

Assessment of Productivity and Income Generation from Rural Agricultural Systems in the Mid-country Wet Zone of Sri Lanka - A Case Study

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Authors' contributions

The work reported in the paper was carried out as a collaborative exercise among all the co-authors. Author WAPW coordinated the survey. Authors NASPN and JKV designed the study programme. Author PGASW was involved in data tabulation and drafting the manuscript. All authors contributed for revising the manuscript.

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ABSTRACT

Majority of the rural population in the wet mid elevations in Sri Lanka are predominantly engaged in Kandyan Homegardening (KHG) and smallholder tea cultivations (TS). Reports indicate that recent developments in this region are very low due to marketing, extension and production issues. The study was conducted to evaluate the recent changes in the agricultural productivity and other socio economic parameters of the households in a selected village belonging to *Yatinuwara* Divisional Secretariat in 2017. Information on social and family status, agricultural systems and income generation of a sample households (65%) were collected using a structured questionnaire. Results revealed that there was a trend of leaving agriculture by the young generation, resulting in just a 58.4% of the males (predominantly middle aged and old) for agriculture, mostly on part-time basis. Low percentage of women involvement in agricultural livelihoods clearly indicated their potential engagements in agricultural livelihoods in the future, bringing about a good solution for their

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unemployment issue. Nearly 76% families were engaged with KHGs whereas 36% and 7% were involved in TS and other cropping systems, respectively. The livestock sector was very much at a diminishing phase, limiting only to 7.8% of the households. The highest annual income was recorded by the TS, compared to KHG farmers. This could be justified with lower productivity of KHGs (compared to potential productivity of its major crop components). Majority of the households (38.2%) belongs to the lowest annual income category of less than Sri Lankan Rupees (LKR.) 50,000 (from agriculture). Hence a boost in agriculture will be an urgent need for improving the financial status and the living standards of the villagers. The outcome of the survey will be an eye-opening for policy makers and the institutional setup that are mandated for rural development in Sri Lanka.

Keywords: Environment; Kandyan homegarden; livestock; rural economy; tea small-holding.

1. INTRODUCTION

The agriculture and forestry in Sri Lanka is having marginal returns and its share in the Gross Domestic Production (GDP) has reduced to 7%, compared to base year, 2010 [1]. There are many constraints in the agricultural systems of the country which seriously affect the economy, living standards and developmental plans of the agriculture based rural communities.

For example over 65% of the rural households are engaged in some form of agriculture either on full time or part time basis for meeting their food requirements or as a source of household income [2].

Homegardening and tea small-holder plantations could be identified as the predominant cropping systems in the mid-country wet zone of Sri Lanka where elevation is 600-1200 MSL and the mean annual rainfall is more than 2500 mm. Hence they can be considered as the main sources of income for the rural dwellers.

According to previous studies [3], home gardens have been serving the agricultural, social and cultural requirements of the rural communities. Kandyan home (forest) garden (KHG) is a specific homegarden type which is considered to be one of the most diverse and productive farming systems [4,5]. It is spread in four main districts of the central highlands of Sri Lanka namely Kandy, Kegalle, Matale and Kurunegala. Multi-storied canopy structure, highest biodiversity are the key characters in this system while use of family labour for the maintenance activities is a prominent character [4,6].

A large number of cultivated and natural plant species could be identified in these lands and their harvest is used not only for the home

consumption but also for marketing within and outside the village. Usually the highest income is obtained from the spice or beverage crops such as nutmeg, clove, pepper and coffee while other plant species are having several economic importance as medicinal, ornamental, food crops (fruits, vegetables etc.), timber and fodder [7]. KHGs are considered to be playing a significant role in maintaining ecosystem services and biodiversity conservation. In addition to high degree of biodiversity in crops/plants, crop and livestock integration is identified as an integral component in smallholder farming systems in Asia [8].

In the meantime, when tea the top ranking export oriented crop is grown in the mid country is called "mid-grown" or "mid country tea" and is produced mainly in Kandy and Matale districts. "Small holding" is one of the dominant management categories of tea classified based on the scale of practice [9].

