

# Consequence of Dialectic Reproduction of Social Structures on Biodiversity of Kandyan Home Gardens in Sri Lanka

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**Abstract-** Kandyan Home Gardens (KHGs) are unique places where a wide number of biological diversity is harbored. The social structures that reproduce and transform by the study community and the KHGs are link together. On the one hand, without KHGs' resources some social structures cannot be reproduced; on the other hand, the plant species, which are not connected to the structuration process is also very rarely be survived in home gardens (HG), due to home garden management practices of the dwellers. Any social structure is reproduced if the structure has power and resources to control and facilitate the society. However, the power of each social structure may be less or more respect to other social structures constituted to the place and other places. In addition, it changes according to time dimension too. Each social structure does many projects to ensure its power and resources. It leads to reproduce the social structures of the place dialectically. In this sense, biological diversity of KHGs is a result as well as a cause for dialectic reproduction of social structures.

**Index Terms-** Biodiversity, Kandyan home garden, Place Theory, Social structuration

## I. INTRODUCTION

Kandyan Home Gardens (KHG) are economically efficient, socio-culturally and politically embedded production and distributional projects as well as ecologically sustainable land use systems that are managed by the Kandyans next to their dwelling place, home, based on the knowledge that is transmitted from one generation to the next, and the experience of daily life. In Sri Lanka, there are about 1.42 million home gardens (DCS, 2002, cited in Pushpakumara, et.al, 2012) and approximately 14.3% of land area of the country except Northern Province was under home gardens in 2002 (Ariyadasa, 2002). During 1980-2000 home garden (HG) area of the country has been increased about 1% (8,000 ha) per year (MALF, 1995). They fulfill an ample amount of resource demand of the country. Hence, home gardening practice is being used as a regional planning/economic development-planning tool, which combats against poverty, food crisis, etc.

Environmentally, HG contribute to conserve biodiversity by reducing pressure on natural forests, by harboring a vast number of flora and fauna species, and by linking fragmented natural forests and wetlands, as complementary corridors that facilitate the movement of wild animals and pollinators. Therefore, it is

very important to understand the biodiversity conservation mechanism that is behind the KHGs.

## II. OBJECTIVES

Locale is one of the main three elements (locale, location and sense of place) of any kind of places (Agnew, 1987) and it implies the enduring and relatively stable pattern in social relations, social structures, that followed by individuals. 'Social structures are both constituted by human practice and concurrently, the medium for this constitution. ... By mean of lifelong socialization, and through the limits set by the physical environment, people draw upon social structure. But while they do this they are also reconstituting that structure (Giddens, 1979, cited in Agnew, 1987: 30p). The main objective of the study was to identify the consequence of this process on biodiversity of KHGs of Sri Lanka. The subordinate objectives of the study were identifying the social structures, systems, institutions and practices reproduced by the community over history, identifying the reactions of the community against structural changes, identifying the main botanical resources (Ethno-botanical value added plant species) of the study community, and identify the plant diversity of KHGs.

## III. METHODOLOGY

To achieve the objectives, social structuration process and KHGs of seven Grama Niladhari Divisions (GND), Millanga, Moonamale, Aluthgama, Bogahakumbura, Doragamuwa, Udurawna and Yatawara located in *Patadumbara* Divisional Secretariat Division (DSD) of Kandy district in Sri Lanka were studied for five years (from 2008 to 2012). Sample household survey, key informants interview, group discussions, and observation methods were used to collect primary data and information. Secondary data were observed from published and unpublished data sources.

In the study, 10% of households of each GND were interviewed. Hence, the total sample was 244 households. A semi-structured questionnaire was used in the sample household survey for collecting data and information. Further, 42 key informant interviews (six per village), and eight group discussion (one per village), were done for acquiring oral history and in-depth descriptive information on practices. The key informants consisted of academic specialists, clergymen, local physicians *Yakaduras* (exorcists who are skilled in the worship and

expulsion of demons), leaders of farmer organizations, and government field officers, namely village officers (Grama Niladhari-GN), and Agricultural Research and Development Assistance (ARDA).

#### IV. RESULT AND DISCUSSION

To give a holistic explanation, the first, dialectically reproduced social structures and their influences on KHGs are explained; the second, the consequences of the process on biodiversity of the area is explained.

