour involved can be identified. Namely, in case of paddy cultivation , traditional system of exchange of labour (Aththama) is still in use and in case of commercial cultivation of pepper in addition to family labour wage earners are also employed. This is depicted clearly by labour chart for crops.(See figure 6.7) Cultivation of

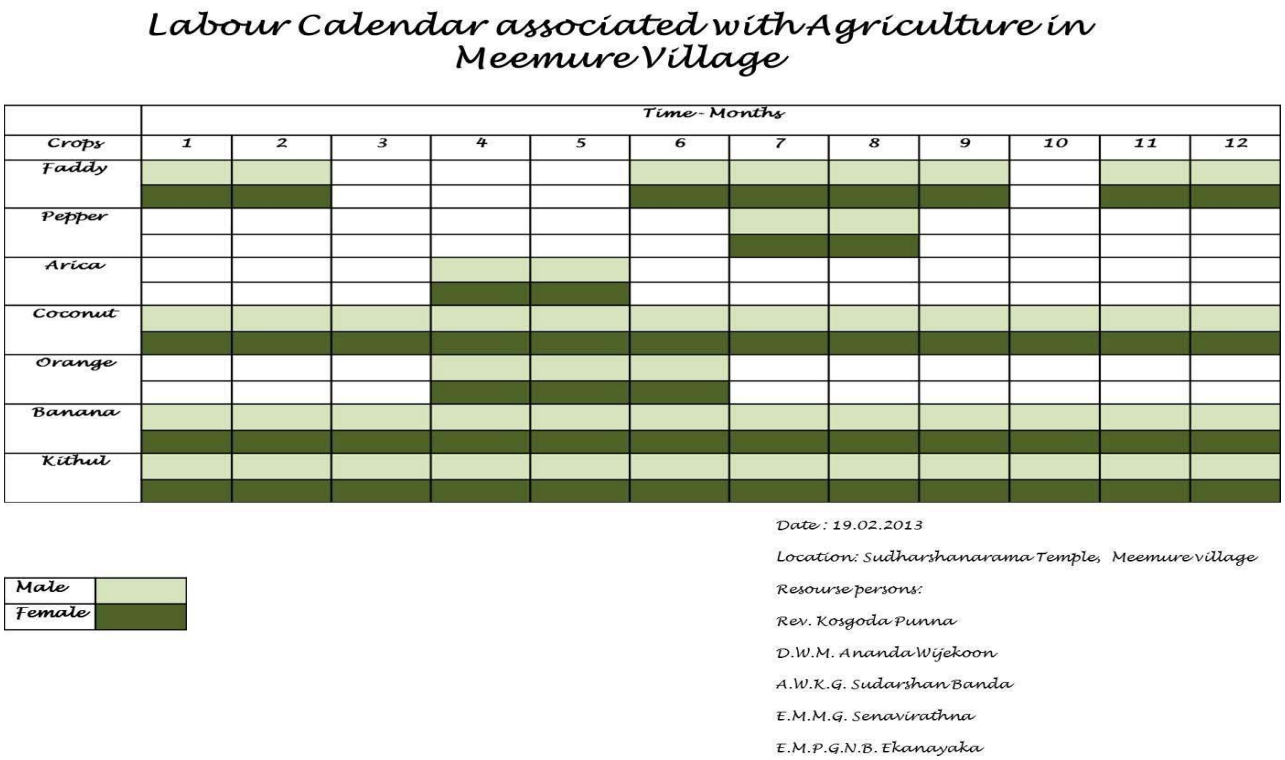
pepper does not involve traditional exchange of labour not only because it is not a traditional cultivation but also because pepper was introduced taking no notice of the labour exchange culture prevailing in the region. Had it been done adhering to tradition at the production itself pepper cultivation would have been more profitable and more fruitful farming.

Cultivation of crops and cost.

W.G. Yapanis (56) a farmer

"Those days we did not buy pesticides, weed killers, manure, seeds and the like. We made everything ourselves. Now everything is to be bought. It costs lots of money. Unlike those days we get no profit. Other thing is what we now buy is poison. Those days we got only "salt" from the town. Now we can save nothing with what we earn by selling pepper. We spend everything on food."

Figure 6.7 Labour calendar associated with agriculture in Meemure



Source: Karunaratne,2013

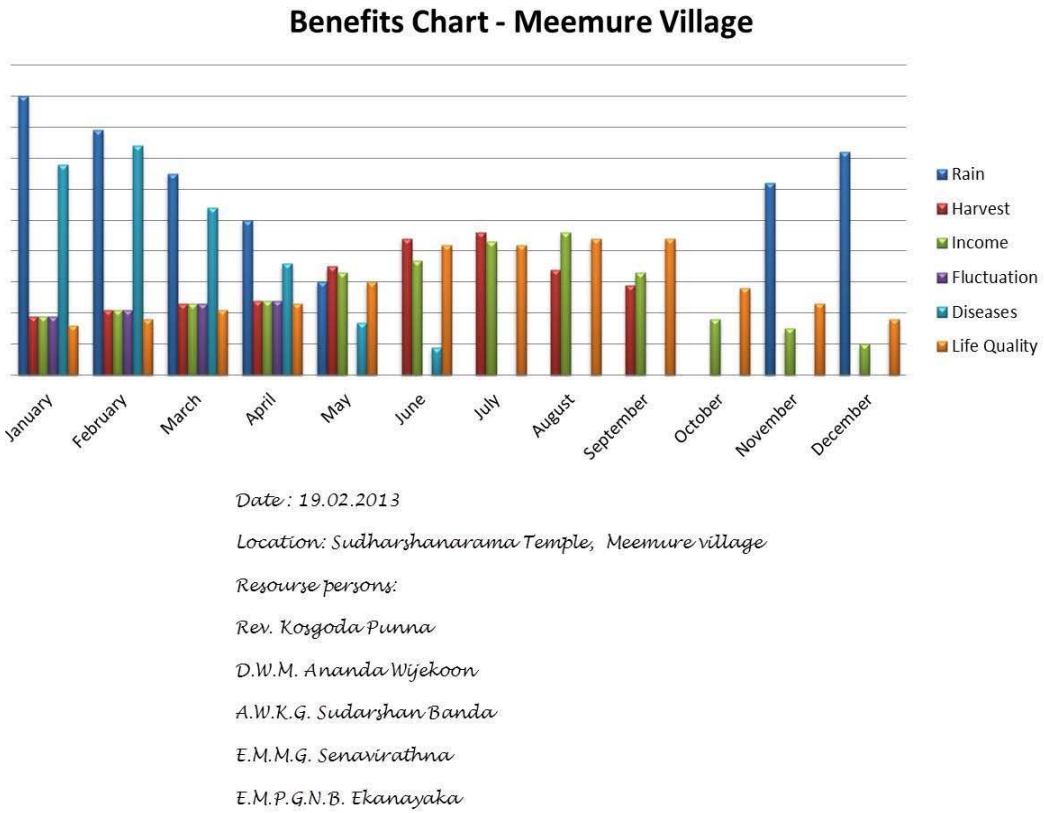
6.3.3. Benefits chart of the village Meemure.

This analysis is based on 6 main factors. i.e.

1. Rainfall
2. Yield
3. Income
4. Fluctuation of prices
5. Crop infections
6. Living conditions

In the month from November to March when there is heavy rain the sources of crops are checked and as a result the income of the community decreases and their living conditions go down.In addition, it is during the wet weather that crops become infectious and damaged and thus will have a prolonged aftermath on them.

Figure 6.8 Benefits chart of the Meemure Village



Source: *Karunaratne,2013*

An analysis of this table will reveal that during the period June-September theirs is an increase in income. The reason is that it is the harvesting time of pepper. Their living conditions go up relative to it. It means their purchasing capacity goes up. It is cultivation of paddy and gardening done in the gardens which help them to subsist on for a longer period. Cultivation of pepper is separately discussed here. No crops which give them economic benefit during the long period from October to May has been introduced to their garden.

Income from KFGs.

P.S.Ukku Banda (48) a farmer

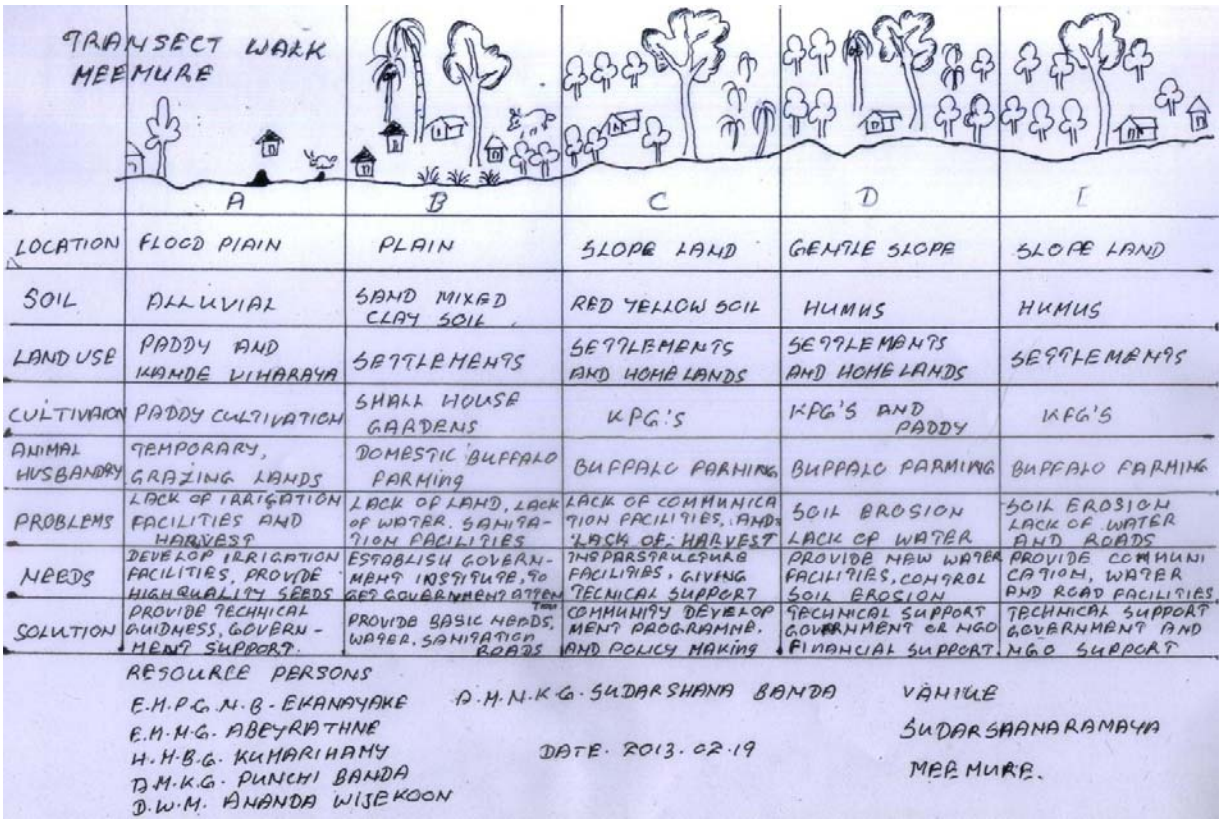
"Major income is what I get once a year out of pepper. After that I get nothing. Now we do not have anything what we had those days in our gardens. Because of pepper we had to uproot all other trees. We have rice as we have paddy land. But unlike those days even the paddy is more infective now. You can't grow any paddy without fertilizer or weed killer."

