

CLIMATE CHANGE AND HOUSEHOLD FOOD SECURITY IN HOMEGARDENS OF SRI LANKA

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ABSTRACT

This study was conducted to assess the changes in rainfall and maximum and minimum temperatures, farmer's perception on climate change, adaptation strategies, composition of home gardens (HGs) and contribution of HGs to household food security over the period of two decades (1991-2010). The study sites were Pethiyagoda [Kandy district; Mid Country Wet Zone (MCWZ); 59 HGs] and Keeriyagaswewa [Anuradhapura district, Low Country Dry Zone (LCDZ); 59 HGs]. A questionnaire survey and focus group discussions were the main methodologies adopted; Historical data on temperature and rainfall were collected from the Department of Meteorology for the climate analysis. In the two study sites a significant rise in the average annual minimum and maximum temperatures were observed during the period 1961 to 2010 while the rate of rise in night-time minimum temperature was more pronounced than that of the daytime maximum temperature. The annual cumulative rainfall did not reveal any discernible trend in the study sites except high variability. The majority of the respondents correctly perceived the changes in environmental temperatures compared to the changes in the amount of rainfall change.

A total of 112 woody tree species were identified in the two study sites where a higher taxic diversity was reported from LCDZ than those of MCWZ, due to the dominance of a few commercial species (spice crops) in HGs in the MCWZ. The mean Shannon-Weiner Index (SWI) for MCWZ was lower (1.99) compared to that of LCDZ (2.13). A total of 27 species were found in common to both sites, which are important for food security. Animals were found only in the HGs at Keeriyagaswewa showing a marginal

*contribution to food security. The most prominent species in HGs of the study sites was Coconut (*Cocos nucifera* L.). The average food ratio in MCWZ (0.58) was higher than that of LCDZ (0.51). The contribution of HGs for food security in MCWZ (28.8%) was higher than those of LCDZ (16.6%). In both LCDZ and MCWZ, 81% of the total coconut nuts harvested were used for home consumption. In HGs in LCDZ, the harvests of 14 food tree species out of 19 were largely used for family consumption purposes while the main income generating food tree species was Tamarind (86% of the total harvest is sold). In MCWZ, 4 out of 9 food tree species found in the HGs were largely for income generation purposes. The HGs in MCWZ was occupied by more nutritional and dense stands of tree species compared to those at LCDZ. Despite the evidence that climate change has taken place in the past 50 years (1961-2010), the composition of HGs in Sri Lanka has not changed substantially. The HGs in study areas, which are dominated by trees, showed resilience to climate change and considerable contribution to household food security. An analysis of the strategies adapted by home gardeners over the past two decades that have enabled them to cope with changes in climate and ensure food security are discussed.*

INTRODUCTION

Home gardens (HGs) are defined as a complex sustainable land use system that combines multiple farming components, such as annual and perennial crops, livestock and occasionally fish, of the homestead and provides environmental services, household needs, and employment and income generation opportunities to the households (Weerahewa *et al.*, 2012).

In Sri Lanka HGs have been an integral part of the landscape and culture for centuries (Mahawamsa, undated; De Silva, 1981; Jacob and Alles, 1987; MFE, 1999). They still remain as one of the major forms of land use in the island having evolved through to suit the socio-economic, cultural and ecological needs of the island's diverse communities and landscapes (FSMP, 1995; MFE, 1999; Pushpakumara *et al.*, 2010; 2012). In 2010, about 14.8% of the total extent of the country was occupied by home gardens, which has continued to grow at an annual rate of 1.6%. Climate change is well known to have significant detrimental impacts on food security. It is well accepted that food security in rural South Asia and food production in HGs are intrinsically related. Conventionally HGs are rich in food trees and serves as primary food sources with direct access to the rural families. Home gardeners obtain nutrients from these crops, naturally grown plants and trees *via* two channels; parts or trees consumed directly, parts consumed by livestock and their products available to family. The developing countries such as Sri Lanka pay special attention on adapting to climate change and hence, changes made to the composition of HGs under variable and changing climate would determine the food and nutritional security of the households.