##### Dialectic Reproduction Social Structures

The Buddhist religious structure is the most dominant religious structure over the history of the area. Archeological evidence of the area such as *Weheragala* ruined shrine of *Moonamale-Talawinna* border are depicted the influences of the structure during the period of King Dutthagamani (161-137 BC). According to the *Choola Bodhiwansaya*, *Weheragala* is one of the places where 34 *Bodhi* trees were planted during the period of King *Buwanekabahu* (Vilgammulla Mahathera, 1962). These institutions (temples) conducted projects, such as *Paya-day* ceremony (worshiping the Triple Gems and observing Sil), *Katina* (the special robe offering ceremony held to express Buddhists' devotion to the *Sangha*), *Pirith* (the Buddha's words chanting ritual held to ward off illness, fear, danger from evil spirits, and to invoke the blessings of the Triple Gem for protection), *Bodhi Puja* (the veneration of the Bodhi Tree to obtain the mental relief, to avert evil influences, to make a wish or fulfill a vow, to fulfill the emotional and devotional needs of the devotees) lead to reproduce the religious structure.

The direct involvement of political authority to spread up the *Hindu* religious structure to the study area is documented with the establishment of 500 Soli settlements in *Dumbara Pansiya Pattuwa* during the period of King Gajaba 1132-1253 (Abeyawardana, 1978). Since then the social structure also has affected to the social structuration processes of the study area. The King *Gajabahu* is said to have introduced the worship of goddess *Pattini* into the island from south India (Nicholas and Paranavitana, 1961, cited in Kariyawasam, 1995). Later on, she becomes the most popular female deity of the *Sinhala* Buddhists of the study area. Study area community worships the goddess to invoke the blessings for protection against disease, attaining special treatment for women who desire children, banishing evil influences, attaining prosperity in general and good harvests, etc. Under the rules of *Kotte* Kings (the 15<sup>th</sup> and 16<sup>th</sup> centuries), most of *Shanthikarma* (worshiping the deities of planets -*Graha*- to ward off evil influences), in the country have been introduced to the country by some *Hindu Brahmins* from south India. The Buddhist religious institutes had understood that the Buddhist religious structure is under threatened due to the reproduction of *Hindu* religious structure. Hence, Buddhist monks recast the *Hindu* religious projects such as *Bali*, *Shantikarma* with Buddhist significance both in form and in content in that all the verses and formulas used in the ritual are those extolling the virtues of the Triple Gem and of the Buddhist deities (Kariyawasam, 1995); Offering animal lives to deities has been converted offering foods. Consequently, present day *Shantikarma* of the study area are made of subservient to Buddhism.

After *King Rajasinghe II (1635-1687)*, all kings of *Kandyan* kingdom had married South Indian *Nayakkar* princesses. The people who came with such princesses were appointed to eminent posts of the kingdom. They have placed their first priority to the *Hindu* religious structure. For example, prince *Wijepala*, one of the brothers of *King Rajasinghe II*, built the *Kataragama Devalaya* at *Yatawara*, where the *Brahmanedara Brahmin* performed the *Bahirawa Puja* for facilitating to the prince to tracing a water canal (Lawrie, 1898). Nowadays also, the study community performs the *Bahirawa Puja* (worshiping the ghosts who are haunts or have taken their abode in a place) to get the permission of ghosts and avoid the evil influences, attaining the help of the Goddess/ghosts to success the building/housing construction. Establishment of *Hindu* religious institutions and popularizing of *Hindu* religious projects reveal that with the support of political authority, *Hindu* social structures became stronger and stronger in the study area. As a reaction to such changes, Buddhist social structure spread out its institutional network over its territory to perform the projects to ensure the reproduction of the structure. *Doragamuwa* temple that built in the reign of *King Kirti Sri* by *Kankanange Rala* and *Anuragala Vihare* that restored in the same time by *Ampitiye Unnanse* are two of temples established under this process. *Sinhala* noblemen had facilitated to maintain the religious institutions and performed institutional projects such as *Katina* by granting lands to the institutions (Lawrie, 1898). In addition to that, under the feudalist mode of production (economic structure) and the caste structure, the duty of some castes was the supplying vegetable, flowers, sandalwoods, etc. to the temples, repository of the king and the houses of aristocracy (Lawrie, 1898). *Gabadagam* (the royal villages) such as *Mahagama*, *Paranagama*, and *Aluthgama* were the villages where such castes inhabited (the study villages are some of hamlets of these traditional villages).

