

# **Socio-economic Impacts of Forest Conservation on Peripheral Communities: Case of Knuckles National Wilderness Heritage of Sri Lanka\***

**Kanchana Wickramasinghe<sup>1</sup>, Paul Steele<sup>2</sup>, Athula Senaratne<sup>3</sup>**

## **Abstract**

Forest conservation generates significant economic benefits to the society. However, the conservation strategies should pay necessary attention to the resultant socio-economic aspects. Otherwise, conservation efforts affect the welfare of peripheral communities due to restrictions on their livelihoods. The present paper intends to assess the socio-economic impacts of declaration of Knuckles Conservation Zone (KCZ) on the livelihoods of surrounding communities, using data and information collected through a household survey, focus group discussion, interviews and observations. The Knuckles National Wilderness Heritage (NWH) is an important natural forest in Sri Lanka, due to its richness in biodiversity, uniqueness in habitat diversity and being a vital catchment to the main rivers. The forest has greatly been threatened by the promotion of cultivation of cardamom, which receives high prices in the international market and shifting cultivation that has resulted in a sizeable decrease in the forest cover. With the declaration of KCZ, shifting cultivation and cardamom cultivation were banned and access to forest products was restricted. Consequently, although conservation activities generated considerable environmental improvements, they caused direct negative impacts on the peripheral communities. The quantity and frequency of forest products harvested has declined due to limited access to the forest, causing income losses and affecting food security. The dependency on non timber forest products (NTFPs) as a source of income is much low according to this study finding, but the forest had played a major role as a subsistence source of food, wood, fuel wood etc earlier. The annual income loss due to banning of shifting cultivation and reduced harvesting of NTFPs is estimated around US\$ 150 per household. Promotion of ecotourism activities, which are already in place, and creation of proper marketing channels for agricultural products is recognized as alternative ways to increase income, thus to improve the well-being of households. Villagers could also be allowed to harvest selected NTFPs, provided that sustainability of the forest is not affected. Therefore a mechanism should be created that communities are compensated through alternative income sources rather than depending on monetary compensations from the government thereby setting a useful example for the future conservation strategies of the country and elsewhere.

*Key words: Forest conservation, livelihood impacts, poverty*

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<sup>1</sup> Research Officer, Institute of Policy Studies of Sri Lanka

<sup>2</sup> Regional Environment Advisor of Asia & Pacific Regional Centre of UNDP, Colombo, Sri Lanka (At the time of this study he was attached to Institute of Policy Studies)

<sup>3</sup> Research Fellow, Institute of Policy Studies of Sri Lanka

## 1. INTRODUCTION

Sri Lanka is blessed with an enormous bio and genetic diversity in its natural forest resources. However, country's forest cover is on a declining trend, at a notable rate, during the past decades. Nearly 70 per cent of the land was covered by natural forests at the beginning of the last century, whereas present forest cover amounts to less than 24 per cent of the total land area. This rapid degradation of forest resources has been a function of an array of factors, stemmed from increased population, expansions in export oriented agriculture and rapid development projects etc. Although utilization of forest lands for alternative activities generates short term tangible benefits at national level, from the global perspective, conservation generates significant benefits to the society (Kremen et al, 2000). Even at the national level, deforestation has brought about detrimental effects, such as loss of biodiversity, sedimentation and destabilization of seasonal water flows in rivers (UNEP, 2001; Bogahawatte, 2002). The situation has called attention of forest owners and managers to take necessary measures to prevent further deforestation and degradation of the existing forest cover.

Since the colonial period, the natural forests of Sri Lanka are owned and managed by the Forest Department (FD), through a 'command and control' approach. The forest conservation interventions put forward so far by the FD, thus have lack of consideration on local level socio economic aspects. The interventions include declaration of conservation zones, strict reserves, national parks etc., which are exclusively aimed at preserving the forests and their ecosystem services. The resultant impacts due to FD interventions on socio-economic aspects of the peripheral households are often disregarded. Based on the evidences from different parts of the world, it is now recognized that the use of strict protection and tight regulations in managing natural forests is largely unsuccessful, especially in the areas, with high poverty incidences and few alternative livelihood options (Scherr et al, 2003). Forest management interventions should carefully identify the implications on local communities and provide necessary measures to mitigate those impacts, in order to make the interventions sustainable in the long run.