Though the HG land use system existed in Sri Lanka for centuries, the system has started receiving national recognition only recently. The HGs are an example of traditionally developed agroforestry systems with excellent promise for future. Having realized the importance of HGs, the national development policy framework of the government of Sri Lanka now includes strategies to expand and improve food and timber productions in such landscapes of the country (Mahinda Chintana, 2010). Development of homegardens in Sri Lanka has been the priority of many development programmes implemented in Sri Lanka over the past five years where development of 375,000 HGs were aimed under the "*Api Wawamu Rata Nagamu*" (Let us grow and uplift the nation) programme launched in 2007, and strengthening of 2.5 million HGs is the target of "*Divi Neguma*" (Livelihood

Development) programme to achieve self-sufficiency in vegetables and to reduce vegetable prices (Government of Sri Lanka, 2011).

Climate change, as the consequence of global warming and depletion of the ozone layer, is already being experienced across the world (Chauhan and Mahajan, 2013). Climate change could have significant adverse impacts not only on food production but also on food insecurity, poverty and malnutrition. However, HG ecosystems are viewed to be resilient to climatic changes. Marambe *et al.*, (2013) reported that climate-resilient food production approach would be the path to sustain food security for sustainable development in Sri Lanka. Use of efficient and effective adaptation strategies in the HGs to minimize the damages caused by climatic changes is one of the reasons attributed to such resilience. The HGs are playing a significant role in adaptation to climate change by changing the microclimate, providing permanent cover, diversifying the agricultural systems, improving resource use efficiency, improving soil fertility, reducing carbon emissions and increasing sequestration and also by being rich in biodiversity (Rao *et al.*, 2007). Recent studies carried out in Sri Lanka have revealed that the variability of seasonal rains have increased over the past five decades (1961-2010), without a discernible trend in the annual cumulative rainfall. In general, the minimum and maximum temperatures have shown an increasing trend (Marambe *et al.*, 2012a).

There is a growing body of evidence examining the types of adaptation strategies and the determinants of the same (Below *et al.*, 2010; Deressa *et al.*, 2010; Nhemachena and Hassan, 2007; Pushpakumara *et al.*, 2012). Home gardening would increase crop production during adverse climate conditions (UNFCCC, 2008). Food security in rural South Asia and food production in HGs is intrinsically related and hence, climate change may have significant implications on food security (Marambe *et al.*, 2012a; Pushpakumara *et al.*, 2012). Despite the large empirical evidence on adaptation, there is a dearth of studies especially in South Asia, examining the

contribution of HGs to food security. Climate-resilient food production approach would be the path to sustain food security for sustainable development in Sri Lanka. The objective of this study was to assess the climate variability, farmers' perception on climate change, composition of HGs in selected villages in Sri Lanka under a variable and changing climate and its contribution to household food security.

METHODOLOGY

Two study sites were selected in Sri Lanka to represent different rainfall patterns and temperature regimes, namely, *Keeriyagaswewa* (7.86° N, 80.65° E) in the Low Country Dry Zone with a considerable fluctuations in rainfall intensity and distribution pattern, and *Pethiyagoda* (7.27° N, 80.6° E) in the Mid Country Wet Zone with a modest variation in rainfall intensity and distribution pattern. Historical data on temperature and rainfall were collected from the Department of Meteorology for the climate data analysis. The analysis of the onset of the season was confined to the recent last two decades (1991-2010) and was analyzed for *Yala* (March to August) and *Maha* (September to February) cultivating seasons in Sri Lanka. All data were examined for their accuracy and consistency and the missing values of the primary climate data (daily data) were estimated using the Normal Ratio Method. Trend analysis for average annual minimum temperature, maximum temperature and annual rainfall were carried out for the entire data set of 50 years starting from 1961 to 2010. The variations observed in the onset of rainfall in *Yala* and *Maha* seasons was analyzed. The onset of rainfall is defined as a spell of at least 20-mm of rain per week in three consecutive weeks after a pre-specified week for the *Maha* (standard week 35). Once this requirement is fulfilled, the first week of the three consecutive weeks was considered as the onset of rainfall (Punyawardena, 2002; Chitranayana and Punyawardena, 2010).