Prior to the period of *King Weera Narendrasinghe (1707-1739)*, the dialectic reproduction of Buddhist and the *Hindu* religious structures was happened due to several reasons. The first, *Sinhala* chiefs of the *Kandyan* kingdom had a free hand; the second, they were appointed to the high ministerial officer posts, including *Mahagabada Nilame* (chief of the King's store); the third, the people believed that the Kings' supports for *Buddhism* were not superficial. Many Kings had understood the opinion of the local community. Therefore, the Kings also had to show their loyalty to the *Buddhists* although they were originally loyal to *Hindu* religion. For example, *Wimaladharmasooriya II* had devoted his life to *Buddhism*, inviting monks from *Arakan* in 1697 to re-establish higher ordination (*Upasampadawa*) (Karunaratna, 1999).

Societal stability of the kingdom was dramatically changed after the death of *King Wimaladharmasooriya*. His son ascended the throne of the kingdom as *Veera Narendra Sinha* in 1707. "He was only seventeen years old at the time of his accession, was addicted to wine, women, and song". "The King attempted to keep the chiefs' activities under close supervision" and "to maintain a balance of power by appointing a *Nayakkar* as *Mahagabada Nilame*, making him responsible for all *Gabadagam* in the *Udarata*". "His support to the *Buddhism* was only superficial" and "the number of monks had dwindled considerably". Further "the King had also shown a

partiality towards the *Catholic* missionaries in Kandy” (Karunaratna, 1999: 38p).

These activities aggravated the ill feelings of the *Sangha* and nobles. Then the dialectic reproduction process of Buddhist and Hindu religious structures became a political rebellion in between ***Nayakkar* and *Sinhala* political structures**. *Sinhales* had not ignored the King’s activity. They had worked against the King. One of the best examples is the responses of noblemen of *Paranagama* and *Aluthgama*. The people

of *Paranagama* sprinkled cow dung on what remained, with a view to disappoint the *Malu-murakarayo*, who visited villages in search of good vegetables to the royal kitchen. “The following week the *Malu-murakarayo* found this out and went to the adjoining village; there also they found that cow dung had been sprinkled on the vegetables, but at that place it had been done newly” (Lawrie, 1898: 708p). The King punished the villagers by degrading their caste seven times into Gattaru. The final result of this process was the rebellion of 1709, which was held by noblemen of *Kandyan* Kingdom to kill the King and to place on the throne *Pattiya Bandara*, the chief of *Mahagama* (Karunaratna, 1999; Tennakoon, 1963; Obesekara, 1993).

However, the rebellion also was not successful. The King had prior information of the plan and before the conspirators surrounded the palace, he had escaped. Subsequently, *the King with the help of loyal villagers captured Pattiya Bandara and conspirators* and all conspirators were sentenced to death (Karunaratna, 1999). In addition to that, *Mahagamas* were degraded to *Gahala* caste. Since then *Millanga*, *Moonamale*, *Aluthgama*, and *Bogahakumbura* villagers had to collect resources for fulfilling socio-cultural, economic and political needs from their villages because of the spatial exclusion limits the accessibility to resources, including King’s property. This also might have led to intensively maintaining various plant species in KHG.

After the signing the *Kandyan* convention of 1815, social structuration process of the country was dramatically changed and it leads to the changes of social structures that dialectically reproduced in the study area. By signing the convention, *Kandyan* chiefs hoped to open a chance to appoint a new King who would obey the advice of Buddhist priests and noblemen and follow the age-old traditions of the kingdom. Within two years, they understood that their hopes would not succeed under the British administration. Therefore, they organized a rebellion in parts of *Kandy* against the British rule in 1817-18. However, the rebellion was crushed. Since then, traditional social structures, sense of place and place identities of local communities were neglected and new social structures were introduced and forced to widespread in the study area by the colonial administration.