Tea sector contributed by 0.7 % to the GDP in 2017 while tea smallholders share was 75.4 % of the total annual tea production [10]. Meanwhile, 60% of the total tea lands fall in to smallholdings [11]. This sub sector contributes to the rural household income generation substantially.

Meanwhile the rural village setup in Sri Lanka has undergone numerous economic and social reforms as a result of changes in national policies over the recent past. Consequently, social and livelihood structures of the village set up has been modernized, introducing new technologies and management strategies for agriculture based livelihoods and the village lifestyles. However, when consider the socio-economic issues of the present village setup, the influence of these changes on the management of agricultural systems and other aspects of the

village life need to be revisited with respect to establishment of independency and self-sustainability within the village setup.

Sustainable agriculture plays a substantial role. Its own merits on the environmental stability and the meeting the household food requirements assures the sustainability of the rural community. Hence, it allows limited interventions to clear the prevailing bottle-necks in the path to a higher productivity of the rural agricultural systems.

Based on the above justification, this study was planned and carried out to evaluate the present status of the households and the traditional agricultural systems of the selected village in the mid-country wet zone of Sri Lanka and with the aim of utilizing the information in the rural developmental initiatives in the future.

2. METHODOLOGY

Based on the fact that information on the human capital, agricultural systems and their economy are the major components of the village livelihood structure, a household survey was carried out with the aid of a structured questionnaire. The survey covered a small rural village, called Nadithalawa belongs to Yatinuwara District secretariat of the Central Province of Sri Lanka during 2017. Nadithalawa represents the typical village setup of the mid country of Sri Lanka in all respects. The village provide residence for nearly 217 households and a population of 878 people. Preliminary visits identified two dominant agricultural systems, namely Kandyan homegardens and small-holder tea plantations. The study was organized and monitored by a multidisciplinary research group affiliated to the Centre for Environmental Studies of the University of Peradeniya and also in collaboration with few other professional institutions. Based on the facts collected from about 5% of the households (during the initial visits), the questionnaire was drafted to collect information on the family status, technical aspects of agricultural systems and the income generation from these systems. Few other aspects such as health, social status, food patterns and environmental issues were also evaluated (not presented in this paper). The survey sample covered all the households (129) that were inhabited at the time of conducting the survey. Data tabulation was done by using MS Excel. Statistical analysis for the variability of different parameter was conducted through ANOVA and Chi-square procedures, respectively

for parametric and non-parametric data while mean separation was done using LSD test and log-linear model fitting, respectively.

3. RESULTS AND DISCUSSION

3.1 Family Background

3.1.1 Age and gender

Based on the available records, the total number of village population was 556 in 2017. Out of this, nearly 65% represented the survey sample, which consisted of 51% females and 48% males, indicating almost a 1:1 male: female ratio. The distribution of family size categories was significantly different where 5 member families were the dominant category (30.5%) whereas much larger family sizes (i.e. 8 - 9 members) were very low (0.8%).

The village population could be categorized in to nine major age groups. The study showed that the younger age groups up to 40 years are densely populated while middle ages (from 40 up to 70 years) are also fairly well populated, leaving nearly 7.2.% for the elderly population (>70 years old). The relatively high population of 30-39 years, which represented 18.7% of the population, signifies the capacity of the village workforce. Further, the large (nearly 30%) 0-20 year age group assures a strong second generation to backup the workforce in the future (Fig. 1). Meanwhile almost equal distribution of the male and female categories within each age group can be considered a blessing for balancing the gender-tagged work requirements within the village livelihood structure as well as their homesteads.

On the assumption of the age groups 20-70 and 20-65 respectively are the actively workable age groups for males and females; 58.4% of the village population could be identified to be the village workforce. And also the work-force was found to be almost equally subdivided between males (30.2%) and females (28.2%).