Such an introduction will provide them with food crops right through the year as well as help them earn some income. Crops such as clove, cardamom, goraka, cinnamon etc. are suitable in this regard. They are to be adjusted to changes in climatic and human factors peculiar to the particular season.

6.4. Effectiveness of KFG for socio-cultural sustainability.

This is a factor that has been overlooked not only in forest Management in Sri Lanka but also in studies done in Kandyan Forest Gardens (Wickramasinghe,1995) Solely due to this reason many a project dealing with Forest Management and Rural Development has come to an abrupt end without fulfilling the expected goal. Transect work By means of walking the knowledge of his land on the part of the community is proved (See figure 6.9).

Figure 6.9 Transect walk in Meemure



TRANSECT WALK MEEMURE

	A	B	C	D	E
LOCATION	FLOOD PLAIN	PLAIN	SLOPE LAND	GENTLE SLOPE	SLOPE LAND
SOIL	ALLUVIAL	SAND MIXED CLAY SOIL	RED YELLOW SOIL	HUMUS	HUMUS
LAND USE	PADDY AND KANDE VIHARAYA	SETTLEMENTS	SETTLEMENTS AND HOME LANDS	SETTLEMENTS AND HOME LANDS	SETTLEMENTS
CULTIVATION	PADDY CULTIVATION	SMALL HOUSE GARDENS	KPG'S	KPG'S AND PADDY	KPG'S
ANIMAL HUSBANDRY	TEMPORARY, GRAZING LANDS	DOMESTIC BUFFALO FARMING	BUFFALO FARMING	BUFFALO FARMING	BUFFALO FARMING
PROBLEMS	LACK OF IRRIGATION FACILITIES AND HARVEST	LACK OF LAND, LACK OF WATER. SANITATION FACILITIES	LACK OF COMMUNICATION FACILITIES, AND LACK OF HARVEST	SOIL EROSION LACK OF WATER	SOIL EROSION LACK OF WATER AND ROADS
NEEDS	DEVELOP IRRIGATION FACILITIES, PROVIDE HIGH QUALITY SEEDS	ESTABLISH GOVERNMENT INSTITUTE, TO GET GOVERNMENT AFTEN	INFRASTRUCTURE FACILITIES, GIVING TECHNICAL SUPPORT	PROVIDE NEW WATER FACILITIES, CONTROL SOIL EROSION	PROVIDE COMMUNICATION, WATER AND ROAD FACILITIES
SOLUTION	PROVIDE TECHNICAL GUIDNESS, GOVERNMENT SUPPORT.	PROVIDE BASIC NEEDS, WATER. SANITATION ROADS	COMMUNITY DEVELOPMENT PROGRAMME. AND POLICY MAKING	TECHNICAL SUPPORT GOVERNMENT OR NGO FINANCIAL SUPPORT	TECHNICAL SUPPORT GOVERNMENT AND NGO SUPPORT

RESOURCE PERSONS
E.M.P.G.N.B-EKANAYAKE
E.M.G. ABEYRATHNE
H.H.B.G. KUMARIHAMY
D.M.K.G. PUNCHI BANDA
D.W.M. ANANDA WIJEKOON

D.M.N.K.G. SUDARSHANA BANDA
DATE. 2013.02.19

VAHIGE
SUDARSHANARAMAYA
MEE MURE.

Source: Karunaratne,2013

According to this Transect walking has been accomplished commencing from the south bank of the river Meemure near the Kande devalaya (Temple of the God of the Hill) to the office of the Grama Niladhari, Meemure. Geographicaly speaking it is an ascent (by climbing) proceeded from a river bank along a hillside up the hill. This cross section is for easy analysis divided into five sections A,B,C,D, and E namely.

A. Is a stretch of field adjoining the river valley.

B. Middle of the village accompanying small gardens.

C. Hillside with larger gardens.

D. Lowland with larger gardens.

E. Lowland with scattered gardens.

An examination of the above discussion will enable one to see that the community has a wide knowledge of details pertaining to each of these sections, i.e. details such as physical and human features, problems the community facing and needs and modes of solving problems etc. It is discussed under six main divisions. Namely,

1 . Location
2. Soil
3. Land use
4. Cultivation
5. Animal husbandry
6. Problems and challenges
7. Need
8. Solution

Hence, the importance of community participation from the stage of planning itself of such projects comes up.

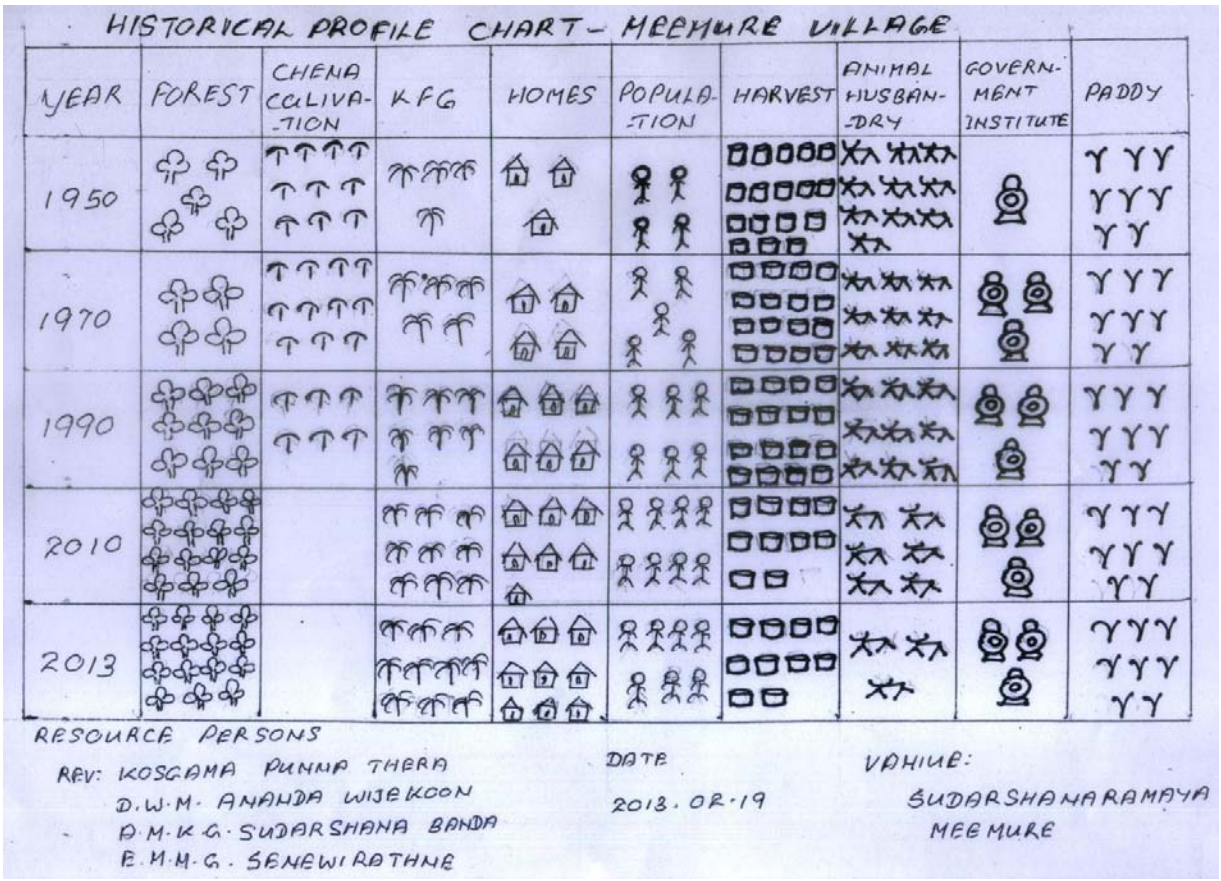
According to this map throughout 4/5 of the village scatter gardens and in each of them stands a house and animal husbandry is also carried out.

The extent of the garden becomes less in the middle of the village (B) whereas it is more at a point far off (from) the middle. Accordingly it is in such a place where the possibility of development is found. In the middle of the village it is suitable to introduce tourism, small industries (rice mills) and shops etc. As they consider, lack of water, soil erosion and fragmentation of land are the factors that obstruct development and the methods to overcome them also have been proposed by the community. It has a decisive importance in development planning.

6.4.1. Change of social, economic and environmental factors in Meemure.

To ascertain the above (factors) PRA Tool called historical transaction is used. (See 6.10) This depits the social, economic, political and environmental conditions occurred in the village Meemure during the period 1950-2013. It is analyzed through seven fields.

Figure 6.10 Historical profile chart in Meemure



Source: Karunaratne,2013

1. **Forests**

   Compared with the year 1960 by this time (2013) the extent of forests has been increased. The reason being that by 1980 chenas have been taken over by the government subsequent to the ban on the same. However, there seems to be no decrease in influence of man upon the forest and his needs of forest products have been unattended to.

2. **Chena cultivation**

Chena cultivation which was commenced in about 1950 reaches its extreme by 1970. Then it undergoes its decline. In consequence of the law of forest conservation following 1990 cultivation of chenas within the reserve has been totally banned. Up to that time the chief means of supporting life of the community had been the chenas.

3. **Kandyan Forest Gardens**

The chief subsistence of the community between 195 and 1990 was not gardens. But with the ban on chena cultivation they were depend on their gardens not only for their economic needs but also for food. As a result a greater distribution and development of gardens in the village can be witnessed since 1990. Introduction of pepper is also behind this development.

4. **Population and house**

Relative to the year 1950 by 2013 there can be seen an increase in the population. The houses the increasing population required were built but unlike their predecessors they were permanent structures.

Gardens of this kind are subject to further fragmentation. The chief reason is the lack of new lands. This is a threat to KFGs.

5. **Harvest**

It was the chena which yielded crop by 1950 and was primarily for subsistence and the sales were least. Following the year 1990 villagers turned to gardening. Cultivation of pepper has become of first importance while that of the edible crops second. Pepper which is an economic crop came to the fore in 2013.

6. **Animal husbandry**

Here first and foremost rearing of water buffalo is considered. This was the chief economic input during the period 1950-1990. Then animal husbandry had been carried out in the pathanas in the reserve. But after 1990 grazing in the pathanas was banned and now that farming is restricted to gardens and the abandoned fields. Even quantity wise it is a considerable decrease. It hampers not only labour needed for agriculture but also consumption of food.

7. **State offices**

   By the year 1950 there was only the office of the Grama Naladhari in this place. By 2013 Government Primary School and the Samurdhi Niladhari were added. Although there are other government offices and services in adjoining villages there are the only offices that belong to the division under the latest delimitation.

An analysis of these factors clearly shows that they have developed along with external social, economic and environmental discourses. It is extremely important to identify the direction of these tendencies in case of planning rural development and forest management approaches. The reason is that without identifying the needs and intentions of the community it is difficult to arrive at the expected goals.