Until the mid-nineteenth century, the main economic structure of (the country and) the study area was **subsistence peasant agriculture**. However, British control of the entire country signaled the entry of the plantation economy, and colonial administration facilitated to diffuse **capitalist market economic structure** in the study area. At first, several incentives, such as the abolition of export duty on coffee in 1825 and waiving land tax on the coffee plantation for 12 years from 1829, were provided to promote coffee plantation by the colonial

administration (Jogaratnam, 1964: cited in Sanderatne, 2000). Then in 1840, Crown Lands Encroachment Ordinance/Wasteland Ordinance was declared by the colonial administration to take over the lands which were unoccupied and uncultivated (including forests), and previously held by royalty, temples, local community and individuals (MOFE, 1999; Sanderatne, 2000). According to the Patadumbara DSD office’s (unpublished) data, the land area grabbed by the colonial administration for the coffee plantation in the study village mosaic during the period is about 1507 acres. It is about 69% of the approximate land extent of the study area. The colonial administration developed infrastructural facilities for encouraging investors to develop large coffee plantations in the study area. One of the most important landmarks of the infrastructural development of *Kandyan* area was building a bridge to cross the *Mahaweli* River at *Katugastota* in 1858. In addition to roads, a railway line was completed between *Kandy* to *Matale*. Besides that many institutions such as schools and missionary churches, hospitals, etc, were established by the colonial administration at bazaars like *Katugastota* and *Wattegama*. It depicts the diffusion and reproduction of market economic structure into the study area. The social structures of the study area were significantly affected by the development of plantations. The economy was transformed into a dualistic agriculture: a dominant plantation agriculture co-existing with weak peasant agriculture.

Based on these structural changes in the study area, *Sinhala* society understood that the *Sinhala* social structures are in under threatened. Hence, they had taken efforts to reproduce the traditional social structures with little alterations, such as slightly changing the traditional socio-structural rules, ensuring the longevity of existing social institutions while diffusing the traditional social institutions into socially excluded villages, ensuring of sustainability of traditionally utilized natural resources/resource-sources, and innovating alternative resources/sources. Such post-colonial reactions started at the early stage of the colonial period. *Yatawara Viharaya*, which was established around 1840 in the middle of a paddy field (Lawrie 1898), *Sri Saila Bimba Ramaya* which has been established at *Millanga* about 1928, and *Mahagama Megodagama* primary school (now named as *Mahasen M.V.*), which was established in 1911 to commemorate the 2500 year after enlightenment of Buddaship of Lord Buddha are empirical examples. Informal institutes related to folk religious and traditional medicine have been reproduced. Hence, nowadays also, the structures are being reproduced.

The study community traditionally maintained KHGs and paddy land as subsistence economic activities. During the colonial period, the study community has introduced market crops to their KHGs. It leads to reproduce the market economic structures more rapidly. For example, in 1939 *Sucharita Wardhana Samitiya* had earned money for repairing the *Oyapahala Ambalama* at *Aluthgama* by establishing new HGs and selling its products by auction (*Wendesikireema*) at the *Ambalama* (CD-PDSD, Undated1).

After the colonial era, socio-cultural and economic policy regimes were directly connected with the political path of the country. If the political ideology of the government is in the **Right**, economy of the country is more opened to economic

liberalization, freer trade, lesser controls, and lesser state management than when the political ideology is in the centre **Left**. These structural adjustments directly and indirectly affected on the structuration process of the study area and their resource sources, including KHGs. The government has placed much attention to HG development; however, it was not merely for succeeding economic objectives but also for succeeding political objectives. If the government cannot manage the socio-economic, cultural structures of the country properly, it directly affects crises and then it leads to de-motivation of candidates who would change the governing political party. Therefore, if there is a shortage of consuming goods in the market, the government tries to fulfill the market demand by importing goods or to reduce the demand by increasing home-grown foods. If consumption goods are imported more and more, it leads to decrease in foreign exchange available in the country. It is then reflected as a bad economic management practice. The government has understood that domestic agricultural development program could not only win the war against hunger and starvation and bring down the cost of living at home but it will also enable the government to win the franchise of the nation repeatedly. Therefore, development of HG was a top priority of the government with multiple socio-economic goals to maintain power in the present political structure.