Livelihood impacts of protected areas vary according to protected area management strategies and governance, but those methodologies for assessing net livelihood costs and benefits are lacking (Lauren et al, 2007). Moreover few or no studies are found from Sri Lankan context, that assesses the socio-economic impacts of FD interventions of forest management. Most of the socio-economic research studies undertaken regarding the forestry sector in the country primarily focus on the dependency aspects of Non-Timber Forest Product (NTFP)s, and few other forest uses. However, detailed assessments on economic consequences of forest protection are rarely found. The present paper intends to assess the socio-economic impacts of forest conservation on peripheral communities, taking the Knuckles Wilderness Heritage (KWH) as a case study. It is expected to come up with policy recommendations to make the future conservation strategies to consider the socio-economic impacts at local level and make them more meaningful and sustainable in the long run.

### 3. SIGNIFICANCE OF KNUCKLES FOREST

KWH is located in the Central province of the country and covers an area about 160 km<sup>2</sup> (IUCN, 1995). The Knuckles forest range in Sri Lanka has a foremost position in Sri Lanka's natural resource base. The forest is recognized as a unique ecosystem, owing to its geographical setting and related ecological aspects. In particular, it is rich in habitat diversity, which covers a wide range of habitats within a relatively small area.

The Knuckles forest range has a great genetic diversity, where it exhibits different types of vegetations such as Lowland Tropical Wet Semi-evergreen, Sub-montane Tropical Semi-evergreen and Montane Tropical Wet Evergreen (Kariyawasam, 1991). It possesses a great genetic diversity and is rich in endemic flora and fauna. Several species of endemic fish, amphibians and reptiles are confined to Knuckles forest where as 14 of 21 endemic bird species in Sri Lanka occupy the range (Bandaratillake, 2005). Most importantly, it contains tributaries that contribute to the major rivers in the country, which provide a significant amount of water resources for agricultural development in Sri Lanka (Kariyawasam, 1991). Thus the Knuckles range of forest has been designated as a National Wilderness Heritage of the country.

In addition to provision of important ecosystem services, Knuckles forest contributes a lot to the national and local economy, both by direct and indirect means. The forest land has been used for shifting cultivation, which provides a livelihood as well as a subsistence source of food supply. Gunatilake et al (1993) estimates that shifting cultivation contributes to more than 20 per cent of household income, based on primary data collected from three villages<sup>4</sup> in the vicinity of Knuckles forest. In addition several export oriented agricultural crops have been largely grown in the area, after clearing the forest, including cardamom, tea etc. It is estimated that cardamom cultivation in Knuckles forest contributes to 55 per cent of the total cardamom cultivated areas in the country and 32 per cent to the national cardamom production in 2002 (Bandaratillake, 2005).

On the other hand Knuckles forest possesses a significant potential for forest-based tourism activities. It possesses an enormous scenic beauty, which could attract both local and international tourists. Moreover, the villages surrounding the forest are traditional villages with specific cultural and social characteristics. Thus from supply side, Knuckles is identified as an ideal site for development of ecotourism (Bandaratillake, 2005; IUNC, 1995).

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<sup>4</sup> Meemure, Narangamuwa, Ranamure

#### **4. OBJECTIVES OF KNUCKLES CONSERVATION ZONE**

This splendid resource has shown signs of rapid degradation with the introduction of cardamom, a spice crop that fetches high prices in the international market and brings in foreign exchange to the country. The rapid expansion of cardamom cultivation in the Knuckles range took place in the 1960s, although the initial introduction dates back over a hundred years. Due to the high prices generated by cardamom in the 1960s the government had encouraged cardamom cultivation and the Knuckles forest land was leased to individuals and groups for export oriented cardamom cultivation. Along with those who were authorized by the FD, others living in peripheral villages also undertook cardamom cultivation in an unauthorized manner.

Cardamom is a shade loving plant and grows well on altitudes higher than 3,500 ft, which is considered to be the most environmentally sensitive area of Knuckles. Around 90 per cent of the plantations have been established in highly environmentally sensitive areas, where as most of the plantations are found on 30 – 70 per cent slopes and cultivations are done without paying attention to soil conservation measures (Gunawardane, 2003). The impact of cardamom cultivation on the forest comes in two ways. First, prior to the establishment of the crop on the land, part of the over-storey is cleared and the undergrowth is totally removed. This in turn poses significant threats on the surrounding flora and fauna species. Repeated cultivation has ultimately resulted in degraded land, which endangers the sustainability of the forest. The second impact is that, raw cardamom fruits are processed in barns located inside the forest and the fuel wood for curing is taken from illegal felled trees in the forest. This again, encourages forest degradation, which ultimately leads to soil erosion.