Ancient cultural heritage of the village.
Rathnayake (34) Grama Niladhari
" Meemure is a very old village. Here the culture is essentially connected with agricultural life. Now the typical features of this culture are being declined. Some of them have already vanished. What you find at the side of my office includes tools used in agriculture in the past. Now even the village boys do not know what they are. It is a pleasure to protect them even like this."

Old chana cultivation in Meemure.
Muthu Menike (69) woman chena cultivator
"Chena was the wealth we had, till 1970-1980 . Cardamom grown forest was given on lease to the rich. We were chased out of forest. It was the chena which yielded us everything but rice. No disease or pest those days. No fertilizer. Villagers together cleared the chena as a single row. They did not clear the forest here and there. Or through craving they did not want to own a large portion of land. What they did was just to eke out."

Aftermath of tourist on the village.
Ven. Kosgama Punna Thero. (Sri Sudarshanarama Vihara,Meemure).
"Many a local tourist visits here just for fun. They don't think that there are people and animals living even here. Most of them are rich and overbearing. Many a man disregard the comfort of the villager. At some occasions due to their uproar teaching in the school is obstructed. Teaching religion at Dhamma School is also hampered. But the foreign guest are all right."

6.4.2. KFG Gender and Labour Force

The contribution of women in the fields of agriculture and forestry globally is of high value. (FAO,2011, 2012, 2013) This position is same in the South Asian Region. Sri Lanka is more remarkable in this respect because of the influence Buddhism exerted on feudal system. But, their contribution has not yet been amply evaluated.

Women labour force for KFG.

K.G. Kusumawathie (45) a house wife

"It is we who mostly attend to both domestic routine and work in the garden. Husband has to work in the field and care for the water buffaloes. We must look after firewood, green leaves and edibles from the garden. During the harvest we also take part. Gender is immaterial."

Migration of the youth from village.

Ukkurala (60) a farmer

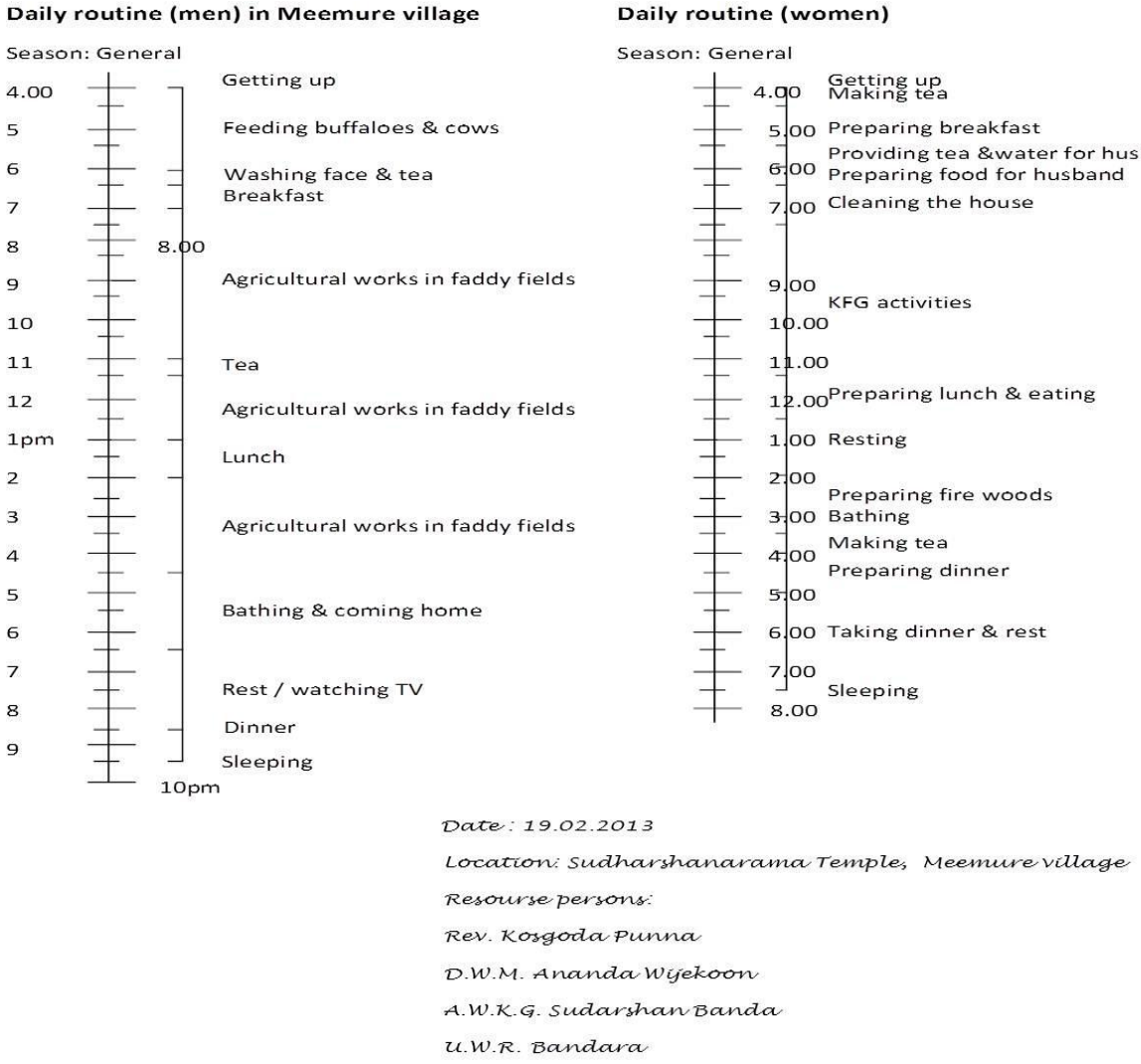
"Now you cannot get hold of 10 young men in case of emergency. Every body is leaving the village. They either join garment factories, army or else as a wage earner in town. Young men don't like to live here. They don't get enough money. Food alone is not enough. No good schools here. Without a good education one cannot get a better job."

In the village Meemure, except toddy tapping (of kithul) almost every other work connected with agriculture direct participation of women can be noticed. Even in case of kithul (toddy) tapping process involving the making of jiggery or trickle is almost women's job. In consequence she (the woman) plays a major role in economic activities. That is besides her daily domestic pursuit. Accordingly we can safely conclude that family labour means a unit of labour inclusive of the labour of the woman as well. (Add division of labour male and female in respect of each cultivation) It is also a continuous affair right through the year.

Daily general routine of Male and Female (during a normal day) in Meemure is given below (See Figure 6.11).

According to this table from 4.a.m. (time of waking) up to 7.30 p.m. (time of sleeping) males devote about2/3 of their time to agriculture. During the harvesting season the time referred to above is spent in fields and that of off season in gardens. In addition to their daily routine women spend much of their time in garden.

Figure 6.11 Daily routine (men and women) in Meemure village



Date : 19.02.2013
Location: Sudharshanarama Temple, Meemure village
Resourse persons:
Rev. Kosgoda Punna
D.W.M. Ananda Wijekoon
A.W.K.G. Sudarshan Banda
U.W.R. Bandara

Source: Karunaratne,2013

The reasons for this mode of life are that the garden stands almost by their house and they (women) maintain constant relations with the garden in connection with their daily needs of food etc. So it is evident that it is the women who make more contribution to the KFG. In case of paddy cultivation and chena cultivation normally women are debarred from taking part.

But in case gardens it is different. So that is a potential of developing KFG as a rural development and Community Forest Management Approach.

6.4. Effectiveness of KFG for environmental sustainability

Former studies have confirmed factors connected with the effectiveness of environmental sustainability. Protection of biodiversity, minimization of soil erosion in the regions of upper river valleys, and defending springs and acting as a buffer zone on peripheries of forest regions etc. illustrate the above.

As this matter has already been discussed above here our attention is paid to the process of forest management and to the analysis of how such process influenced the KFGs. Diagram 6.12 and 6.13 shows Relations of the Community with forests relative to the development of Kandyan Forest Gardens. It is given under 4 main stages.

1950-

This is the time when community was still not conscious of gardens/ paid little or no attention to gardens. They are fully engaged in chena cultivation within the reserve.

1970-

Leasing of the forest to major scale cultivators of cardamom commences. At the same time traditional chena cultivators are removed from their chenas and they are inclined to gardens. But cultivation of chena does not completely come to an end.

Figure 6.12 Evolution of KFG's in Meemure village

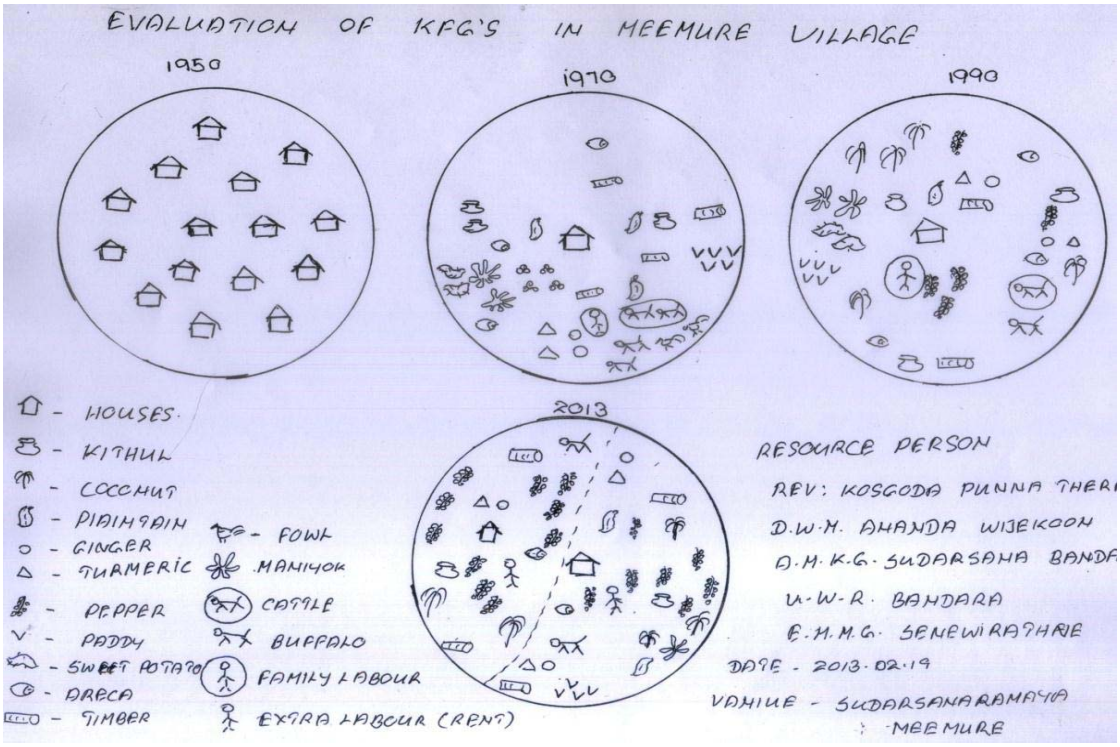
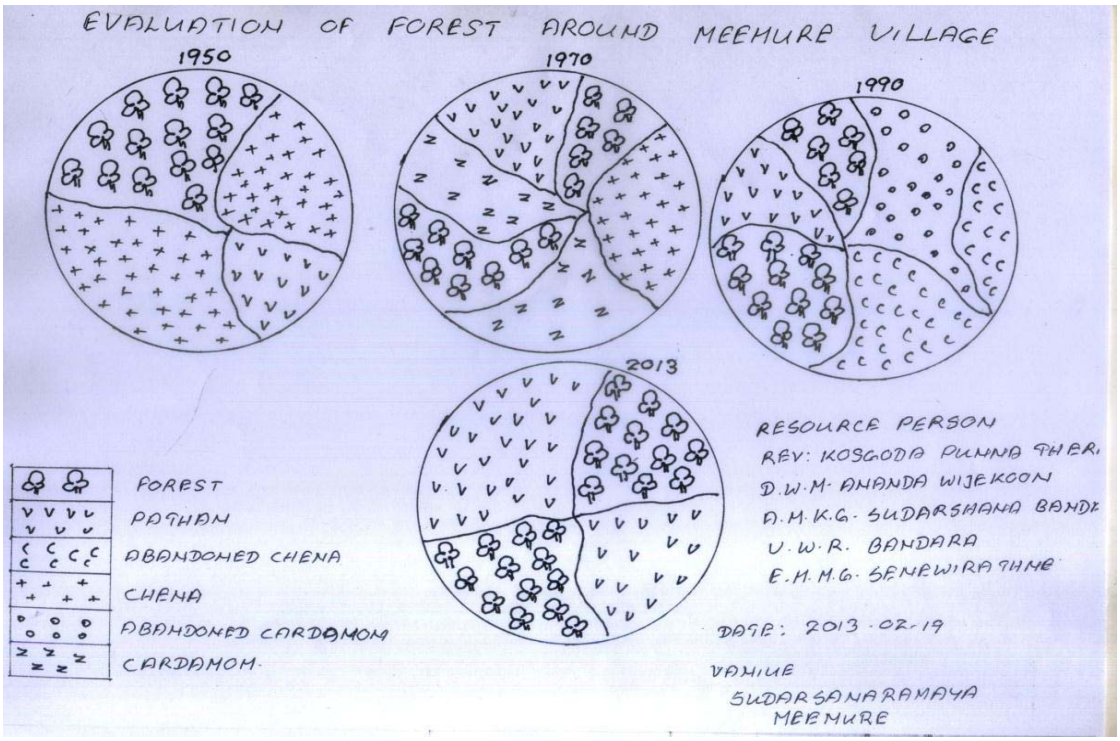