Thus, it is clear that political institutes have paid their attention to reproducing their political structures by maintaining the stability and reproduction of **market and subsistence economic structures**. For achieving the objectives, the government has established new institutions and declared many projects, such as proof giving program, training and teaching program, planting materials, equipments granting program, etc. Now there are four government officers per village for facilitating to KHGs and paddy cultivation; the Grama Niladhari, *Samurdhi* development officer, agricultural research and development assistance, livelihood development officer. In addition to that, Department of Export Agriculture also facilitates to the community to produce the minor export crop products in the KHGs.

Under *Swarnabumi* Proof Giving Program, since 1980 to 2010, about 1355 proofs had been granted to the landless families of *Patadumbara* DSD for housing, establishing KHGs and enhancing the productivity of KHG (IRDP, 1991; LD-PDSD, 2010). The total land area which was granted under this project is about 1114 acres. Hence, it is clear that this project leads to expand the KHG land area of the study area.

Under Grow More Food Campaign, Export Decade, Let Us Cultivate and Uplift the Nation, Regain Sri Lanka, the National Program for Food Security, Livelihood Development, etc the government granted planting materials, agricultural equipment and inputs for HGs. Some programs paid attention to distributing coconut and other minor-export crops such as pepper, cloves, nutmeg, coffee, etc. whereas other programs paid attention to distributing vegetable species such as green chili, okra, brinjal, tomato, and other items used in the kitchen. However, under *Divi Naguma* program vegetable seeds, coconuts, and other minor export crops as well as fruit species have been distributed among the study community. Under this program coconut (976 plants), lemon (672 plant), pomegranate (322 plants), avocado (144 plants), guava (338 plant), Ambaralla (329

plants), Durian (90 plants), pepper (360 plants), coffee (200 plants), and Jack (40 plants) species have been distributed among the study area HG in 2011 for encouraging home gardening.

By establishing the Ministry of Indigenous Medicine, the government place much attention to reproduced the **traditional medicinal structures** such as *Ayurveda Wedakama* (a holistic system of medicine and health care which originated in India), *Sinhala Wedakama* (traditional formal medicine of the Sinhalese), *Goda Wedakama* (home remedies) that reproduced by the local community without the government interventions. Present days, in *Patadumbara* DSD, there are 35 registered ayurvedic and traditional formal medical doctors, who provide medical treatments for the inhabitants of the study area too. The institutions are specialized in bone/joint surgery (11), whole body diseases (11), venomous animal allergies (9), skin diseases (4), and eye diseases (2). As reported in the household survey, many of the sample households are getting treatments from ayurvedic/traditional formal medical institutions if a family member is injured due to venomous animal/snake bites (165 (68%) sample households), suffer from pain in bone/joints (134 (55%) sample households). A high proportion of traditional knowledge related to the traditional medicine and ethno-botanical information of medicinal plants have not been documented yet. The structures are being reproduced as a result of *Gurukula* system of ancient teaching of traditional knowledge. Some of the knowledge is secretly guarded and the medicinal value of many plant species of KHGs is not well known by the current inhabitants of the study area perhaps because the knowledge has died with their ancestors.

### **Consequences of Dialectic Reproduction of Social Structures on Biodiversity of KHGs**

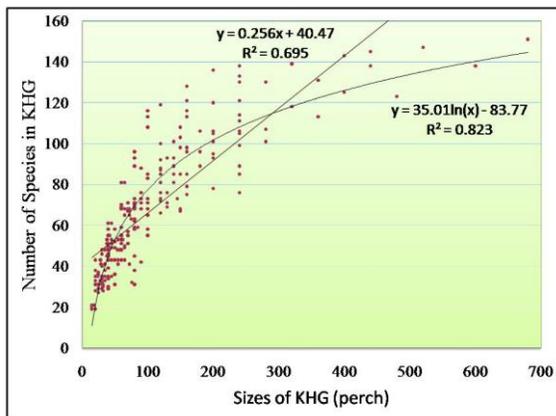
The contribution of the dialectic reproduction of social structures to biological diversity conservation of the area can be summarized into three points. The first is the establishing and continuing the resource values of plant species. The second is the continuing resource demand by forcing to social institutes to conduct the institutional projects. The third is the motivating the community to supply resources continuously.