A household survey was carried out in 108 homesteads (59 at each site) using a structured questionnaire. The questionnaire was pre-tested

and was administered from May to December 2010 in the study sites. Apart from the general household characteristics, the survey captured information on perception of farmers on climate change, the changes made to the HGs during the past 20 years (1991-2000) on adaptation strategies, and changes made to HGs during the past 20 years with regard to crops, woody trees, naturally grown plants, and domestic animals, food consumption pattern (dependence on HG vs. market), plant and animal species composition, ecological information, production from plants and animals, diseases outbreaks, shift of flowering and fruiting, adjustment to cultivation practices, and marketing information. Focus group discussions were held for further clarification on the climate variability and changes made to the HGs. The Shannon-Weiner Index (SWI) was calculated to estimate the food tree diversity and the average food ratio (total expenditure on food and drinks as ratio of total household expenditure) and the percentage contribution of HGs to household Food Security (contribution from HG as a ratio of total expenditure on food and drinks) were calculated to estimate the status of food security in HGs in the selected study sites.

RESULTS AND DISCUSSION

Trends in change of climate

In the two selected study sites, a significant rise in the average annual minimum and maximum temperatures were observed during 1961 to 2010 (Table 1). The rate of rise in nighttime minimum temperature was more pronounced than that of the daytime maximum temperature, a phenomenon that is evident in most parts of the world (Prasad *et al.*, 2008).

The annual cumulative rainfall did not reveal any consistent trend in the study sites (Table 2), but a high variability (data not shown). A similar pattern was observed from different study sites in Bangladesh and India, too (Marambe *et al.*, 2012). However, change of the trend in annual rainfall is the most common phenomenon of the

Table 1. Trends in the minimum and maximum temperatures during 1961-2010

Location	Trend	R ²	P value
Keeriyagaswewa			
Minimum temperature	Y = 0.22X - 21.85	0.589	0.000
Maximum temperature	Y = 0.024X - 16.7	0.395	0.000
Pethiyagoda			
Minimum temperature	Y = 0.013X - 7.114	0.329	0.000
Maximum temperature	Y = 0.012X + 4.428	0.147	0.005

Table 2. Changes in the cumulative rainfall of the study sites during 1961-2010

Location	Trend	R ²	P value
Keeriyagaswewa	Y = -0.893X + 8975	0.071	0.171
Pethiyagoda	Y = 0.146X + 1545	0.001	0.957

rainfall climatology in Sri Lanka (Punyawardena, 2002).

At the *Keeriyagaswewa* study site, the onset of the *Maha* season has been highly variable during the past two decades (Fig. 1). Out of the 20 *Maha* seasons, the season has not been set on time in 85 % of the occasions. During this period, onset of the

season has been delayed in most years. In contrast, the *Yala* season has not been subject to much variation during the above period.

During the recent decade of 2001 – 2010, the rains of *Yala* season has arrived on time in 70 % of the years. The same is true for the preceding decade too. However, the trends observed in