Figure 6.13 Evolution of forest around in Meemure village



Source: Karunaratne,2013

1990-

By this time cultivation of chena and that od cardamom both within the reserve becomes banned. The community focuses full attention on fields and gardens for means of supporting life. Pepper is introduced as the major economic crop. Abandoned chena lands, the pathana unused for rearing cows are retained within the reserve.

2013-

By this time only the forest and the pathana can be seen within the reserve. Edibles as well as economic crops are grown in the gardens. Water buffalo rearing and bee keeping etc. On the other hand, with the population explosion fragmentation of gardens can be seen. Relative to it the forest remains as a reserve surrounding the village. With no permission man interfere in the reserve. What is obvious according to this community map is that forest management laws have had a direct influence upon KFGs. However as these laws do not satisfy the traditional needs of forest products of the community they go on enjoying the resources of the reserve further without permission. Therefore, Community Forest Management Approaches based on KFG will result in benefits to which both parties will be entitled in addition to controlling the situation.

After effects of the change of the mode of cultivation.

Ananda Wijekoon (52) a farmer

" Now weed killer, insecticide, fertilizer all are universalized. No fish in the paddy fields now. At the beginning birds died due to insecticide. Those birds who died must have eaten victims of insecticide. Now we can't graze cattle in the fields."

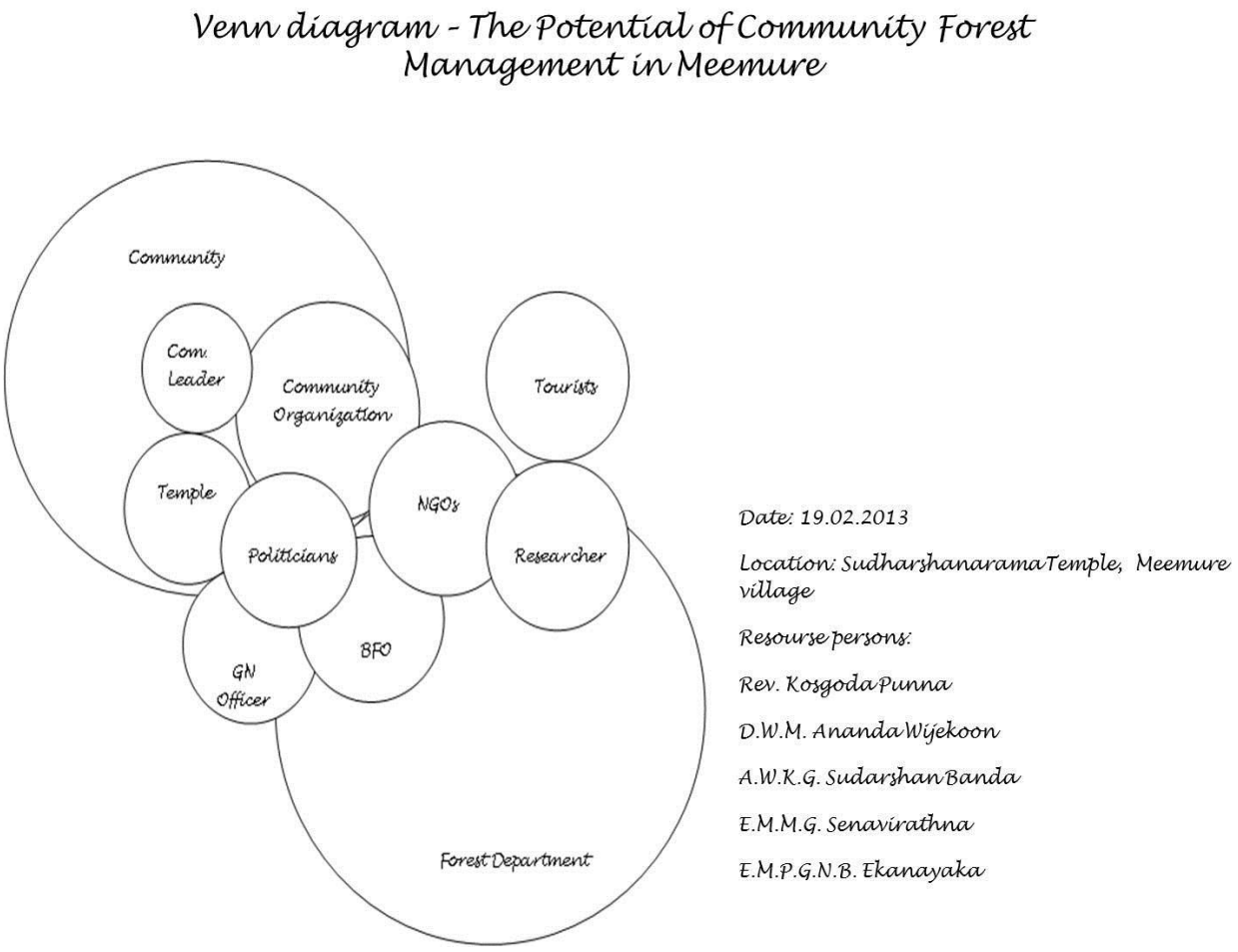
Influence pepper had on KFG.

K.S.Kusumawathie (48) woman engaged in cultivation

"It was following the introduction of pepper that diverse trees in the gardens were cut. This was following the recommendation of tree species called Ladappa (Ginisiriya) a favorable tree for pepper vine to climb. Owing to this replacement we were deprived of many a tree species on which we had been depending. Only now we feel it was a crime. Now not even a single tender leaf of cycard (madu) can be found. Those days' wildfowl frequented our compounds themselves. Now we seldom see them"

The Venn diagram given below depits attitudes of the community towards forest management policies and projects implemented up to date and of their persons and institutions connected with it.

Figure 6.14 Venn diagram



Source: Karunaratne,2013

According to this Venn diagram a clear partition between the Forest Conservation Department and the community can be seen. In the meantime an attempt is being made on the part of NGOs, community organizations, the Grama Niladhari and Beat Forest Officer (BFO) to create relations between them. However, those who should make a greater contribution, i.e. researchers and politicians who are directly responsible for policy making are being marginalized between these two groups. The insignifance of these two bodies, i.e. researcher and politician has an adverse effect on the realization of substantial approach. By extending the contribution of community leaders, NGOs, researchers and policy makers to both these parties (community and Department of Forest Conservation) both of these objectives, namely substantial Forest Management Approach as well as rural development could be achieved. But in Meemure this is not yet visible. To do so studies of Zoology and Botany alone will not suffice but more important thing is the social sciences research.

Abandonment of forest management process by the community.

K.*P.G Wijerathne Banda (59)a old chena cultivator*

" We were utilizing the forest for generations. We love forest. Even today we worship god before we go to forest because it is we who know the worth of the forest. Chena cultivation did not kill the forest. The chena stood in the same locality. From time to time the chena was cultivated. It was the government which destroyed the forest. The government gave thousands of acres to businessmen on lease to grow cardamom. Those people don't know the forest. They don't even respect it. They destroyed everything. In the end it was we who were chased out of the forest and it was we who were guilty. Now we don't own the plot of land we once cultivated. Everybody thinks that we are the sole enemy of the forest. They think that everything is all yight when we out of the forest."

Contribution of research towards forest conservation and rural development.

Rathnayake (34) Grama Niladhari of Meemure Village

" Don't misunderstand me when I say this. Many people come like this and say that they are carrying out a survey. They interview me, collect information and go. We are villagers. We devote our time and help them. But one thing I can say. I don't know whether except themselves either we or others in the village or at least the forest itself got any benefit out of it."

Influence of climatic changes on KFG.

Heen Banda (57) a farmer

"Now it is not possible to do cultivation like in the past. February is dry now. But this year in February there was a great downpour of rain. Our crop was destroyed. We could not gather any edible to feed animal's wet weather. Change of rain means a change in our life entirely. When drought comes it goes on till we reach the deprival of drinking water. God knows! These things did not happen those days May be a bad period!"

Community participation in Community Forest Management.

Herath Banda (51) a farmer

"They took over our chenas. We were forbidden to enter the forest. Grazing in the pathanas was banned. Even without consulting us village boundaries were marked in such a way that the village is surrounded by the forest. Now we are just like prisoners in the middle of this jungle. We were not given a change at least to say what we had in mind. Even we are against destruction of the forest. We don't know why the Forest Department thinks that we are enemies. Whatever it is we would like to discuss the matter with them"

Conclusion

In order to make the sustainable development a reality at regional level it is important to take into consideration approaches peculiar to individual regions. This will be a suitable adjustment especially in a region where developing agricultural lifestyles are found. Kandyan Forest Gardens in the tropical Sri Lanka have been maintaining social, cultural, economic, and environmental substantiality for a time beyond record and even at present they act in order to preserve such sustainability. To develop KFG forest sustainability is also essential. Accordingly as a community forest management approach KFG has more fruitfulness.