Study community and family institutes force their members to reproduce social structures as well as to ensure the continuation of resource supply to perform the institutional projects that lead to social stability, security, progress, wealth, power, solemnity, satisfaction, etc. of their members. They intentionally introduced many plant species while maintaining other plant species that were naturally germinated or introduced by seed carriers. In the studied KHGs, there were 345 plant species and out of them about 10% were intentionally planted, about 59% were naturally germinated, and about 31% were reported as both naturally emerged or intentionally planted species.

One of the consequences of this process is maintaining a vast number of plant species in KHGs. The average KHG size of the study area is about 0.67 acres (107.2 square perch) and species per perch is about 2.59. Further, there is a negative co-relation between KHG size and species per perch as indicates in Figure 1. The dwellers have maintained a vast number of species in KHGs for ensuring the continuation of resource supply for performing

institutional projects that leads to reproduction of social structures.

**Figure 1: Species richness in relation to KHG size of the sample**



**Source: Sample household survey, 2010**

All other plant species except *Mimosa pigra* (*Yodanidikumba*) reported in the KHGs of the study area have ethno botanical values. There are 135 **subsistence** food value added plant species (39% of the total reported species). These species are producing vegetables, leaf vegetables, yams and root crops, fruits, coconut and spices, and beverages which fulfill the daily nutrition needs of the sample households. There are 35 vegetable species in the study KHGs. Common perennial vegetable plant species are Jack (*Artocarpus heterophyllus*), bread fruit (*Artocarpus altilis*) and wild bread fruit (*Artocarpus camansi*). There are 14 of Yam and root crop species such as *Welala* (*Dioscorea sp.*), *Alakola* (*Alocasia indica*), sweet potato (*Ipomoea batatas*), manioc (*Manihot utilissima*), *Angili-ala* (*Dioscorea sp.*), and *Katu-ala* (*Dioscorea pentaphylla*). Mostly reported seasonal vegetable crops species are long bean (*Leguminosae*), cucumber (*Cucumis sativus*), bitter melon (*Momordica charantia*), bean (*Phaseolus vulgaris*), ladies fingers (*Hibiscus esculentus*), pumpkin (*Cucurbita maxima*), tomato (*Solanum lycopersicum*), *Elabatu* (*Solanum xanthocarpum*), *Tibbatu* (*Solanum torvum*) and brinjal. There are 38 plant species such as *Dummalla* (*Phyllanthus reticulatus*), *Kalukamberiya* (*Solanum nigrum*), *Gotukola* (*Centella asiatica*), *Penala* (*Aerno lanata*), *Tampala*, spinach, *Mugunuwalla* (*Alternanthera triandra*) etc. that produce subsistence leaf vegetable. Some species are more common than other subsistence leaf vegetable species. However, leaf products of *Thalla* (*Ipomoea staphylina*), *Ikiliya* (*Acanthus ilicifolius*), *Barukoku*, *Thebu* (*Costus speciosus*), *Kuppameniya* (*Acalypha indica*), *Tumba* (*Blainvillea acmella*), *Polpala* (*Aerno lanata*), *Loonu alakola* (*Alocasia fornicata*), *Kiriangu* (*Chonemorpha fragrans*) species are very rarely used as subsistence leaf vegetables. There are 62 fruit species maintained in KHGs of the study area. Out of them Jack fruit, two banana species (*Seeni Kesel- Musa acuminata*, *Ambul Kesel- Musa acuminata*), papaya (*Carica papaya*), guava (*Psidium guajava*), and *Kohu Amba* (*Mangifera indica*) are most common subsistence fruit species (reported over 100 of sample households) of the area. Very rare (reported less than 10 sample households) fruit species are slime