Meanwhile the mean number of children per family was 2.0. This figure is far below the recently estimated average family size (3.8) in rural households in Sri Lanka [12]. The reason for this situation may be a higher percentage of families (31.5%) families with just a one child.

When compared to studies conducted 20-30 years ago, the average family size in rural

villages in the mid country of Sri Lanka, was reported as 4.7 [13,14] showing a drastic reduction in the family size during last 2–3 decades.

3.1.2 Occupation

As illustrated in Fig. 2, the occupational status of the heads of the household (predominantly the husband) is highly diverse. Contract jobs and small businesses are found to be the dominant occupational category (44%), followed by agriculture (23%). As far as spouse’s occupation is concerned, the vast majority (82%) falls within “Pensioners and unemployed” and it is followed by those who are employed as contract workers and involved in small businesses, respectively (Fig. 2). Recent survey data revealed that the percentages of economically active male and female populations in Sri Lanka as 61.4% and 38.6%, respectively [15]. The occupational rate of males in the village exceeds the national value for males but the same for women is highly lagging behind. It seems that the vast majority of women are underutilized as a personal resource. Hence in a prospective village development program in the future, more women will be available for the work-force.

3.1.3 Education

Nearly 37% of the heads of households were having G.C.E. Ordinary Level (O/L) qualifications (High-school Entrance), while a similar fraction (40%) falls there below that level. Meanwhile a fairly high percentage of them (26%) are having

the education up to G.C.E. Advanced Level (A/L) (University Entrance). When considering the spouses’ educational qualifications, a much higher percentage (50%) belongs to the G.C.E. (O/L) qualified category, surpassing the educational level of heads households. Further to that 22% of the spouses are qualified either up to G.C.E. (A/L) or more. Thus the results show that majority of the residents have accomplished their education up to G.C.E. (O/L) indicating their pre-qualification for further education, training or awareness developments in life-skill as well as for social wellbeing [16].

Low education is considered as one of the main reasons for the high degree of technology gap (20-40%) in tea smallholdings [9]. Further, educated farmers are more efficient than others in managing tea smallholdings too [17].

Also farm size, farming experience and family member cooperation are considered as the important factors which contribute to the productivity [16] while production efficiency of full-time involvements in tea smallholdings is higher than the part-time involvements [17].

3.2 Agricultural Systems and Production

The records in the local authority as well as the responses of the heads of households reported that land area under agriculture or a particular farming system varies from household to household in the Nadithalawa village. The observations of the survey group found that these farming systems have been subjected to minor changes over the recent past.