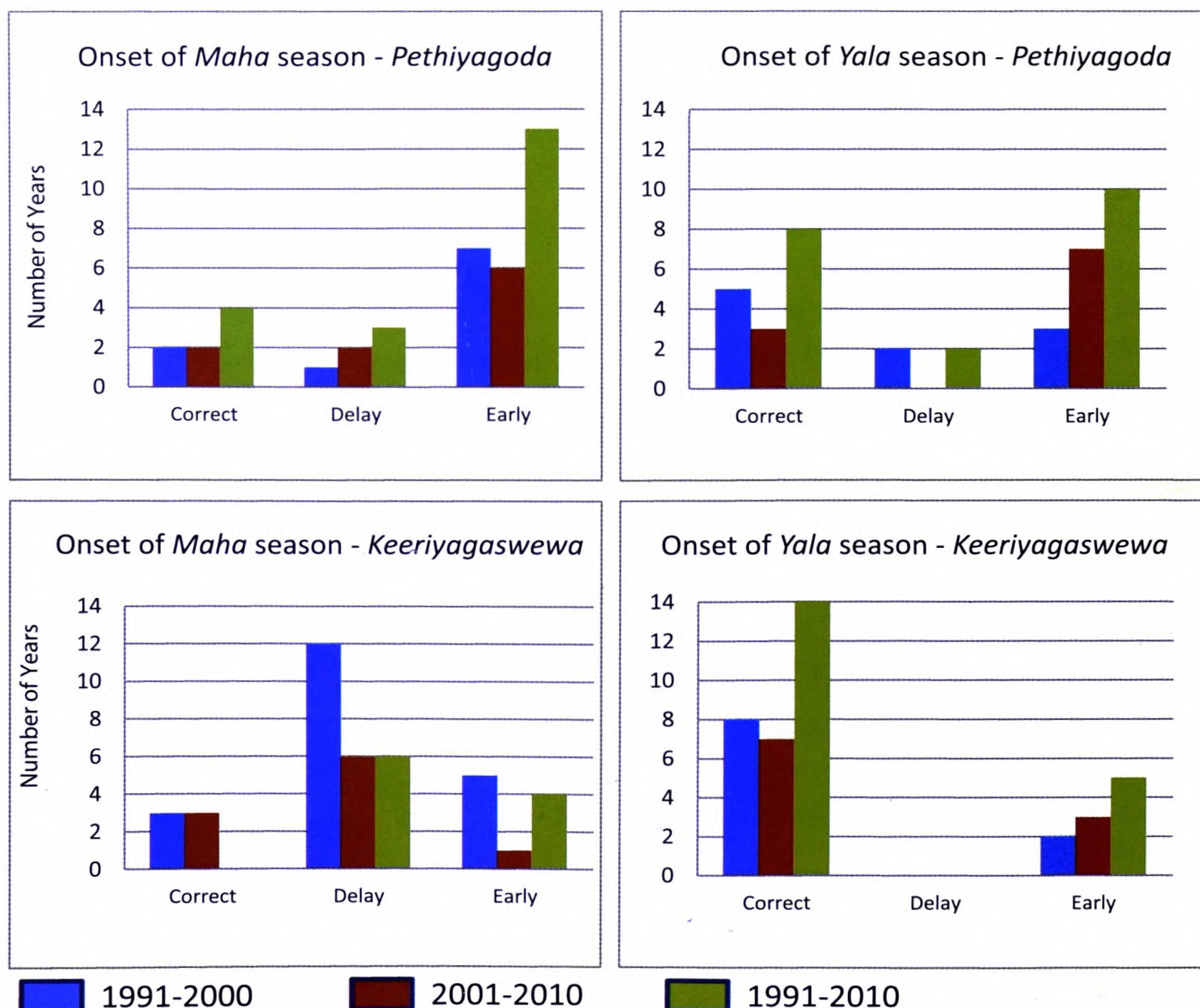


Fig. 1. Status of onset of rain in the study sites

Pethiyagoda was in contrary to those of the *Keeriyagaswewa* site, where 65 % of instances the rains during *Maha* season has arrived early compared to the expected time (Fig. 1). This was more pronounced during the most recent decade of 2001 – 2010. Onset of the *Yala* season at *Pethiyagoda* during the last 20 years has been either on the correct time or early. Occurrence of delayed onset of *Yala* season was only about 10 % of the years in the 20 year period. However, during the recent decade of 2001 – 2010, the onset time of *Yala* rains has not been delayed.