apple, *Beheth Nelli* (*Phyllanthus emblica*), *Atamora* (*Glennia unijuga*), wood apple (*Feronia elephantum*), *Eraminiya* (*Ziziphus lucida*), *Madan* (*Syzygium cumini*), *Atamba* (*Mangifera zeylanica*), carambola (*Averrhoa carambola*), two banana species (*Suwandal - Musa acuminata* and *Kalkannoru- Musa acuminata*), cashew-nut (*Anacardium occidentale*), *Ambul Pera* (*Psidium sp.*), *Damunu* (*Grewia damine*), *Nami-nami* (*Cynometra zeylanica*), and *Ugurassa* (*Flacortia indica*). However, most of these rare species are commonly known as dry zone fruit species. Coconuts (*Cocos nucifera*) and 20 species such as gamboges (*Garcinia quaesita*), pepper (*Piper nigrum*), green chilly, *Naimiris* (*Capsicum minimum*), *Kochchi*, cloves (*Eugenia caryophyllata*), cinnamon (*Cinnamomum zeylanicum* and *C. verum*), nutmeg (*Myristica fragrans*), etc. were reported as natural flavoring species. More frequently reported beverage goods producing plant species are coffee (*Coffea arabica*), lime apple (*Aegle marmelos/Limonia acidissima*), *Ranawara* flowers (*Cassia auriculata*), and *Polpala* (*Aerno lanata*).

There are 52 (15%) **fuel wood** (FW) value added plant species. More frequently reported plant species are coconut, gliricidia (*Gliricidia sepium* L), coffee, *Kanda* (*Macaranga peltata*), jack, cloves, and *Ginisapu* (*Michelia champaca*). Very rarely reported (less than 3% of total sample households) plant species are *Alandu* (*Broussonetia zeylanica*), *Waldel* (*Artocarpus nobillis*), wild bread fruit, *Kakuna* (*Canarium zeylanicum*), *Katu-erambadu* (*Erythrina fusca*), *Dammunu*, *Kumbuk* (*Terminalia arjuna*), and mango species. Domestic timber requirement of sample households is also fulfilled by sixty four (19%) perennial tree species grown in KHGs. 36% of total timber supply for sample households comes from their KHGs. Most common timber tree species are coconut, *Kanda*, jack, *Ginisapu*, *Wanasapu* (*Cananga odorata*), and *Gaduma* (*Terma orientale*) trees which are maintained over 25% of sample KHGs of the study area for fulfilling the timber demand.

It was identified that the hidden economic values<sup>1</sup> of annually consumed vegetable, leaf vegetables, fruits, spice, fuel woods, and other non timber HG products are respectively Rs. 3155.00, Rs. 1138.00, Rs. 14283.00, Rs. 10546.00, Rs. 5732.00 and Rs. 3445.00. Hidden income that gains by reproducing subsistence economic structures by a household of the study area is about Rs 38299.00 per year.

Sample households actively participate to reproduce the market economic structure by not only buying the goods of markets but also supplying surplus of their KHGs products, such as vegetables, leaf vegetables, fruits, spices, and other non-timber products to the market. 31 plant species supply resources for reproduction of market economic structure. Surpluses of the production of these trees/plants (9%) are marketed. High-income (over 100,000 Rs/year) generating plant species are nutmeg, cloves, pepper, cocoa (*Theobroma cacao*), coffee, banana spp., *Kitul* (*Caryota urens*), *Duriyan* (*Durio malaccensis*), bread fruit, *Goraka* and coconuts. Most of them are known as minor export crops in the country. Retail shops and bazaars are the main marketing centers for KHG products. There are 96 retail shops in the study area additionally to marketing centers at Ambatanna,

<sup>1</sup> Economic value for consumed production of a species = (average unit price of the production of the species in the local market\*annual consumed amount by the producing household)

Katugastota, Wattagama and Madawala bazaars. Income earned by the sample households by supplying resources to those marketing centers for reproducing market structure is about 317, 280.00 Rupees/year/household. In addition, 93% of KHG produced cash income is coming from spice and related products. Fifty four plant species (15.7%) were reported as of **ritualistic** and ceremonial value-added plant species. Out of them, areca nut (*Areca catechu*), coconut, *Wada (Hibiscus rosasinensis)*, *Anthurium (Anthurium sp)*, banana, gliricidia, bamboo (*Bambusa vulgaris*, *B. beecheyana*), and papaya (*Carica papaya*) species are very commonly used for performing ritualistic projects.