Chapter 07

Findings and hypothesis testing

7.1. Introduction

In this chapter findings of the study and hypotheses made above will be tested. Accordingly what has been discovered as a whole by this study is presented below

7.2. Findings

1. KFG of *Meemure* is a common land use pattern.

   KFG is a main land use pattern in the village *Meenure* in the Kandy region (see second and fifth chapters). It is a combination of the three components fields, house and garden. Although it has not been identified as KFG in determining land use patterns it belongs to it because in it only one crop is not found. Although pepper has become the major crop in these gardens today a multiplicity of manifold varieties of three species are found in them. This is a special feature which distinguishes KFGs from other farmyards. On the other hand layer system analogous to rainforests can be found in these gardens. The difference between them is that some species have been purposely introduced by the owner because he needs them.

2. These gardens are a result of historical development.

   These gardens have a long history (See chapter three). Contemporary social, economic and political factors have contributed to the development of these gardens. Although it originally comprised only materials necessary for subsistence and was land with a high biodiversity at earlier stages, by now it is no longer so. Economic crops such as pepper have been introduced to it. The spread of influence of the money economy, social and economic changes have led to further development.

3. Changes of forest management policies have directly affected KFGs.
   National forest management policies underwent changes due to the influence of global forest management policies.
   The policy of direct extraction of forest resources for the purpose of development which was in force during the period 1960-1970, underwent changes after 1970. A ban was enforced on the forest area, comprising the reserve, where up to then the villagers were engaged in chena cultivation and animal husbandry. As a result of this ban they were compelled to depend on gardens to fulfill their needs connected with food, non-timber forest products and animal rearing. But the ban proved incapable of keeping the villager completely away from the forest. But if the KFGs are developed, their ties with the forest might come to an end.

4. KFGs are a way of living and provide income to the community.
   As shown above in chapter five in detail apart from the production of short term and long term crops for subsistence economic crops are also planted in gardens. This is the major land produce belonging to the villagers who lost their chena cultivation. In addition even for animal husbandry they use this land. Therefore KFGs are the community's major source of produce. It is the major source of livelihood and economy too.

5. KFGs have increased the greenery in the area.
   Trees outside forests (TOFs) provide main the green cover except from forests (FAO, 2011). This region is the catchment area of the *Mahaweli*, one of the major rivers in Sri Lanka. Although there are settlements and paddy lands in these regions, they belong to the KFGs. Consequently soil erosion and water pollution characteristic of such settlements are rare in these lands. These gardens can be distinguished from the surrounding forests owing to the presence of houses.

6. Needs of the non-timber forest products of the community are fulfilled by KFGs.
   The community living on the periphery of the forests has depended on forest products for time immemorial. It cannot be stopped merely through laws of forest conservation. They must be provided with other alternatives so as to satisfy their needs of forest products. This need has been

satisfied to some extent by KFGs (See chapter five). By developing it further, the purpose of forest conservation can be fulfilled.

7. Lifestyle of the community is directly connected with KFGs.
   A community can be considered through social, economic, political and cultural aspects. On the one hand gardens provide villagers with food and sources of income and on the other hand there is a social aspect. The communities are responsible for exchange of traditional labor and maintenance of the extended family. Moreover, traditional property transfer system, feudal system, caste system are compulsive part of their lifestyle. Gods such as *Kande Deviyo, Gange Bandara, Kele Bandara, Mangara, Vanni Bandara* etc are honored in this region (Rajapakse,2007). Almost all of these gods are firmly connected with village life and agricultural activities. In other words these beliefs and faiths are part and parcel of KFGs.

8. KFGs have a high potential in developing community forest management approaches.
   Community forest management strives to achieve two major goals, i.e rural development and forest management. In these zones which are on the peripheries of the forest it is not possible to achieve sustainable development objects by treating the above factors separately. To attain success more suitable methods are the joined, labor, prevailing customs and manners and practices too create a suitable background necessary for CFM. In the process of community forest management they are to be appropriately managed. Forest management cannot be accomplished abandoning the community (Wickramasinghe, 1995).

9. KFGs have been a prerequisite for the preservation of the biodiversity in the region.
   Comparatively to other areas, diversity of fauna and flora is high here (Hitinayake, 1999;2009, Wickramasinghe,1994;1995). It is these forest gardens which have become “home” for animals and tree species who lost their habitat owing to forest degradation and deforestation. This factor has been confirmed by studies done on amphibians and small mammals (Babaradeniya,2006). On the other hand these forest gardens are not an obstacle to animal migration which occurs across the village surrounded by the reserve. These gardens check “forest fragmentation” also. Its directly cause to biodiversity conservation. Migration of wild elephants across the village too

can be observed in months April and May. However, no considerable damage to crops has been reported.

10. Influence of climate change – decisive influence.
    According to experiences of farmers during the recent ten years' period, rainfall patterns in the region have undergone substantive changes. Unexpected heavy downpours and droughts have had direct adverse effects on cultivation. This aftermath of weather in turn has had a decisive effect on the daily life of the community, as well as uncontrollable, decisive influence on the KFGs.

11. Emergence of problems of labor for KFGs.
    The physical and mental labor necessary for the maintenance of KFGs is obtained from the extended family. However, there is a recent tendency of the young generation to leave the villages for town seeking labor and unskilled employment. Existing agricultural work is insufficient to satisfy their socio- economic needs. This is a common challenge to both KFGs as well as the future of the village.

12. Community participation has been neglected by forest management projects.
    Community participation was minimal in the early years of forest management projects. Even in modern times, participation is at a minimum. Villagers' active contributions have not been there when plans were designed. Their lifestyle and opinions have not been considered. In consequence the community was kept away from forest management approaches. This kind of atmosphere will affect even future projects.

13. In case of the supply of labor feudal features as well as some progressive features can be identified in KFGs.
    Possession of land, and transfer of KFGs are based on an ancient feudal system. 99% of the land communities in the region belongs to the high caste called "attama", and it is common in paddy cultivation and cultivation of garden crops. But for cultivation of pepper, labor is obtained for wages, which is a recent system. Although under the ancient feudal system women had restricted possibilities of movements, it is she who makes a more marked contribution to work in the KFG.

Many a responsibility connected with the KFG is also held by her. It is a positive potential even in feudal system.

14. KFGs are unique patterns of land use in the tropical zones, according to which limited resources of land are used to obtain maximum possible yield.
    It is a method of reaping crops through the year by using the sunlight optimally. KFGs are more suitable to peripheral communities not only on account of the lack of land in those areas but also as they act as a buffer zone around the reserves. It minimizes negative human impact on core area of the forest. In agricultural communities its potential is more decisive because, most of them directly depend on primary natural resources such as forests and lands.

15. Attraction of tourists and its influence.

    Owing to its singular location and scenic beauty *Meemure* attracts tourists. By now tourism has grown to such proportions that it hampers even villagers' daily routine. Only about 20% of the villagers have benefited from tourism industry. Very few villagers benefit from tourism, but their visits may have long term social and cultural influence on the region.

16. KFGs satisfy multiple needs of the community.

    As already shown in above chapters; needs of food crops, NTFPs, animal husbandry etc. can be satisfied by the KFGs. Moreover, direct and indirect contribution to protect environment also should be added to this. Accordingly potential found in KFG within socio-economic, environmental and cultural patterns are unique.

17. Influence of prevailing socio-economic and political factors on KFGs.

    Influence of global as well as national tendencies are gradually entering these regions too. Influences such as modernization, globalization, individualism etc can undo the collective feeling of a traditional agricultural community. The sustainability of KFGs may depend on this collective feeling. Modern socio-economic patterns seem to be unhesitatingly obstructing the

traditional social values of this agricultural society. This kind of influence will naturally affect the existence of Kandyan forest gardens.

7.3.Hypothesis testing

Hypotheses used in the study are presented in this section . Mainly, four hypotheses were used. Here the acceptance or reject takes place on the results of the hypothetical research constructed at the beginning.

1. KFGs are capable of fulfilling the needs of Non-timber forest products.
2. KFGs are able to satisfy both socio-economic needs and environmental objects.
3. Forest management or agricultural projects active in the region have understood the importance of KFGs and have obtained the active participation of the community in those projects.
4. KFG as a community Management Approach has a high potentiality which could be utilized for modern sustainable management and rural development.

On the basis of the results of the study each of them is considered here and then either the acceptance or the rejection takes place.

1. KFGs are capable of fulfilling the needs of Non-timber forest products.

According to the data and information given in the chapter 5 above, forest gardens helped the community to fulfill their needs of forest products since the ban on chena cultivation. These needs which are of a wide range, include medicine, food, tapping Kithul toddy, firewood and construction materials etc. The community depended on forests for these needs earlier.
But once the forests became a reserve, the community was forbidden to enter it. Yet it is the forest products which are essential to their traditional lifestyle. As a result the community is now inclined to get their needs fulfilled out of their own forest gardens. In other words KFGs are now in a position to satisfy the community's needs of forest products. This results shows that the KFG has a high potentiality which could be harnessed to develop it as a community forest management approach.
Accordingly, this hypothesis is accepted.

2.KFGs are able to satisfy both socio-economic needs and environmental objects.

What is clear from data presented in chapter five is that these gardens are closely attached to the lifestyle of the community. Their agro-economy is based on the forest gardens. Further the socio-cultural life of the community is directly attached to the garden. Conclusions of the study clearly show that.

On the other hand the gardens are responsible for the maintenance of an environmentally favorable climate, conditions of soil and water resources. A community living by a forest for an exceedingly long period expects not only to gather physical things from it but also it is spiritually connected together with their beliefs and aesthetic life. Most of these object of the community if not all have been fulfilled by KFGs.

Accordingly, Hypothesis no two is also accepted.

3. Forest management or agricultural projects active in the region have understood the importance of KFGs and have obtained the active participation of the community in those projects.

Forest- and agricultural approaches implemented in the region up to now concentrated on each avenue separately. In consequence the projects thus implemented were not sustainable and did not fulfill the expected need. On the other hand forest management projects were misunderstood by the community who took them to be “forest foes.” Agricultural projects have ignored factors such as forest, bio-diversity etc. Projects of both these kinds paid little or no attention to the needs, priorities and lifestyle of the community. As a consequence, the potentiality and significance of KFGs, part and parcel of the community, have not been considered. The chief reason is that the active participation of the community in regard to the relevant projects was not sought for.

Therefore this hypothesis is rejected.

4. KFG as a community Management Approach with a high potentiality which could be utilized for modern sustainable management and rural development.

KFGs consist of economic, social, cultural and environmental components. Even in the case of community forest management, these three factors are considered. Development of KFGs which have a high potential as a community forest management, is therefore discussed in chapter 6. Rural development is a necessary result of substantial Forest Management Approach. It is distinguished from other development approaches by being an approach with a substantial existence. Therefore, KFGs are responsible for substantial Forest Management as well as rural development.
Accordingly Hypothesis five is accepted too.