Perception of home gardeners on climate change

In the two study locations of Sri Lanka, the home gardeners (respondents) perceived different levels

of changes in rainfall and day and night temperatures (Table 3). In the *Keeriyagaswewa* site (LCDZ), the majority of the respondents perceived reduced amount of rainfall and changed onset of the rainy period and increased day/night temperatures while in *Pethiyagoda* (MCWZ), the majority of the respondents have perceived reduced amount of rainfall, changed onset of the rainy period and increased day/night temperatures.

At *Keeriyagaswewa*, the majority of the respondents correctly perceived change in day temperature and night temperature (71.2% and 66.1%, respectively) and *Pethiyagoda* (64.4% and 64.4%, respectively). In both study sites, the majority of the respondents have correctly

Table 3. Perception on climatic changes during the past 20 year as a percentage of the total respondents in each category

Incident	Nature of perception	<i>Pethiyagoda</i>	<i>Keeriyagaswewa</i>
Amount of Rainfall	Increased	67.8	13.6
	Decreased	8.5	66.1
	Fluctuate	3.4	8.5
	No change	20.3	11.9
	No idea	0	0
Rainy period	Onset changed	52.5	81.4
	Fluctuate	25.4	5.1
	No change	20.3	13.6
	No idea	1.7	0
Day temperature	Increased	64.4	71.2
	Decreased	5.1	3.4
	Fluctuate	5.1	1.7
	No change	23.7	23.7
	No idea	1.7	0
Night temperature	Increased	64.4	66.1
	Decreased	5.1	8.5
	Fluctuate	5.1	1.7
	No change	23.7	23.7
	No idea	1.7	0

perceived the changes in temperatures compared to the changes in the amount of rainfall change. The majority of the respondents in *Keeriyagaswewa* incorrectly perceived that the amount of rainfall has decreased (66.1%) and in *Pethiyagoda*, 67.8% of the respondents incorrectly perceived that the amount of rainfall increased. More than 81% of respondents at *Keeriyagaswewa*, 52.5% in *Pethiyagoda* correctly perceived the change in onset of rains. An in-depth analysis revealed that the educated farmers are more likely to perceive climate change correctly (data not presented). Nevertheless, those who owned low lands and non-farming employments perceived change in temperatures more correctly than the other categories such as older farmers and livestock rearing farmers.

Climate Change Adaptation Strategies

The specific adaptation strategies used by the homegardeners in the study sites were (a) changing planting date, (b) changing agronomic practices, (c) changing technology such as use of new varieties and (d) irrigation equipments, and use of soil and water conservation measures. In the present study about 37% of the dwellers have changed the planting dates of the crops, 39% changed the agronomic practices in HGs, 55%

changed the technology adapted and 41% used soil and water conservation measures. Results of a previous study carried out in Sri Lanka indicated that about 19% of the total farmers surveyed did not adapt strategies in HGs to cope up with climate change while 44% did strategic changes to the HG agro-ecosystem without due consideration to climate change (Marambe *et al.*, 2011).

Food tree composition of the HGs

The composition of HGs in the study sites has not changed substantially over the 20 year period from 1991-2010. The highest species diversity in an individual HG, as indicated by the Shannon-Weiner Index (SWI; Table 4), was recorded in *Pethiyagoda* (3.0) where *Keeriyagaswewa* followed closely (2.98). The minimum species diversity in an individual HG was recorded in *Keeriyagaswewa* (0.885). The species diversity in about 63 % of the HGs at *Keeriyagaswewa* indicated a SWI greater than 2. More than 40 % of HGs in *Pethiyagoda* falls in SWI values between 2-1.5 (Table 5).

Only 7% of HGs in *Keeriyagaswewa* recorded a SWI bellow 1.5 where as it was as higher as 23% in *Pethiyagoda*. A total of 112 woody tree species were identified in the two study sites. The mean Shannon-Weiner Index (SWI) was significantly

Table 4. Details of SWI of the two study sites.