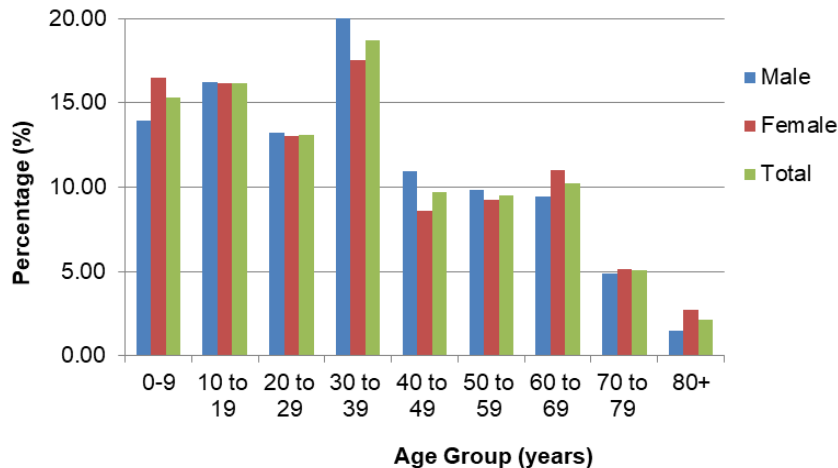


Fig. 1. Age distribution of the village population

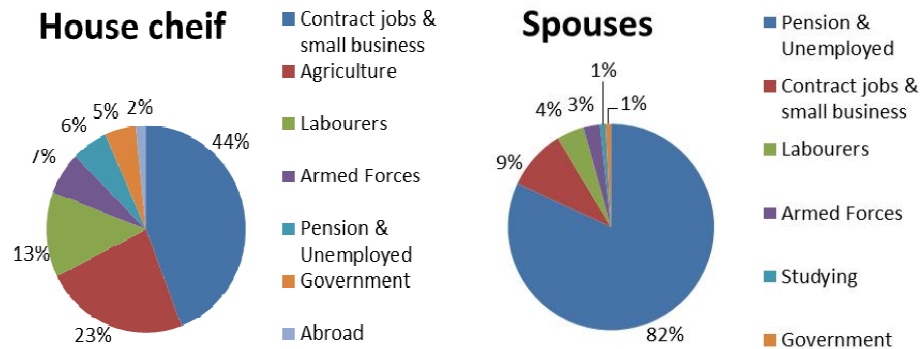


Fig. 2. Distribution of occupations of the heads (House chiefs) and spouses of the households

According to the results, total land area (of 28.2 ha) in Nadithalawa village, is shared among three major cropping systems, Kandyan homegardens (KHG), mid-country tea small holdings (TS), and paddy and minor cropping systems (P&M) at the extent of 10, 16.8 and 1.3 ha, respectively. Hence the village contributes greatly for the tea smallholder sector which has a larger share (53%), compared to rest of the tea smallholdings of the country [11]. Meanwhile the average landholding of TS is 0.2 ha, while that of KHG, and P&M are 0.16 ha each. Generally tea smallholdings in Sri Lanka are defined as tea cultivations having a land extent below 4 ha [17]. According to earlier reports mean landholdings of mid country TS and KHGs were of the sizes of as 4 ha and 0.4 – 2 ha respectively [13,18,19]. The survey results indicate much lower landholdings for both types of land used in Nadithalawa. This situation (in Nadithalawa) can be justified with high rate of land fragmentation in the recent past generally in Asia [20].

Kandyan Homegardens (KHG): The outcome of this survey indicates that, the majority of families (76%) maintain KHG but a minority maintains TS (36%) and P&Ms (7%). Further, livestock management (animal husbandry) is not considered as a major component among the families, (7.8%), where only a 6.2% of families are involved in rearing dairy cattle and 1.6% practices broiler chicken management.

When elaborate on the crop/species diversity of KHG, spices such as nutmeg (*Myristica fragrans*), clove (*Syzygium aromaticum* (L.) Merr), and pepper (*Piper nigrum*) together with beverages crops (i.e. coffee (*Coffea arabica*)) and multipurpose crops such as coconut and jak-fruit (*Artocarpus heterophyllus*) are found in almost all the KHGs, under favourable

temperatures and dominantly wet conditions in the mid-country. Of them, cloves were found to be the dominant crop component (Fig. 3). In Sri Lanka an average of 14 trees per 100 m² are planted in high density KHG while a low density KHG has an average of 0.7 trees per 100 m² [5]. When down scale the tree density to an average KHG holding of 0.16 ha, the tree density fits well with the situation of a low density farm.

Tea Smallholdings (TS): Among major cropping/farming systems, TS contribute much for the overall agricultural production of the village. The majority of tea smallholders (46%) in Nadithalawa village produces 0 - 499 kg of fresh tea yield per monthly (Fig. 4) while just above (8%) of the families in the village falls into the highest category. And also their average productivity (1252 kg/ha) was found to be lower than the national average 2001 kg/ha in 2012 [11]. This prominent decline in the average production of tea in Nadithalawa village appeared to be connected with improper soil nutrient management and other agronomic practices. Meanwhile high variation of tea yields among smallholders has been reported in previous studies in neighbouring villages in earlier studies (i.e. 500-5000 kg of made tea ha⁻¹ in Yatinuwara District Secretariat) [17].

According to Table 1, productivity of the clove, nutmeg, pepper and coffee were much lower than the potential yields but also similar to the average yields reported in 2017 [21].