While three hypotheses are accepted, one is rejected out of the four constructed at the beginning of this thesis.

Chapter 08

Conclusion and recommendation

8.1. Introduction

In this chapter conclusions relevant to each field, conclusion of the whole research and the recommendations useful for policy makers are presented.

8.2. Conclusions

1. Kandyan Forest Gardens (KFGs) are a unique land use pattern containing social, economic and environmental value.

   As shown in chapters five and six above in detail, KFGs are man- made and man-handled, ecosystems important to the community already referred to. Socio-cultural, economic and environmental needs of the community are being fulfilled by KFGs.

2. KFGs are successful as a Community Forest Management Approach (CFMA).

   Until now no attempt has been made to develop KFGs as a CFMA. But in accordance with the findings of this research what is obvious is that it has a high potential to do so. As already indicated in chapter 6 KFGs are linked with a community's needs such as food, medicine, forest product crop, and animal husbandry as well as their spiritual and aesthetic life. Therefore, it is more familiar than other concepts to the community. As it is one of their own concepts with regard to implementation, difficulties are relatively at a minimum. So KFGs have a high potential of developing into a CFMA.

3 .It is necessary to identify needs, opinions and views, talents and resources of the community before developing KFG as CFMA.

Forest management projects launched in the past failed to achieve the expected goals because socio –cultural factors were overlooked. On the other hand it is the very factor essential in case of Community Forest Management (Karunarathne,2007,Kumara,2011). Certain amounts of consideration also must be given to bodies of traditional knowledge, feudal systems (caste system) etc.

4 At the stage of planning, active participation of the community should be sought.

This is one of the most decisive factors. It should be the duty of the policy makers to let the community take part in policy making or at least let them listen to the latter. Otherwise the implementation will end in a failure. In the end it will turn out to be something loaded on them by force. Such circumstances will lead to conflicts between policies and needs of the community, and thus will hinder sustainable development.

5 Other groups who take an interest in the matter also must be accepted in pursuing the development of KFG as Community Forest Management Approach.

NGOs , government institutes , community organizations, and technical facilities are in particular important in this regard. Opinions, resources and contribution are essential for the success of a project. Tapping Kithul is a major economic activity in this region, Here Kithul Development Authority can make a contribution, and Development of Agriculture can take part in paddy cultivation. When an activity is connected with the concept of community forest management, a new creation characteristic of that particular field can be introduced. “Organic agriculture” is such a concept.

6 Management and maintenance of KFG as CFMA.

Most of the projects at the end of its lifetime naturally omit mentioning not only the project itself but the community which favored it. But if we trust in the substantiality of a project we cannot do so. This is particularly so in case of forest management which is extremely sensitive. Therefore, the community must be entrusted with responsibilities. In order to supervise the project from time to time a mechanism must be made. A mechanism to provide them with facilities must be made. To accomplish this task cooperation of the groups already mentioned must be sought.

7 Attention has to be given to the composition of crops.

The secret behind the success of KFGs lie in its diversity of plants and crops. Compared to the previous days (before 1980) plants diversity in these gardens is on the decline. The reason is the spread of pepper cultivation as a monoculture. It gives crop only once a year yet it must be looked after right through the year. So it is better to introduce to gardens crops which give yields

right through the year at different times (such as clove, cinnamon, and fruit crops) . Apart from the above, various kinds of local yams, vegetables, edible flora (such as cycad, jack fruit, bread fruit) must be spared in the gardens. Such action will result in a favorable environment not only to garden owners but also to animals that depend on gardens. To accomplish the above in addition to the traditional knowledge of the community, it might be necessary with technical assistance from outside.

8 contribution for upper water shed conservation.

The contribution the KFGs can make to protect upper water sheds is remarkable, but little or no attention has been given to it so far.

This mountain range (The Knuckles-*Dumbara*) is the catchment area of several major rivers in Sri Lanka. These gardens have been protecting the greenery within the catchment area for an exceedingly long time in addition to keeping up springs from evaporating. In addition it checks soil-erosion, run-off and water pollution.

9 KFGs contribute to habitats or home for fauna and flora and conservation of biodiversity.

According to conservation of biodiversity there are two phenomena called in situ and ex situ. There are two primary divisions. KFGs belong to an intermediate stage between the two mentioned above because this ecosystem is a man-made one. Although trees and animals have made it their home they are not under control. It was these forest gardens that have become home of numerous tree species and animal species that lost their original homes in consequence of the-deforestation of the jungle in Kandyan regions in the colonial period and that of the post independent days. Therefore, the capacity which contains this garden for conservation of biodiversity must be given serious consideration.

10 KFGs a tourist attraction.

Hills, mountains, forests, terraced fields and gardens are the elements of the topography of this region. Residences are associated to gardens. Houses which stand somewhat inferior to the garden do not naturally influence the beauty of the region. The reason is that these gardens are an entity peculiar to this place. In consequence forests as well as these gardens attract tourists. The forest gardens form a greenish background favorable to tourists.

11 KFGs make an individual contribution to preservation and maintenance of local industries, cottage industries and medicine.

People of Meemure have satisfied the above needs of theirs out of the forest for a long time. After the ban on the use of the forest they had to turn to the forest gardens for the same. Accordingly the preservation of the traditional customs and the lifestyle and knowledge connected with the above fields depend on forest gardens. Reeds, canes, sticks, various kinds of wax necessary for local and cottage industries they get from gardens.

In addition there are several families coming from lineages famous for medical practice in snake-bite , osteology, and diseases of cattle. The knowledge they possess of these practices are not taught or given to outsiders of the family. According to them about 80% of herbs or medicine necessary for their medical practice comes from forest gardens.

12 The reasons for the attention of the community to KFGs are the ban on chena cultivation and limited extend of the land.

Due to sudden deprival of the chena which had been their principal source of livelihood the community is fettered within their small gardens. As it is impossible for them to spread their land horizontally in accordance with the later system found in a forest they stretched the garden vertically. This is the core of the forest gardens.

13 KFGs are the basis for the conservation of forest resources in the region.

This takes place both ways direct and indirect. Though the entry of the community to forests has become minimized it is not altogether checked. When their needs reach a point beyond which they can endure it no more than they tend to violate the law. If necessary measures are taken it will be a permanent remedy. It is that KFGs have brought about. As a result, degradation and reforestation have been prevented to some extent by KFGs.

If KFGs are improved as CFMA in a more formal manner, better results could be achieved.

14 There are a few factors adverse to KFGs.

They are of two kinds, i.e. anthropogenic and natural. Human factors include difficulty in supply of labour needed for cultivation due to decline of extended family and migration of the young from the villages which are fundamental. Further, introduction of mono crops (pepper) tendency to use insecticide, weed killer, fertilizer etc .also hamper KFGs. Seed rights these gardens possessed have already been nullified .Traditional crops methodologies used in protecting traditional crops are but exhibits confined to the *Meemure* museum.

Climatic changes are the natural phenomena which exert decisive influence upon them. According to farmers unexpected drought and unexpected showers are but typical of this region. These climatic extremes are capable of retarding their agricultural activities.

These complicated human and natural factors are adverse to KFGs.

8.3. Summary of conclusion

Kandyan Forest Gardens (KFGs) are traditional land use patterns found in the region of Kandy in Sri Lanka. It is a unique, local agro-forest cultivation approach. For a long time these forest gardens have been satisfying social, economic, cultural and environmental needs of the people of this area. In this region, rich with forests (like Knuckles) of biodiversity a multitude of old villages lie about. Meemure is one of them. The major economic activity of this community consists of primary agricultural activities and gathering non timber forest products. Collecting non timber forest products and chena cultivation were banned due to policies of forest conservation. Thence by now KFGs are the only source left for their existence. Entry of the community to forests can be restricted by force of law as far as the necessity is decisive. However, the forest gardens themselves to some extent already satisfy the needs of the community and contribute to the forest conservation and rural development.

Owing to the unusual facts referred to above these gardens have a huge potential of improving as CFMAs. Therefore, fulfilling the goals of the sustainable development at regional level it is necessary to design the models suitable to each and every region. Kandyan forest gardens are a fruitful approach towards rural development as well as forest conservation of the peripheries of tropical rain forests rich in biodiversity.

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Appendices

Appendices: 01 Utilization of KFGs

Main categories and sub divisions of KFG utilization

Category	Sub category
01 .Cultivation	Subsistence
	01 Paddy 02 Pepper 03 Beatle nut Flan 04 Coconut 05 Other
02 Animal Husbandry	
	01 Buffalos 02 Cattle 03 Poultry 04 Bee keeping
03 Non-Timber forest product s	01. Edible
	1. *KithulTapping* 2. Green vegetables 3. Substitute foods for food staple 4. Fruits 5. Condiments
	02. Species of medicinal value
	03. Non-Edible Forest Products
	1. Fuel wood 2. Binding materials 3. Resins or Oil 4. Agricultural needs 5. Shelter
04. Timber	
05 Habitat for wild flora and fauna species	Flora
	Bushes Creeps Vines
	Fauna
	Mammals Birds Reptiles

Utilization of KFG Products by Major Categories

1 Edible Produce

Appendices Table 01:Kithul tapping of KFG's

Widely Used Species	Using Material or Parts	Production or Using Methods
Kithul falm tree (Caryota uranus)	Sweet toddy	Kithul jaggery,toddy and trical

Source: Observation, Interview, and Questioner survay,2013.

Appendices Table 02; Condiments for Marketing and Consumption

Widely Used Species	Using Material or Parts	Production or Using Methods
Karabu-*Syzygium aromalicum*	Buds	After sun drying the use as a condiments
Enasal-*Elettara repens* (Somnner.)Pers.	Seeds	After sun daring the use as a condiments
Gammiris - *Piper nigrum* L.	Seeds, Leaves	Boiled and after sun daring the use as a condiments
Inguru - *Zingiber cylindricum*	Rhizome, Leaves	After sun daring the use as a condiments
Kaha - *Bixa orellana* L.	Rhizome, Leaves	Boiled and after sun daring the use as a condiments
Goraka - *Garcinia cambogia*(Gaertn.) Desr.	Fruits	After sun daring the use as a condiments
Kopi - *Coffea Arabica* L.	Seeds	After sun daring the use as a condiments

Source: Observation, Interview, and Questioner survay,2013.