Categories	<i>Keeriyagaswewa</i>	<i>Pethiyagoda</i>
Mean SWI	2.13 ± 0.43	1.99 ± 0.4
Maximum SWI	2.98	3.00
Minimum SWI	0.89	1.27

Table 5. Distribution of SWI Categories of the two study sites (% HGs).

Location	SWI		
	>2	2-1.5	1.5-0.7
<i>Keeriyagaswewa</i>	63	30	7
<i>Pethiyagoda</i>	49	39	12

lower ($p < 0.05$) in *Pethiyagoda* site (mid country wet zone) than that of *Keeriyagaswewa* (Low Country Dry Zone). The lower taxic diversity of the *Pethiyagoda* site, despite being in the wet zone of Sri Lanka, was due to the dominance of a few commercial species (spice crops), which are common in the HGs in MCWZ. However, structurally, the HGs at *Pethiyagoda* were compact. Marambe *et al.*, (2012a), comparing the taxic diversity in selected HGs in Sri Lanka, India and Bangladesh reported that the diversity of HGs was high in Sri Lanka while it was the lowest in Bangladesh. The frequency of occurrence of woody food tree species in the study sites are shown in Table 6. In *Pethiyagoda*, four out of nine food tree species found in the HGs are largely for income generation purposes. The HGs at *Pethiyagoda* were occupied by more nutritional and dense stands of tree species compared to those at *Keeriyagaswewa*. Cloves, Nutmeg and Durian are the main income generator where 87-100% of the harvest is sold. In HGs in LCDZ, the harvests of 14 food tree species out of 19 are largely used for family consumption purposes. The main income generating food tree species was Tamarind (86% of the total harvest is sold).

Diversity of domestic animal species in HGs

Animals were not reported from any HG surveyed in the *Pethiyagoda* site in the MCDZ. In *Keeriyagaswewa* 35% of the households reared at

least one breed of cattle. Out of all cattle breeds indigenous and Jersey (Hybrid) types were prominent. In addition poultry and buffalo were recorded from three HGs and goats from one HG homegarden in *Keeriyagaswewa* (Table 7).

Table 7. Frequency of occurrence of animals in *Keeriyagaswewa* study site.

Type	Breed	Frequency of Occurrence
Cattle	All breeds	21
	Indigenous	14
	Cross Sahiwal	1
	Hybrid Sahiwal	1
	Hybrid Jersey	5
Buffaloes		3
Poultry	Indigenous	3
Goats	Indigenous	1

The HGs in India and Bangladesh were found to include more domestic animals when compared to Sri Lanka (Marambe *et al.*, 2012a) and that the young male farmers those who own livestock and who are relatively more educated and experienced, are more likely to adapt livestock rearing.

Household food security

A total of 27 species were found in common to both sites, which are important for food security. The most prominent species was Coconut (*Cocos*

Table 6. The dominant woody tree species in the study sites

Scientific name	Frequency of occurrence
<i>Pethiyagoda</i> (Mid Country Wet Zone)	
<i>Areca catechu</i> L.	46
<i>Cocos nucifera</i> L.	43
<i>Gliricidia sepium</i> (Jacq.) Walp.	38
<i>Swietenia mahogany</i> (L.) Jacq.	37
<i>Mangifera indica</i> L.	37
<i>Keeriyagaswewa</i> (Low Country Dry Zone)	
<i>Azadirachta indica</i> A. Juss.	52
<i>Mangifera indica</i> L.	36
<i>Moringa oleifera</i> Lam.	36
<i>Tamarindus indica</i> L.	34
<i>Cocos nucifera</i> L.	33

nucifera L.). About 80% of the coconuts harvested in *Keeriyagaswewa* (LCDZ) and 82% in *Pethiyagoda* (MCWZ) were used for home consumption while 11% in *Keeriyagaswewa* and 18% in *Pethiyagoda* were sold. Pods of *Moringa oleifera* Lam., flowers of *Sesbania grandiflora* (L.) Poir. and raw fruit of *Psidium guajava* L. were the most nutrient-rich food crops found in the HGs. The food crops identified in the study sites were rich in Carbohydrate, vitamin C, Riboflavin, Fe and vitamin B6 (Tables 8 and 9).