The study community usually use home remedies with religious healing rituals, if diseases such as chicken pox, small pox, etc and skin disease affected. There are 41 plant species reported in KHGs of the study area as medicinal plant species. Very common medicinal plants used in domestic remedies are coffee, coconut/king coconut, *Balatana (Eleusine indica)*, *Balunaguta (Stachytarpheta indica/urticifolia)*, *Kitul, Kapun Keeriya (Hedyotis hirta)*, nutmeg, pepper and turmeric (*Tamarindus indica*). No household reported taking western medicine for *Deviyange Leda*. About 67% of total households of the area practice domestic remedies for curing skin diseases. Hence, the reproduction of the structures lead to reduce the social pressure on modern western medical centers/hospital. The government also has paid much attention to sustain the reproduction of these medicinal structures by establishing the Ministry of Local Medicine (*Deseeya Vaidya*). Because of this interference, reproduction of ayurvedic medicinal structure is accelerated. Ayurvedic hospital at *Yatawara* is one of the best examples.

The consequence of this process, 345 plant species are maintained in the study area KHGs. Out of them 12.2% species are alien plant species to Sri Lanka but now these species are a part of the social structuration process of the study area. About 47% species are in the IUCN Red list 2012 (Table 1). *Stachyphrynium zeylanicum* was reported as a Critically Endangered and Possibly Extinct species. *Ziziphus lucida*, *Alocasia formicate*, *Typhonium flagelliforme*, *Iphomoea staphylina* were the species that classified as Critically Endangered category in the IUCN Red list. *Loxococcus rupicola*, *Girardinia diversifolia*, *Basella alba*, *Areca concinna*, *Plectranthus zatarhendi*, and *Klugia notoniana* were the identified Endangered species in the study area HGs. 15 plant species, namely *Broussonetia zeylanica*, *Spondia pinnata*, *Dichilanthe zeylanica*, *Saraca asoca*, *Ochrosia oppositifolia*, *Antidesma thwaitesianum*, *Canarium zeylanicum*, *Oncosperma fasciculatum*, *Chonemorpha fragrans*, *Cinnamomum zeylanicum*, *Cycas nathorstii*, *Rhipsalis baccifera*, *Phyllanthus emblica*, *Ixora calycina*, and *Crinum zeylanicum* were reported as Vulnerable species. *Syzygium alubo*, *Strychnos wallichiana*, *Gmelina arborea*, *Carallia brachiata*, *Monochoria hastaefolia*, *Chukrasia tabularis*, *Petchia ceylanica*, *Erythrina fusca*, *Sapindus trifoliolate*, *Chrysephyllum rexburghii*, *Madhuca longifolia*, *Vitex altissima*, *Cynometra zeylanica*, and *Syzygium amphoraecarpus* species reported in the study have been classified as Near Threatened species in IUCN Red list. In addition to that, many species identified in the study have been classified as Least Concerned species.

**Table 1: Summary Table of Species Mentioned in IUCN Red List 2012 in KHGs of the Study Area**

| Category   | No of species and percentage |
|--|------------------------------|
| Critically Endangered and Possibly Extinct                     | 1 (0.3%)                     |
| Critically Endangered  | 4 (1.2%)                     |
| Endangered   | 6 (1.7%)                     |
| Vulnerable   | 15 (4.3%)                    |
| Near Threatened  | 14 (4.1%)                    |
| Least Concerned  | 119 (34.5%)                  |
| Data Deficient   | 4 (1.2%)                     |
| <b>Sub Total</b> (Mentions species list in IUCN Red List 2012) | 163 (47.2%)                  |
| Alien species  | 42 (12.2%)                   |
| Rest of species  | 142 (40.6%)                  |
| <b>Total</b>   | 345 (100%)                   |

## V. CONCLUSIONS AND RECOMMENDATIONS

Over the history, most social structures are reproduced dialectically. Each social structure forces to the community to reproduce the structure by performing the institutional projects. Under the limits set by the physical environment, people do many efforts to maintain resources, because resources are essential for performing the institutional projects. The result of this process is conserving the biodiversity in KHGs. Therefore, biodiversity conservation agencies have to pay attention to reproduce the modern as well as traditional social structures to ensure the resource value of plant species that lead to consumptive conservation of plant species in man-made ecosystems such as KHGs.

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