3.3 Family Income

Income generation is the driving force of the economic sustainability of a given farming system. Fig. 5 illustrates the percentage

households belong to different annual income categories that represent two major cropping systems (TS and KHG) in Nadithalawa village. The majority of the households who maintains KHG (54.17 %) are engulfed in poverty as they earn only a less than Sri Lankan Rupees (LKR.) 50,000.00 a year. However, the lowest income category in TS is a much smaller fraction (23.4 %) while the majority of TS belongs to a medium income category (Fig. 5).

The mean gross annual income from KHG is LKR. 80,809.00 while the same from TS is LKR. 157,260.00. Meanwhile, the overall village income generated from TS in the year 2017 (LKR. 6,521,333.00) was higher than that of KHG (LKR.9,916,988.00). All these data indicates the relative advantage of TS in income generation over the KHG, requiring further investigation on the causes of this income disparity.

According to the potential yields reported by the Export Agricultural Department for major spices and beverage crop species found in KHG and the estimated annual income from an average home garden (LKR.79,292.00), the actual mean income revealed by the survey was much lower. This could be partly due to low productivity and partly due to low and variable farm gate prices. The observations on poor land and crop managements as well as the reports on less occupation in agriculture (23% family heads) justify the low productivity of crop components in KHG. Reports on part-time involvements in family farming in wet and intermediate zones of Sri Lanka, [22,23] which is an indication of less attention on farm management, further explains this situation.

The overall income from agriculture (including animal husbandry) as shown in Fig. 6 is highly

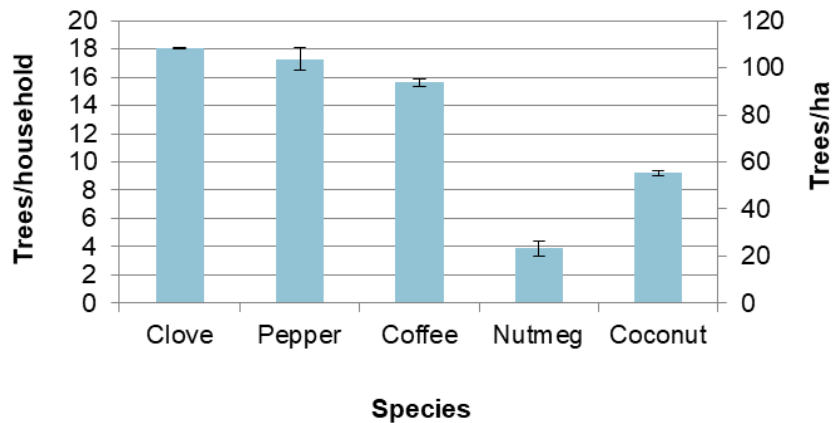


Fig. 3. Tree distribution per family/per land area

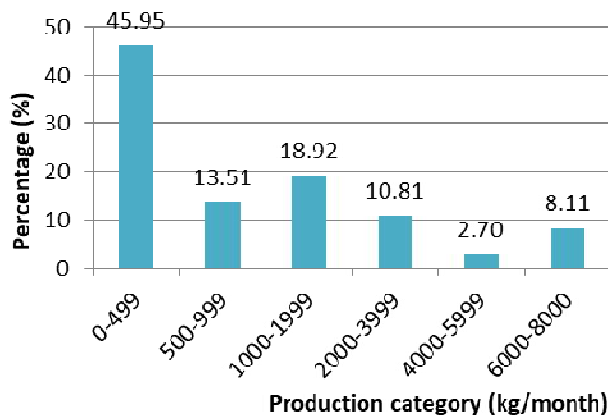


Fig. 4. Annual tea production by tea smallholders at Nadithalawa

Table 1. Production and income distribution of export agricultural crops

	Average production (kg/pl*/y)	Average income (LKR/pl*/y)	Average production (kg/household/y)	Average income (LKR/household/y)	Average production (kg/ha/y)	Average income (LKR/ha/y)
Nutmeg	14.1	4099.2	53.4	15495.2	329.9	95818.2
Pepper	4.5	1362.3	74.9	22860.6	462.9	141163.0
Clove	4.7	1865.9	81.9	32747.1	505.4	202154.6
Coffee	2.2	539.4	32.8	8189.2	202.2	50556.7