Appendices Table 03; Green Vegetables from KFG's

	Widely Used Species	Using Material or parts	Production or Methods
	Green leaves		
1	Gotukola - *Centella asiatica* (L.)Urb.	Whole plant	Leaves and tender towing used to make salad and conjee
2	Nivithi- *Basella alba* L.	Branches	Leaves and tender towing used to make curries
3	Anguna- *Tinospora malabarica*	Leaves	Leaves and tender towing used to make curries
4	Mugunuwenna - *Alternonthera sessilis*(L.)R.Br.ex.	Leaves	Leaves and tender towing used to make curries and conjee

5	Murunga - *Euphorbia tortilis* Rottl.ex.Wight.	Fruits, Leaves	Leaves and tender towing used to make curries
6	Kemberiya - *Solanum nigrum*	Leaves	Leaves and tender towing used to make curries
7	Iramusu - *Hemidesmus indicus* (L.) Ait.f.	Whole plant	Leaves and tender towing used to make curries and conjee
8	Hathavariya - *Asparagus racemosus* Willd.	Leaves	
	Yams		
10	Bathala - *Ipomoea batatas* (L.) Lam.	Yams	Boiled roots are used as a staple food
11	Maniyok - *Manihot esculenta* Crantz.	Yams	Boiled roots are used as a staple food
12	Katu ala - *Dioscorea pentaphylla* L.	Yams	Boiled roots are used as a staple food
13	Kiri ala - *Colocasia esculenta* (L.) Schott.	Yams	Boiled roots are used as a staple food
14	Raja ala - *Ceropegia biflora* L.	Yams	Boiled roots are used as a staple food
	Vegetables		
16	Rabu - *Raphanus sativus* L.	Whole plant	Used to make curries
17	Nokoll	Whole plant	Used to make curries
18	Mae karal - *Vigna cylindrical* (L.)Skeels.	Fruits	Used to make curries
19	Thibbatu - *Solonum indicum* L.	Fruits	Used to make curries
20	Thakkali –*Lycopersicon exculentum* Mill.	Fruits	Used to make curries
21	Dambala - *Phaseolus lunatus* L.	Fruits Leaves	Used to make curries
22	Kochchi miris	Fruits, Leaves	Used to make curries
23	Wambatu - *Solonum melongena* L.	Fruits	Used to make curries
	Mushrooms		
24	Piduru hathu	Whole plant	Boiled and Used to make curries
25	Lena hathu	Whole plant	Boiled and Used to make curries

	Grain		
27	Kurahan - *Eleusine coracana* (L.) Gaerth.	Seeds	Grind and used as a staple food
28	Undu - *Paseolus mungo* L.	Seeds	Grind and sued as a staple food
	Bee horny types		
30	Mee peni	Honey and Wax	Used as food and medicine
31	Bambara peni	Honey and Wax	Use as food and medicine
32	Kanamee peni	Honey and Wax	Use as food and medicine
33	Danduvel peni	Honey and Wax	Use as food and medicine

Sources: Observation, Interview, and Questioner survay,2013.

Appendices Table.04; Fruits from KFG's

	Widely Used Species	Using Material or Parts	Production or Methods
1	Mora - *Dimocarpus longan*	Fruits	When ripped used as a Wild fruit
2	Himbutu - *Salacia reticulate* Gaerth.	Fruits	When ripped used as a Wild fruit
3	Pera - *Psidium guajava* L.	Fruits	When ripped used as a Fruit
4	Annasi - *Ananas comosus (L.) Merr.*	Fruits	used as a Fruits and vegetable
5	Kesel - *Musa sapientum* L.	Fruits	used as a Fruits and vegetable
6	Koss - *Artocarpus heterophyllus*	Fruits	used as a Fruits and vegetable
7	Embul dodam - *Citrus aurantium* L.	Fruits	used as a Fruits and Medicine
8	Peni dodam - *Citrus sinensis* (L.) Osb.	Fruits	used as a Fruits and Medicine
9	Papol - *Carica papaya* L.	Fruits	used as a Fruits and vegetable
10	Katu anoda - *Annona muricata* L.	Fruits	used as a Fruits
11	Thembil - *Eugenia bracteata* (Willd.) Roxb.	Fruits	used as a Fruits and Medicine
12	Poll - *Cocus nucifera* L.	Fruits	used as a Fruits and vegetable
13	Amba - *Mangifera indica* L.	Fruits	used as a Fruits and vegetable
14	Beli-*Aegle marmelos*	Fruits	used as a Fruits and, Medicine
15	Naran-*Citrus crenafifolia*	Fruits	used as a Fruits and Medicine

16	*Dehi-Citrus medica*	Fruits	used as a Fruits and Medicine
17	*Siyambala- Tamarindus indica*	Fruits	used as a Fruits and Curry essence

Sources: Observation, Interview, and Questioner survay,2013.

Appendices Table. 05; Subtitle food for Staple Foods

Widely Used Species	Using Material or Parts	Production or Using Methods
Koss-*Artocarpus heterophyllus*	Fruits	Cooked seeds are used as a staple food
Rata del - *Artocarpus altilis* (Park.)Fosb.	Fruits	Cooked seeds are used as a staple food
Madu-*Cycas circinalis* L.	Seeds	Madu Pittu, Roti and Sweets
Bedi del - *Artocarpus nobilis* Thw.	Fruits	Cooked seeds are used as a staple food

Source: Sources: Observation, Interview, and Questioner survay,2013.

Appendices Table. 05; Plant Species for Medicinal Utilization of KFG's

	Widely Used Species	Using Material parts	Production or Methods
1	Binkohomba - *Munronia pumilam* Wight.	Whole Plant	According to traditional knowledge and methods
2	Asamodagam - *Trachyspermum roxbergnianum* (ex.)Craib.	Whole plant	According to traditional knowledge and methods
3	Inguru - *Zingiber cylindricum* Moon. Ex. Thw.	Rhizome	According to traditional knowledge and methods
4	Komarika - *Aloe vera var littrovalis* Koen.	Leaves	According to traditional knowledge and methods
5	Hathavariya - *Asparagus racemosus* Willd.	Leaves, Rhizome	According to traditional knowledge and methods
6	Pawatta- *Pavetta indica* L.	Whole plant	Same
7	Iramusu- *Hemidesmus indicus* (L.) Ait.f.	Whole plant	Same
8	Bewila	Whole plant	Same
9	Bulu- *Terminalia belerica* (Gaertn.)Roxb.	Fruits	Same
10	Aralu- *Terminalia chebula* Retz.	Fruits	Same
11	Sassanda- *Aristolochia indica* L.	Whole plant	Same
12	Bemithiriya- *Bacopa monniera* (L.) Wettst.	Whole plant	According to traditional knowledge and methods
13	Nika- *Vitex negundo* L.	Whole plant	Same
14	Keppettya -*Crotolaria retusa* L.	Leaves, Barks	Same
15	Katukithul- *Oncosperma fasciculatum* Thw.		According to traditional knowledge and methods
16	Iriveriya- *Plectranthus zeylanicus* Benth.	Branches	Same
17	Kapparawalliya- *Coleus amboinicus*	Branches	Same

	Lour.		
18	Welkahambiliya- *Tragia involucrata* L.		Same
19	Nelli- *Phyllanthus emblica* L.	Fruits	Same
20	Mee-*Madhuca longifolia* (L.)J.F.Mecbr.	Whole plant	Same
21	Heeressa- *Cissus quadrangularis* L.	Whole plant	Same
22	Heenthambala- *Camona microphylla* (Lam.)G.Don.	Seeds, Barks, leaves, lianas	According to traditional knowledge and methods
23	Wara- *Catophylum pulcherrimum* Wall. Ex.Choisy.	Seeds, Barks, leaves, lianas	According to traditional knowledge and methods
24	Aththana- *Datura metel* L.	Seeds, Leaves	Same
25	Penela- *Cardiospermum halicacabum* L.	Leaves, Vines	Same
26	Tholabo - *Dilenia indica* L.	Leaves, Rhizomes	Same
27	Endaru - *Foeniculum vulgare* (L.)Wight.	Whole plant	Same
28	Ekaveriya - *Rauvolfia serpentina* (L.)Benth. Ex. Kurz.	Seeds, Roots	According to traditional knowledge and methods
29	Ankenda - *Acronychia pedunculata* (L.)Miq.	Leaves Barks	According to traditional knowledge and methods
30	Dehi - *Citrus medica* L.	Fruits, Barks, Leaves	Same
31	Rasakinda - *Tinospora cordifolia* (Willd)Mires. Ex. Hook&Thoms.	Whole plant	According to traditional knowledge and methods
32	Kumburu - *Caesalpiinia bonduc*(L.) Roxb.	Seeds, small leaves	According to traditional knowledge and methods
33	Wadakaha - *Acorus calamus* L.	Rhizome, Medicineeaves	According to traditional knowledge and methods

Source: Sources: Observation, Interview, and Questioner survay,2013.

02. Non-Edible Products

Appendices Table. 06; Fire wood from Kandyan Forest Garden

Widely Used Species	Using Material or Parts	Production or Using Methods
Giniseeria	Arbor and benches	Fuel wood
Koss-*Artocarpus heterophyllus*	Arbor and benches	Fuel wood
Burutha - *Chloroxylon swietenia* DC.	Arbor and benches	Fuel wood
Tekka -*Tectona grandis* L.f.	Arbor and benches	Fuel wood
Kenda-*Macaranga peltata*	Arbor and benches	Fuel wood
Albeisia	Arbor and benches	Fuel wood
Sapu-*Michelia champaca*	Arbor and benches	Fuel wood
Poll - *Cocys nucifera* L.	Arbor, leaves and benches	Fuel wood

Source: Observation, Interview, and Questioner survay,2013.

Appendices Table; 07. Binding Materials from KFG's

Widely Used Species	Using Material or Parts	Production or Using Methods
Wea vel - *Calamus rotang* L.	Whole vine	For making domestic and agricultural goods
Bata - *Ochlandra stridula* Thw.	Whole vine	For making domestic and agricultural goods
Thambatu vel	Whole vine	For making domestic and agricultural goods

Source: Observation, Interview, and Questioner survay,2013.

Appendices Table. 08; Resins and Oil from KFG's

Widely Used Species	Using Material or Parts	Production or Using Methods
Mee-*Madhuca longifora*	Resin and Wax	For making medicinal Oil
Kaju – *Anacardium occidentale* L.	Resin and Wax	For making medicinal Resin

Source: Observation, Interview, and Questioner survay,2013.

Appendices Table.09; Things for Agricultural Purposes

Widely Used Species	Using Material or Parts	Production or Using Methods
Mee-*Madhuca longifora*	Stem, seeds and tender	Making sowing tools and used as a pesticide
Kumbuk-*Terminalia arjuna*	Stem, bark and roots	Making sowing tools and used as a pesticide
Domba-*Calophylum inophyllum*	Fruits and stem	Making sowing tools and used as a pesticide
Na-*Mesua ferrea*	Leaves and stem	Making sowing tools and used as a pesticide
Bata-*Ochlandra stridula*	Leaves and stem	Use for thatching huts and bindings
Una-*Bambusa vulgaris*	Stem	Use for making huts and pest control tools
Puwak-*Areca catechu*	Leaves and stem	Use for making huts and keeping dams
Kithul-*Caryata urens*	Stem	Use for making huts and keeping dams
Wea vel-*Calamus rotang*	vine	Used as bindings
Koss-*Artocapus heterophyllus*	Stem	Used as bindings
Kenda-*Macaranga peltata*	Stem	Use for making huts and keeping dams

Source: Observation, Interview, and Questioner survey, 2013.

Appendices Table.10; Shelter Material from KFG's

Widly Used Species	Using Material or Parts	Production or Using Methods
Piduru (Straws)		For thatching according to traditional methods
Mana (*Cymbopogon confertiflorus Stapf*)	hay	For thatching according to traditional methods
Iluk (*Imperata cylindrical var.major*)	hay	For thatching according to traditional methods
Poll Athu (Coconut branches)	Coconut branches	After weaving and thatching

Source: Observation, Interview, and Questioner survey, 2013.