In addition to cardamom, the forest has been impacted by land clearing for shifting cultivation, particularly in the most accessible parts of the Knuckles. This includes clearing of land for cultivation of upland crops such as finger millet and mustard. Shifting cultivation is largely identified as an unsustainable agricultural system, which induces land degradation, followed by deforestation. Peripheral households engaged in shifting cultivation to earn an income as well as to meet subsistence food requirements. As well as cardamom and shifting cultivation, allowing cattle to graze in the forest had contributed to forest degradation.

In order to ensure the sustainability of the forest, in the year 2000 the FD declared a conservation zone for the Knuckles, in the area 3500 ft above mean sea level. The boundary was intentionally laid down in order to facilitate the elimination of cardamom from the forest. The declaration was also intended to totally ban shifting cultivation and other unsustainable activities such as illegal timber felling, over-grazing, and other activities affecting the sustainability of the forest. The FD serves as the responsible government agency for implementation of the Knuckles Conservation Zone (KCZ).

However, to make such conservation initiatives sustainable in the long run, impacts on local communities must be properly addressed. Around 77 traditional, agriculture

dependent villages are located in the periphery of Knuckles (FSMP, 1995). The paper intends to assess the impacts of forest conservation on the peripheral household economy and poverty level, drawing the case of the Knuckles forest range in Sri Lanka.

## **5. METHODOLOGY**

The study is based on mainly the primary data collected from three study sites, in the periphery of Knuckles using a household survey, focus group discussions, stakeholder interviews and observations. The sites include Ilukkumbura, Atanwala and Pitawala, located in the buffer zone and same catchment. The villages were selected in a way that they represent varying elevation and varying accessibility from the paved road.

The household survey was undertaken with the support of the IUCN funded Forest Governance project on “*Strengthening Voices for Better Choices*” to collect primary data on socio-economic conditions of households, their relationship with the forest and the impacts of conservation interventions, using a pre-tested detailed questionnaire. The initial intent of the survey was to cover all the households living in the three sites. The sample includes 149 households, which accounts for 93 per cent of all the households living in the selected villages.

## **6. LOCAL LIVELIHOODS**

The principle livelihood of the households in the three villages is agriculture. Paddy cultivation, as well as upland farming is undertaken. Upland crops mainly include vegetables, grown for consumption as well as for commercial purposes. Almost all households are small farmers, with small agricultural land extents. Before the KCZ came into implementation villagers were used to clear the forest lands to cultivate upland crops on rotational basis, but after the declaration of KCZ, shifting cultivation has been totally be banned.

There are no landless people in the survey area. About 90 per cent of the households own more than one plot. Cattle and buffaloes are reared by the villagers to use them in land preparation and to obtain calves. The livestock sector has not been properly developed as most of the villagers rear animals for subsistence purposes.

The percentage of households dependent on agriculture seems to be related to the accessibility to a particular village. More than 93 per cent of the households in Atanwala, the most remote and less accessible of the three, are engaged in agriculture as their main source of income. In the most easily accessible village, Ilukkumbura, agriculture provided the principle livelihood for only 52 per cent of the households. Around 30 per cent and 12 per cent of the households in Ilukkumbura are respectively government servants and retired persons, earning monthly pensions.

## 6.1 Household Income

In the three selected villages, agriculture is the main income source for more than 80 per cent of the total households. The second most important source of income has been salaried employments. However, the dependency on agriculture and salaried employment varies across the three pilot sites (Table 1). More than 75 per cent of the income in Pitawala village is derived through agricultural activities and this may be explained by the larger plots of lands owned by the Pitawala villagers when compared with other two villages.

**Table 1: Percentage Contribution of Different Income Sources to Household Income, by Village**

Village	Agriculture	Salaried Employment	Home Garden	Shifting cultivation	NTFP	Total
Atanwala	37	62	< 1	< 1	< 1	100
Ilukkumbura	39	60	< 1	< 1	< 1	100
Pitawala	76	24	< 1	< 1	< 1	100
<b>Total</b>	<b>54</b>	<b>45</b>	< 1	< 1	< 1	<b>100</b>

Source: Author's calculations using primary survey data

However, households face numerous problems in marketing their agricultural products. With the banning of shifting cultivation, many households have shifted for commercial vegetable cultivation which uses agrochemicals purchased from the market. Hence cost of production is higher when compared with shifting cultivation which uses no agrochemicals at all. Due to the remoteness, proper marketing channels have still not developed and the farm gate prices received by farmers are not enough to cover cost of production during certain months of the year.