In terms of alleviating food insecurity, the claim that food production controlled by households is more reliable and sustainable than nutrition interventions that rely on government goodwill and financial support (Moskow, 1996). The diversity of plants, domestic livestock and poultry raised in HGs provides households with a diversity of foods, including vegetables, fruits, staples and meat, which are rich in vitamins, minerals and proteins (Murphy 2008; Marambe *et al.*, 2012a, 2012b; Weerahewa *et al.*, 2012). A baseline study carried out in Nepal (Gautam *et al.*, 2008) showed that home gardens provided 60% of the household's total fruit and vegetables and for more than 95% of the households, their own garden was the main source of vegetables

consumed and raising poultry enabled mothers and children to eat eggs. A study carried out in South Africa (Shizanya and Hendriks, 2011) using the Household Food Insecurity Access Scale reported that community gardens were unable to solve the problem of food insecurity, but their contribution to consumption cannot be entirely ignored. Climate change, however, is considered as posing the greatest threat to agriculture and food security in the 21st century, particularly in many of the agriculture-based countries having low capacities to effectively cope. The FAO recognizes the need to downscale the broad and global climate change agenda at the local level and engage policy makers to better address the impact of climate change on food security at household level (<http://www.fao.org/climatechange/59732/en/>).

The average food ratio for *Pethiyagoda* site was 13.7% higher than that of the *Keeriyagaswewa* site. The contribution of HGs to household food security in *Pethiyagoda* was 73.5% higher than that recorded at *Keeriyagaswewa* site (Table 10). The contribution of animals to the food security of HGs in this study sites was minimal probably due to the lower frequency of occurrence of animals in the HGs.

Table 8. Nutrient supply from food trees found in HGs in Pethiyagoda at Mid Country Wet Zone of Sri Lanka

Local/Botanical name	Pro	Fat	Carb	Ca	Fe	Mg	P	K	Na	Zn	V-C	Thiamine	Riboflavin	Niacin	Vit. B6	Folate	Vit. B12	Vit. A	Vit. E	Vit. D	Vit. K	
Anoda - <i>Annona reticulata</i> L.																						
Katu anoda - <i>Annona muricata</i> L.																						
Jackfruit - <i>Artocarpus heterophyllus</i> Lam.																						
Bread Fruit - <i>Artocarpus altilis</i> (Parkinson) Fosberg																						
Sapodilla - <i>Manilkara achras</i> (Miller) Fosberg																						
Dehi - <i>Citrus aurantifolia</i> (Christm. & Panzer) Swingle																						
Dodam - <i>Citrus aurantium</i> L.																						
Jambola - <i>Citrus grandis</i> (L.) Osbec var. grandis																						
Pol - <i>Cocos nucifera</i> L.																						
Durian - <i>Durio zibethinus</i> Murr.																						
Mangus - <i>Garcinia mangostana</i> L.																						
Amba - <i>Mangifera indica</i> L.																						
Murunga - <i>Moringa oleifera</i> Lam.																						
Jam - <i>Muntingia calabura</i> L.																						
Rambutan - <i>Nephelium lappaceum</i> L.																						
Ali geta pera - <i>Persea americana</i> Miller																						
Nelli - <i>Phyllanthus emblica</i> L.																						
Pera - <i>Psidium guajava</i> L.																						
Delum - <i>Punica granatum</i> L.																						
Kathurumurunga - <i>Sesbania grandiflora</i> (L.) Poir.																						
Jambu - <i>Syzygium jambos</i> L. (Alston).																						
Siyambala - <i>Tamarindus indica</i> L.																						