Appendices Table.11; Wild flora of the KFGs (General composition)

Plant Category	Number of Plants	Mature (M) / Not Mature (NM)
Trees		
Burutha-*Choloroxylon swietenia*	3	M
Lunumidella-*Media dubia*	3	M/NM
Kithul-*Caryata urens*	5	M/NM
Kenda-*Macaranga peltata*	2	M/NM
Bedi del-*Artocarpus nobilis*	1	M
Milla-*Vitex pinnata*	2	M
Kumbuk-*Terminalia arjuna*	1	M
Kahata-*Careya arborea*	2	M/NM
Kela- *Dalbergia lanceolaria*	1	M
Ehela-*Cassia fistula*	1	M
Bushes		
Bata-*Ochlandra stridula*	3	M/NM
Una-*Bambusa vulgaris*	2	M/NM
Mana-*Cymbopogon confertiflorus*	10	M/NM
Iluk-*Imperata cylindrica*	10	M/NM
Creeps		
Bimkohomba-*Munronia pumila*	10	M
Vines		
Wea vel-*Calamus rotang*	3	M
Iramusu-*Hemidesmus indicus*	2	M/NM
Hathavariya-*Asparagus racemosus*	4	M/NM
Thambatu vel	4	M
Orchids		
Phaius tankeroilleas	11	M/NM

Source: Observation, Interview, and Questioner survey, 2013.

Appendices Table.12; Wild fauna of the KFGs (General composition)

Name of species	Day (06.00am-06.00pm)	Night (06.00pm-06.00am)
Mammals		
Wild bour (*Sus scrofa cristasus)*		X
Sambhur (*Cervus unicolour)*		X
Mouse Deer (Tragulus meminna)	X	
Baking deer *(Muntiacus munntijak malabaricus)*	X	
Black monkey *(Canis aureus lanka)*	X	
Purple- faced leaf monkey *(Macaca sinica aurifrons)*	X	
Fishing cat *(Prionailurns viverrina)*	X	X
Field Mouse *(Mus cervicolour fulvidiventris)*	X	X
Porcupine *(Hystrix indica)*	X	
Giant squirrel *(Ratufa macroura)*	X	
Rufius Horse-shoe Bat *(Rhinolopus rouxi rouxi)*		X
Birds		
Jungle fowl *(Gallus lafayetii)*	X	
Ashy-headed Babbler *(Garrulax cinereifrons)*	X	
Black-capped Bulbul *(Pycnonotus melanicterus)*	X	
Purple-rumped Sunbird *(Nectarinia zeylonica)*	X	
Sri Lanka Lorikeet *(Loriculus beryllinus)*	X	
Black-headed Oriole *(Oriolus xanthornus)*	X	
Sri Lanka Brown capped Babbler *(Pellorneum fuscocapillum)*	X	
Reptiles		
Geen-pit Viper *(Trimerasurus trinoncephalus)*	X	
Common Cobra *(Naja naja)*		X
Chequered Keelback (*Xenochrophis asperrimus)*	X	
Python *(Python molurus)*	X	
Lizards and Geckos		
Green Garden Lizard *(Calotus calotes)*	X	
Jungle Geckos *(Cnemaspis knadianus)*	X	
Water monitor *(Varanus monitor)*	X	
Amphibians		
Torrent Toad *(Bufo Kelaartii)*	X	X
Common Toad *(Bufo melanostictus)*	X	

Source: Observation, Interview, and Questioner survey, 2013.

Appendices: 02 Questionnaire and interview guide

The Role of Kandyan Forest Gardens for Sustainable Development: *A case of Meemure Village near the Knuckles forest in Sri Lanka*

Researcher
MSML Karunaratne
Lecturer
University of Ruhuna, Matara

SECTION 1

Village/GN Division…… HH No:……

Interviewer……..
Date……

Interviewee name……..

HHH's name……..

SECTION 2 HOUSEHODES DETAILS

	Relationship to HHH[1]	Age	Gender	Marital status	Resident in HH[2] (yes/no)	Education level	Monthly income	Occupation	
								main	secondary
1									
2									
3									
4									
5									
7									
8									

1. House Hold 2. House Hold Head

SECTION 3 INFORMATION OF HOUSEHLD ASSETS & HOUSING STANDARDS

Land ownership

	Relationship to HHH	Amount of HH land	Ownership of land	Paddy	Distance from forest	Garden	Distance from forest	Other	Distance from forest
1									
2									
3									
4									
5									
6									
7									

Household living standards

HOUSING STANDADS		SERVICES/AMENITIES		OTHERS	
1. standard	If yes X	2. service	If yes X	3. consumer goods	If yes X
Permanent		Piped water		Bulls and buffaloes	
Semi-permanent		Pit latrine		Motorbike	
Temporary		Flush toilet		Motor vehicle	
Mud walls		Electricity		Mobile phone	
Brick or cement wall		Proper rods		Landline phone	
Thatched roofing		Other (specify)		Radio	
Permanent roofing		Other (specify)		TV	
Large size 4 or more rooms				Internet access	
Medium size (2-3)				Other (specify)	
Small (1room)					
Other (specify)					

SECTION 4 INFORMATION OF FOREST & KFG'S UTILIZATION

1. Do you gather edible forest products from forest and KFG YES…… NO……

If yes, how often occasionally…….. Used to…….. Often……..

2. Information of edible forest products from forest and KFG gathering

category	produce	collector	Place of extraction		Amount collected (per annual)	Collecting period	Purpose[1]	Income per annual (Rs)
			forest	KFG				
Kithul tapping								
Fruits								
Spices								
Grains								
Root crops								
Green leaves/vegetable								
Mushrooms								
Bee's honey								
Animal farming								
Other specify								

1. Purpose 1= only for subsistence 2= only for sale 3= both

3. Do you gather non edible forest products from forest and KFG YES……
NO……

If yes, how often occasionally…….. Used to…….. Often……..

4. Information of non-edible forest products from forest and KFG gathering

category	produce	collector	Place of extraction		Amount collected (per annual)	Collecting period	purpose	Income per annual (Rs)
			forest	KFG				
Vines								
Fire woods								
Thatching leaves								
Agro tools								
Other specify								

6. Do you gather medicinal plant species from forest and KFG YES…… NO……

If yes, how often occasionally…….. Used to…….. Often……..

7. Information of medicinal plant species from forest and KFG gathering

category	produce	collector	Place of extraction		Amount collected (per annual)	Collecting period	purpose	Income per annual (Rs)
			forest	KFG				

8. Do you extract timber from forest and KFG YES…… NO……

If yes, how often occasionally…….. Used to…….. Often……..

10. Information of timber extraction from forest and KFG gathering

category	produce	collector	Place of extraction		Amount collected (per annual)	Collecting period	purpose	Income per annual (Rs)
			forest	KFG				

SECTION 5 INFORMATION OF COMMUNITY FOREST MANAGEMENT & KFG

As a community forest management approach

1. Is there any forest conservation and management project YES…….. NO…… if yes,

2. Levels of your involvement in deferent phases of the project/s

- Policy making & planning phase

Very good……

Good……..

Satisfactory…….

Feeble……

Non……

- Implementing phase

Very good……

Good……..

Satisfactory……..

Feeble…….

Non…….

- Monitoring and evaluating phase

Very good……

Good……..

Satisfactory…….

Feeble…….

Non…….

3. Are they related to the KFGs YES ……..NO…….

4. Effectiveness of the above projects in fulfilling your needs of forest resources utilization is

Extremely high

High……

Satisfactory……..

Average……

Poor…….

5. Effectiveness of the above projects in fulfilling your needs of forest resources utilization is

Extremely high

High…….

Satisfactory……

Average…….

Poor……

6. Effectiveness of the above projects in fulfilling your needs of income development is

Extremely high……

High……..

Satisfactory……

Average……

Poor……

7. Effectiveness of the above projects in fulfilling your needs of forest conservation is

Extremely high……..

High……..

Satisfactory……..

Average……

Poor……

8. Effectiveness of the above projects in fulfilling your needs of agricultural development is

Extremely high…….

High…….

Satisfactory…….

Average……

Poor……..

Kandyan forest gardens (KFGs)

9. Is there KFGs YES…….. NO…….

10. Effectiveness of the KFGs in fulfilling your needs for income

Extremely high…….

High……..

Satisfactory……

Average…….

Poor……

11. Effectiveness of the KFGs in fulfilling your needs for foods

Extremely high……

High…….

Satisfactory……..

Average……

Poor……..

12. Effectiveness of the KFGs in fulfilling your needs for medicines

Extremely high……..

High……

Satisfactory……

Average……

Poor……

13. Effectiveness of the KFGs in fulfilling your needs for animal husbandry

Extremely high……

High……

Satisfactory……

Average……..

Poor……..

14. Effectiveness of the KFGs in fulfilling your needs for ensure agricultural practices

Extremely high…….

High……

Satisfactory……

Average…….

Poor……

15. Effectiveness of the KFGs in fulfilling your needs for manage proper living condition

Extremely high…….

High……

Satisfactory…….

Average……

Poor……..

16. Effectiveness of the KFGs in fulfilling your needs for uplift quality of life

Extremely high…….

High…….

Satisfactory…….

Average……..

Poor…….

17. Any other viewpoints regarding the KFG to conserve forest ensure agricultural practices and enhance quality of life of villages.

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……
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Thank you

Interview guide

The Role of Kandyan Forest Gardens for Sustainable Development: *A case of Meemure Village near the Knuckles forest in Sri Lanka*

Interview guide for key informants on the village

1. Are you maintaining Kandyan Forest Garden (KFG)?
2. Why are you maintaining KFG?
3. How do you get knowledge about KFG?
4. What are the advantages of KFGs?
5. What are the disadvantages of KFG?
6. What are the challenges that you face in KFG ?
7. Do you know about the history of KFG?
8. Are you doing animal husbandry in KFGs? If yes what are they?
9. Are you using any chemical fertilizer, pesticides, herbicides, etc. for your forest gardens?
10. How are you getting labor force for KFG activities?
11. What are the domestic plant species in the KFG?
12. What are the wild plant species in the KFG?
13. What are the animal species in the KFG?
14. Are KEGs helping you to achiev your modern socio-economic goals?
15. Are KFGs helping to conserv forests in the area?
16. How KFGs connection with your lifestyle?
17. Did anyone get your knowledge about KFG? If yes for what?

Interview guide for government officers on agriculture, forestry & governance

1. Do you know about Kandyan Forest Gardens (KFG)?
2. Do you think KFGs can be an effective and efficient land use pattern for conserving forests, sustain agriculture and uplift socioeconomic conditions of the people?
3. Do you (your institution) have any plan or idea to develop and ensure sustainability of the KFGs?
4. If yes what are they? if no why?
5. Did you identify any weakness or strengths of KFGs?
6. Do you see any potential of KFGs to develop as a community forest management approach?
7. What are the legal conditions or barriers of agriculture and forestry sector to emerge KFGs as a community forest management approach?
8. Other viewpoints about KFGs?

Appendices: 03. Some photos of the data collecting process in the research

1: Community Mapping

2: Good Rapport with the villagers

3: explaining about research for research assistants

4: Questioner survey