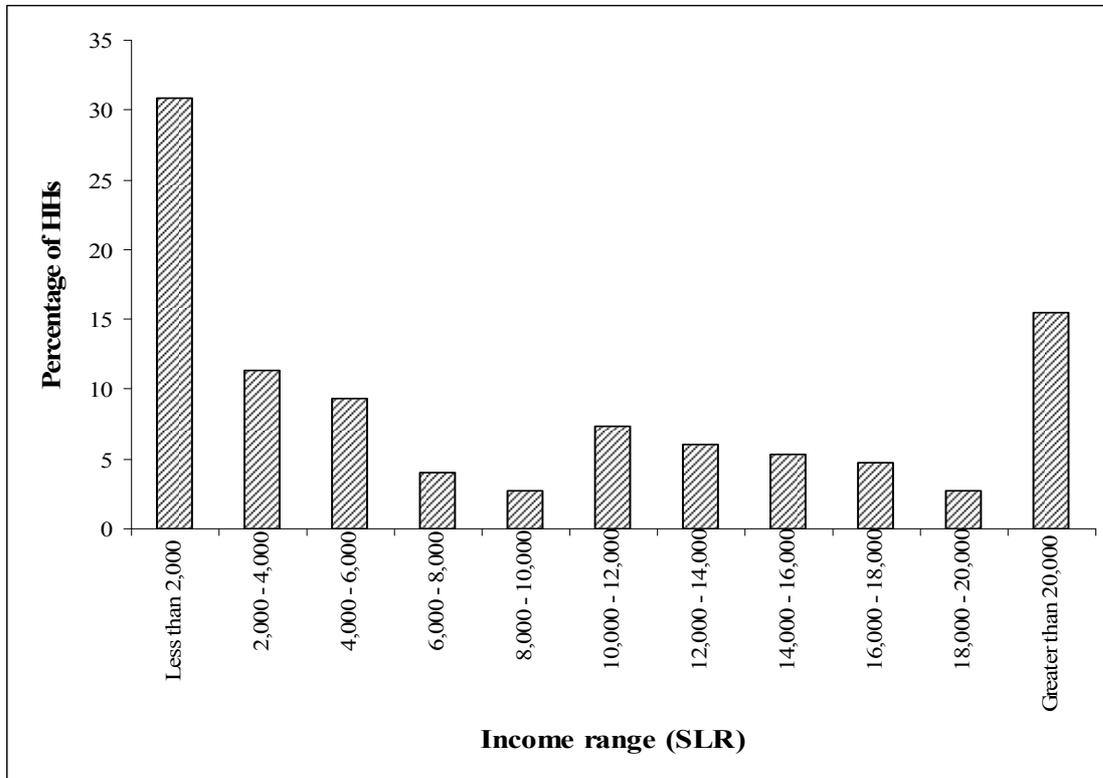
## 6.2 Poverty Situation

The remoteness of the three villages, as seen in other forest peripheral villages of the country is associated with lack of access to social services such as transport, health and education. The area is poor in infrastructure development which has constrained community development. Due to these reasons, all three selected villages are characterized by lack of alternative income sources and somewhat isolated from urban based incomes. In terms of monetary measures, around 57 per cent of the households subsist below the provincial poverty line, as opposed to the national poverty incidence of 23 per cent. Income inequality also remains very high (Figure 1).

The percentage of household heads, who have received secondary level education, is 70 per cent and rest have received primary education only. Only 4 per cent of the households comprise of members who have received tertiary education. Young people face the problems in finding suitable non-agricultural income generating activities in the

area. Some female household members work in garment factories in Matale and Colombo.

**Figure 1: Percentage of Households by Income Category**



Source: Author's illustrations using primary survey data

## 7. RELATIONSHIP BETWEEN PEOPLE AND THE FOREST

The forest has been providing various benefits to the peripheral communities for thousands of years. Mainly it functions as a source of income and materials to fulfill subsistence needs of the peripheral communities. In the case of Knuckles, the relationship between forest and the people could be assessed in three principle ways, including shifting cultivation, cardamom cultivation and harvesting of forest products, both timber and non-timber.