Note: The shaded areas represent the common nutrients provided by the respective species.

Table 9. Nutrient supply from food trees found in HGs in Keeriyagaswewa at Low Country Dry Zone of Sri Lanka

Local/Botanical name	Pro	Fat	Carb	Ca	Fe	Mg	P	K	Na	Zn	V-C	Thiamine	Riboflavin	Niacin	Vit. B6	Folate	Vit. B12	Vit. A	Vit. E	Vit. D	Vit. K	
Cadju - <i>Anacardium occidentale</i> L.																						
Katu anoda - <i>Annona muricata</i> L.																						
Anoda - <i>Annona reticulata</i> L.																						
Jackfruit - <i>Artocarpus heterophyllus</i> Lam.																						
Bread Fruit - <i>Artocarpus altilis</i> (Parkinson) Foergrsb																						
Camaranga - <i>Averrhoa carambola</i> L.																						
Sapodilla - <i>Manilkara achras</i> (Miller) Fosberg																						
Dehi - <i>Citrus aurantifolia</i> (Christm. & Panzer) Swingle																						
Dodam - <i>Citrus aurantium</i> L.																						
Pol - <i>Cocos nucifera</i> L.																						
Amba - <i>Mangifera indica</i> L.																						
Murunga - <i>Moringa oleifera</i> Lam.																						
Jam - <i>Muntingia calabura</i> L.																						
Ali geta pera - <i>Persea americana</i> Miller																						
Nelli - <i>Phyllanthus emblica</i> L.																						
Pera - <i>Psidium guajava</i> L.																						
Delum - <i>Punica granatum</i> L.																						
Kathurumurunga - <i>Sesbania grandiflora</i> (L.) Poir.																						
Siyambala - <i>Tamarindus indica</i> L.																						

Note: The shaded areas represent the common nutrients provided by the respective species.

Table 10. Economic access to food and contribution from the HGs

Attribute	Pethiyagoda	Keeriyagaswewa
Average income (Rs/month)	26,195.76	23,216.02
Average expenditure (Rs/month)	18,603.45	14,166.10
Average expenditure on food and drinks (Rs/month)	10,909.09	6,179.80
Average Food ratio	0.58	0.51
Average contribution from the HG (Rs/month)	969.77	1,154.74
% contribution from the HG	28.81	16.60

Note: 1 USD = 127 Sri Lanka Rupees

CONCLUSIONS

The average annual minimum and maximum temperatures in the study sites have increased significantly during 1961 to 2010, with the rise in nighttime minimum temperature being more pronounced. The annual cumulative rainfall in the study sites did not show any discernible trend but high variability. However, the onset of seasonal rainfall was highly variable during the study period 1991-2010. The perception of the homegardeners was however, different between the two study sites on the changes occurred in the climate over a period of two decades. The respondents correctly perceived the change of environmental temperature compared to the change in the total amount of rainfall. The HGs at Mid Country Wet Zone (MCWZ) were occupied by more nutritional and dense stands of tree species compared to those at Low Country Dry Zone (LCDZ). Despite the evidence that climate change has taken place in the past 50 years (1961-2010), the composition of HGs in Sri Lanka has not changed substantially. The HGs in study areas, which are dominated by trees, showed resilience to climate change and considerable contribution to household food security. Incorporation of animals to the HGS in the study sites was found to be minimal with the HGs at MCWZ recording none.

A detailed analysis on the extent of utilization of trees, plants and animals in HGs by the household using the proportions of harvest consumed by the members of the household (the actual amount of nutrients provided by each HG) under a changing

and variable climate would assist in further understanding on the meeting food and nutrition security of the households. This would also help in identifying the trees, plants and animals that are vulnerable to climatic changes and comment on the degree to which food supply from the HGs will be affected due to changes in climate. The HGs selected for this study were found to be climate resilient. However, this study should be replicated in other agro-ecological regions to understand whether similar pattern could be observed.

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