*pl**= plant

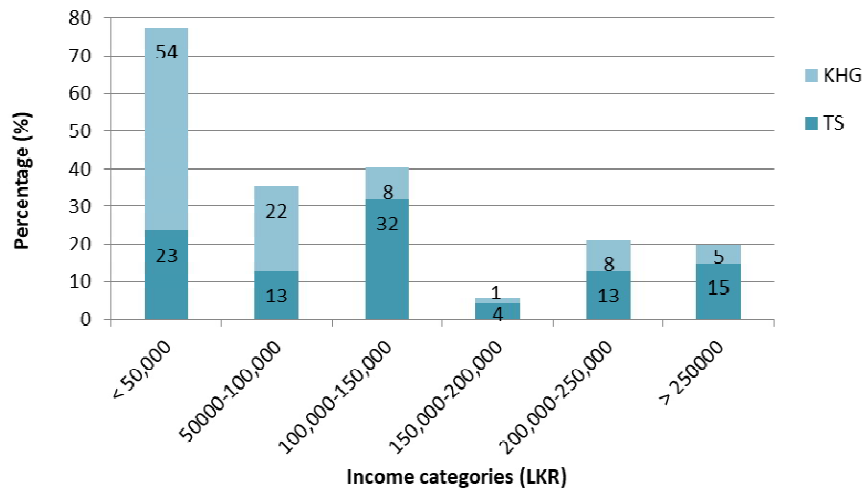


Fig. 5. Distribution of farm families among income categories under two cropping systems, TS and KHG

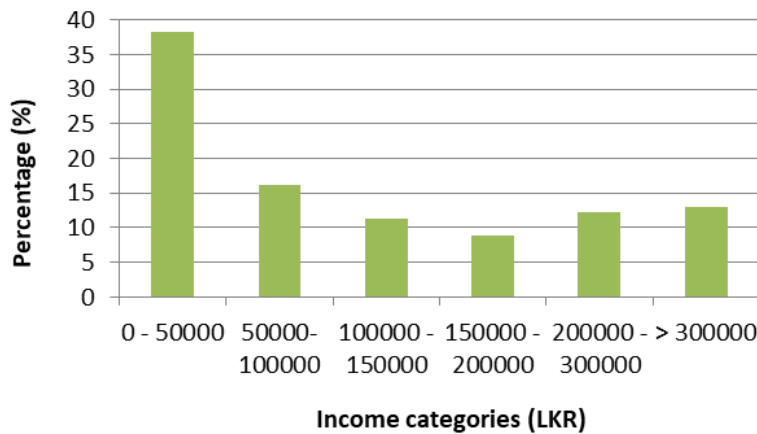


Fig. 6. Total annual incomes from agriculture by farm families at Nadithalawa

Variable among households. Nearly 38% of the farmers' annual income falls below lkr. 50,000 categories while it is distributed in the range of lkr. 25,000-500,000. Despite the fact that mean annual income of the households in nadithalawa were low, there is agricultural share is much higher, compared to the same at the national level (7.6%) [12].

4. CONCLUSION

The study has proven that the mean annual income of the village households from agriculture is not much appreciable while smallholder tea cultivation dominates in income generation, compared to its widely distributed counterpart, Kandyan homegardens. The farm productivity

which is an integral part of income generation from agriculture, appeared to be under-capacity in both farming systems due to lapses in crop and land management. The age and gender distribution, level of education and present occupation of the adults indicate a potential improvement in the agriculture based livelihoods in the village. However, it might need proper policy formulation and implementation together with the commitment of the stakeholders, as successfully demonstrated in other parts of the country and the region.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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