### 7.1 Cardamom Cultivation

Although Cardamom cultivation is forbidden in the forest, still communities do benefit from the existing plots in the forest. The Knuckles Management Plan highlights the need for restoration of the forest area cleared for Cardamom cultivation but it has not yet taken place in practice.

There are two types of households who derive economic benefits from Cardamom plots located in the forest. They include cardamom plot owners and individuals who provide labor for harvesting, weeding and drying of cardamom fruits. Usually under employed youth, in their spare time, work as laborers in the plots as a non-regular source of income. The owners manage the lands and they earn higher profit margins. However, the owners stated that profitability has gradually been decreasing over time as replanting is legally prohibited. Opposing statements were also made about continued replanting in certain areas even after the declaration of conservation zone..

The study carried out by Gunatilake et.al (1993) and Gunatilake (1995), before the declaration of KCZ in another peripheral area of Knuckles where cardamom was very important estimated that if cardamom related activities in the forest are totally banned, the forgone income would be US\$ 308 per year. Cardamom is not a regular source of income for the households in the three study sites. Generally cardamom is harvested thrice a year and particularly the unemployed youth in the area are engaged in this. The daily wage earned by cardamom laborers is around US\$ 3 per month.

## **7.2 Shifting Cultivation**

Before the declaration of KCZ, shifting cultivation was one of the major sources of subsistence for the peripheral communities. Around 90 per cent of the surveyed households were engaged in shifting cultivation and 54 per cent have derived some sort of cash income out of it. The average cash income derived from shifting cultivation before the declaration of KCZ is around US\$ 15 per month per household. Gunatilake et al (1993) estimates that average monthly income from shifting cultivation before KCZ is US\$ 21 (US\$ 253 per year), based on a study done in different sites in the same periphery. Currently shifting cultivation is totally banned in the forest area creating significant loss of subsistence for households.

## **7.3 Timber**

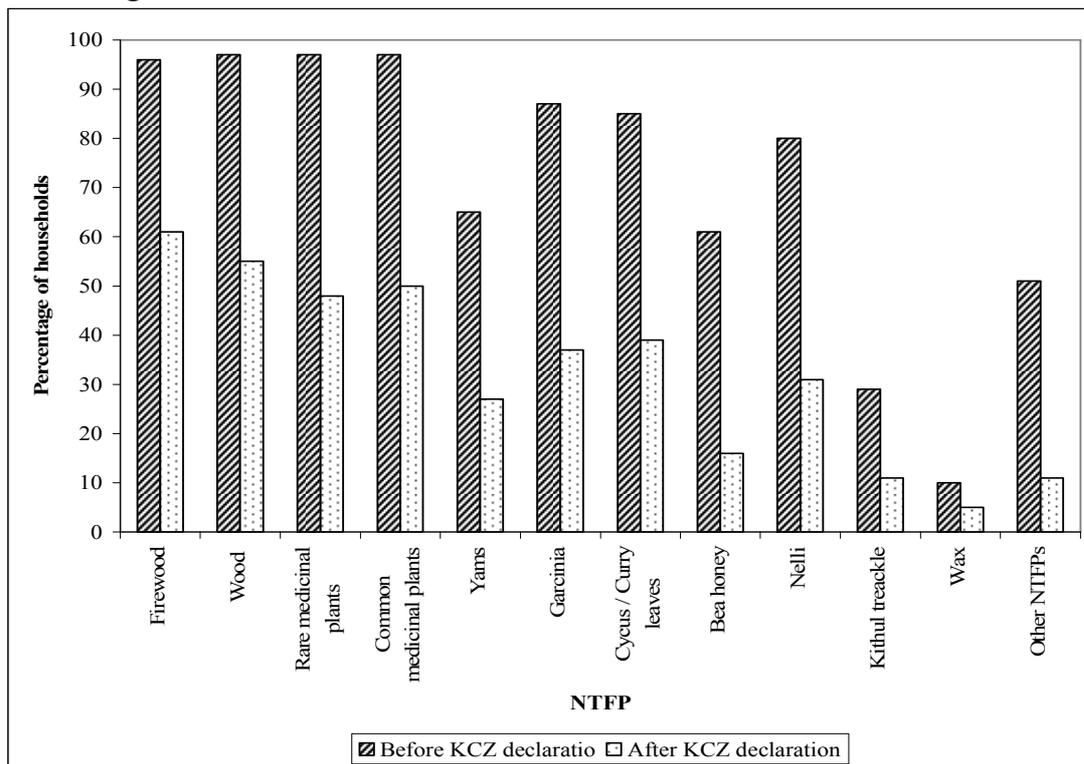
Timber is harvested by the households to meet their subsistence needs only. Even before the declaration of KCZ timber, felling activities were not undertaken commercially. However the percentage of households harvesting timber has dropped to 9 per cent from 88 per cent following the declaration. However, 18 per cent of households have expressed that illegal timber felling is still being carried out in the area and 6 per cent of the households have witnessed such incidents. People involved in these activities include both villagers and outsiders.

## **7.4 Non-Timber Forest Product (NTFP) s**

The quantity (Figure 2) and frequency of harvesting NTFPs have decreased significantly following the KCZ declaration. NTFPs are used for both subsistence and commercial purposes. The decrease in percentage is accrued to limited access to the forest. However, contrary to the findings of surveys carried out in other peripheral villages of the forest range, the contribution of NTFPs to household income had not been

significant, even prior to the declaration. This indicates that along the periphery of Knuckles, the dependency on NTFPs varies significantly. Moreover, the percentage contribution of NTFPs in other forests of the country also vary in a wider range, depending on the type of forest, types of products and socio-economic characteristics of the communities concerned.

**Figure 2: Percentage of Households Harvesting Different NTFPs, Before and After Declaring KCZ**



Source: Author's illustrations using primary survey data

## 7.5 Ecotourism

The Knuckles forest area is emerging as an ecotourism site owing to its scenic beauty, favorable climate and numerous types of eco-systems and habitats and accessible roads with Kandy and Matale close by. At present, ecotourism activities are gradually emerging. Around 35 per cent of the households already benefit from ecotourism including as boutique owners, other businessmen and trekkers.

Strikingly 95 per cent of the surveyed households foresee that future improvements in ecotourism activities could create positive impacts on their income. Such an improvement has to be backed by active and meaningful local participation in order to ensure that households will be benefit. Some have complained that the increased

arrival of tourists to the area would be harmful to the socio-cultural setup of these traditional villages. Such impacts could be mitigated via active community involvement. Particularly the unemployed youth can be employed in such activities to enable them to earn an income, supplementing their agricultural incomes.

It is a positive development that the FD has signed a memorandum of understanding with a Community Based Organization (CBO) called “*Dumbara Surakinno*” (Knuckles Protectors) in the area to ensure the benefits from ecotourism will be shared with local households also. According to the agreement, 60 per cent of such income will be devoted to the CBO to be used in community development. However, this arrangement has not come to operation yet.

The slow progress in ecotourism so far is attributed to several issues. Lack of accommodation facilities in the area is seen as a major obstacle to increase the number of visitations. On the other hand the site is mainly visited by local tourists and arrival of foreign ecotourists is limited. This is primarily because that the FD is not capable of investing heavily on tourism facilities. On the other hand promotion of ecotourism is beyond the scope and role of the FD. Besides, the local households too have lack of knowledge to handle a profitable ecotourism business. Due to less exposure to the outside world, the villagers do not have the required management skills. Villages perceive that inability of the villagers to communicate in foreign languages would be a barrier for them in attracting foreign tourists in the future.

With the IUCN Forestry Governance project implemented in the area, several villagers have been hired as paid garbage collectors. This has resulted in beneficial impacts on the environment, since was a significant problem before. At the same time it provides part-time livelihood for those who are engaged in. However, continuation such activities after withdrawal of the project in the near future, remains an issue, since the villagers are not financially strong for such a carry-over.

In this regard, private sector is seen as a potential investor in ecotourism in the area. Collaboration between community, FD and the private sector would be successful in providing direct economic benefits to communities and to actively contribute to conservation.

## **8. COSTS OF FOREST CONSERVATION TO HOUSEHOLDS**

The view of 89 per cent households is that declaration of KCZ has caused detrimental effects on their day to day activities. The main impact has come from banning of shifting cultivation. Other effects include restricted access to the forest, inability to collect other NTFPs such as bee honey and medicinal plants, prohibition of allowing cattle for grazing, sand mining and loss of land etc. Although cardamom cultivation is in principle banned, no steps have been taken so far to restrict or ban the harvesting of cardamom from the existing cultivations in the forest. However due to the restrictions

imposed on replanting and new planting, the productivity of existing plantations is said to be gradually decreasing.

As per the direct income losses occurred through prohibition of shifting cultivation and restricted access to NTFPs, the average loss is estimated as 150 US\$ per household per year (Table 2). This value could be much higher for other peripheral villages of the same forest. The findings of the present study suggests that dependency on NTFPs is much low. However, the contribution of NTFPs to household income is much significant in Meemure, Narangamuwa Ranamure, Kiwlewadiya and Kalugala which are located in the same periphery according to Gunatilake et al (1993) and Gunatilake (2005). Gunatilake (1994) reveals that forest dependency is determined by availability of non-agricultural employment activities, access to social services such as education, and the level of agricultural productivity.

Nevertheless, non-monetary losses are not incorporated in this figure. Therefore, it is undoubtedly an under estimation. However, it gives some indication of the direct economic losses to the peripheral communities. Both cash income and subsistence losses have to be compensated in order to make conservation more meaningful and it is useful to look at the ways and means of compensating the foregone livelihood opportunities.

**Table 2: Income from Shifting Cultivation and NTFP before and after KCZ (SLR/month)**

	Atanwala	Ilukkumbura	Pitawala	Total
<i>NTFPs</i>				
Before KCZ	48	977	0	1,025
After KCZ	282	198	0	480
Difference	(234)	779	-	545
<i>Shifting Cultivation</i>				
Before KCZ	17,579	18,914	7,916	14,420
After KCZ	0	0	0	0
Difference	17,579	18,914	7,916	14,420
<b>Total income loss</b>	<b>17,346</b>	<b>19,693</b>	<b>7,916</b>	<b>14,965</b>

Source: Author's calculations using primary survey data

Until today, villagers have not been compensated for the forgone benefits of the KCZ by the FD. Other than the direct impacts on their livelihood, substantial losses occurred due to loss of private lands and restricted access to the forest. In addition some households believe that restricted access to the forest has affected the availability of nutritious food to the households. Before the declaration, villagers harvested yams, herbal vines, cycus fruits etc, which are of higher nutritional value.

It is important to note that lands owned by 35 per cent of the households were acquired by the KCZ. The average land size consumed is 3 Ac. Around 24 per cent of the households have received woodlots from the Forest Department following the declaration of KCZ.

## **9. ENVIRONMENTAL BENEFITS**

Halting the destruction of virgin forests due to banning of further expansion of cardamom cultivations could be seen as a huge environmental benefit. On the other hand, restricted shifting cultivation has put an end to degradation of the forest land. In addition, villagers perceive that KCZ has led to environmental improvements in the area. About 48 per cent households have perceived that declaration of KCZ has been beneficial for them. Around 38 per cent of households have identified that this action has led to increased water availability in the area and prevented unnecessary damage to the nature. Other benefits mentioned by villagers include weather and climatic improvement, soil erosion reduction and reduced impact of fire set by villagers.

Pesticide usage has increased due to vegetable growing and villagers believe that it will lead to health hazards in the area due to the intake of agrochemicals through vegetable consumption and pollution of the environment. Shifting cultivation, by contrast was carried out free of organic pesticides, and was based on traditional farming methods.

## **10. LINK BETWEEN THE FOREST DEPARTMENT AND PEOPLE**

Households perceive that the Forest Department officials do not maintain a good relationship with them. Households are not well aware of the rules and regulations that are applied to forest product harvesting. Around 91 per cent of villagers have found that none of the activities are allowed in the conservation zone. This clearly shows that villagers do not have a common understanding on allowed and prohibited activities within the KCZ. The knowledge of households on the forest conservation boundary and buffer zone boundary is also limited. Lack of knowledge on the KCZ rules undermines the relationship between people and the forest. On the other hand, only 13 per cent of the households were formally informed about the declaration of KCZ and all other have got to know about it mainly through word of mouth, when the boundaries were established and when the forest officers came to village to start their work.

## **11. CONCLUSIONS AND POLICY SUGGESTIONS**

The declaration of KCZ has caused significant impacts on the household economy and poverty. The losses have occurred mainly due to banning of shifting cultivation. In addition certain benefits from harvesting of forest products were lost. The FD has not recognized the socio-economic impacts on the peripheral households and consequently no compensation has been given. Although a few wood lots have been provided to some households, this is not adequate to compensate for the foregone benefits. There is growing ecotourism and vegetable cultivation which can provide alternative sources of income in the area.

Since there is no any compensation mechanism currently in place for the households in KCZ, future policies should aim at strengthening the emerging alternative sources of income. First, raising income from commercial vegetable cultivation is emphasized as the main priority to minimize the impacts of the KCZ. In particular, creation of proper marketing channels would be beneficial for farmers to sell their agricultural produce at a reasonable price. A positive development has been reported from Ilukkumbura village, where a tomato marketing society has been established by the IUCN Forest Governance project. So far the society has been able to receive a reasonable price for vegetables. Such measures can be replicated in the other villages to increase agricultural income. Secondly, promotion of ecotourism with active and meaningful local participation can serve as an alternative income source for those who lost income due to the KCZ.

Apart from this, households could be allowed to harvest selected NTFPs for commercial purposes, ensuring that such activities do not harm the sustainability of the forest. For instance issuing licenses for utilization of particular forest products would enable them to harvest those products while abiding by the conservation rules. Promotion of rural industries which make use of such forest products would ultimately serve as a supplementary source of income for households.

Sustainable forest management rests on effective and meaningful involvement of all the stakeholders, specifically the local households who have been beneficiaries as well as the custodians of forests for thousands of years. The meaningful participation of households in forest management has to be improved for achievement of successful results. Even though the Knuckles management plan highlighted the need for active community involvement, such objectives have not been well achieved in the actual implementation of the plan.

## REFERENCES

- Bandaratillake, H.M. 2005. The Knuckles Range: Protecting Livelihoods, Protecting Forests. In *In Search of Excellence: Exemplary Forest Management in Asia and the Pacific*, edited by Patrick B. Durst, Chris Brown, Henrylito D. Tacio, Miyuki Ishikawa, FAO, RECOFTC
- Bogahawatta, C. 2002. *Forestry Policy, Non Timber Forest Products and the Rural Economy in the Wet Zone Forests in Sri Lanka*  
(<http://www.eepsea.org>)
- Forestry Sector Master Plan (FSMP) (1995), Ministry of Agriculture, Lands and Forestry
- Gunatilake, H.M. 1994. Factors Influencing Peripheral Villager Dependency on Forest Resources Use in the Knuckles Forest Range. *Sri Lankan Journal of Agricultural Economics*, 2(2)
- Gunatilake, H.M. 1995. An Economic Impact Assessment of the Proposed Conservation Program on Peripheral Communities in the Knuckles Forest Range of Sri Lanka. *Journal of Sustainable Forestry*. 3(1)
- Gunatilake, H.M., D.M.A.H. Senaratne, P. Abeygunawardena. 1993. Role of Non-timber Products in the Economy of Peripheral Communities of Knuckles National Wilderness Area of Sri Lanka: Farming Systems Approach, *Economic Botany* 47(3): 271 – 281
- Gunawardene, H.G. 2003. Ecological Implications of Cardamom Cultivation in the High Altitude of Knuckles Forest Reserve, Central Province of Sri Lanka. *The Sri Lanka Forester* 26:1-9
- IUCN, Forest Department, 1994. Management Plan for the Conservation of the Knuckles Forest: Phase II, Colombo , Sri Lanka
- Kariyawasam, D. 1991. Resource Use and Settlement in the Forests of Knuckles Range. *The Sri Lanka Forester*. .10 (1 & 2): 1-13
- Kremen, C., J.O. Niles, M.G. Dalton, G.C. Daily, P.R. Ehrlich, J.P. Fay, D. Grewal, R.P. Guillery. 2000. Economic Incentives for Rain Forest Conservation Across Scales, *Science*: 288: 1828 -1831  
(<Http://www.sciencemag.org>)
- Lauren Coad, Alison Campbell, Sarah Clark, Katharine Bolt, Dilys Roe and Lera Miles. 2007. *Protecting the future: Carbon, forests, protected areas and local livelihoods*. UNEP World Conservation Monitoring Centre, Cambridge, U.K

Scherr, S.J., White, A., Kaimowitz, D. (2003), A New Agenda for Forest Conservation and Poverty Reduction: Making Forest Markets Work for Low-Income Producers (<http://www.forest-trends.org> )

UNEP (2001), State of the Environment: Sri Lanka (<http://www.ricap.unep.org>)