FACTORS INFLUENCING SMALLHOLDER CROPPING SYSTEMS IN TWO AGRO-CLIMATIC ZONES OF SRI LANKA

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Introduction

There is overwhelming evidence that smallholder cropping systems in Sri Lanka are strongly influenced by major socio-economic factors together with the biophysical environment. There are two aspects of land that are important to smallholder livelihoods: i) land provides the basis for agricultural productivity and ii) there may be non-agricultural economic value of land to the household. There are marked differences between the Wet and Intermediate Zones of Sri Lanka in the type of crops selected and cropping practices used by smallholder farmers. This is probably due in part to variation in land availability and hence size of land holdings, quality of land, the form of land ownership (Harwood, 1979; Pagiola *et al.*, 2001), the distance between farm and homestead and accessibility to water facilities associated with land. Differences in the above variables amongst agro-climatic zones, villages or households are influenced by several socio-economic factors. Various land use systems, including permanent, semi-permanent, seasonal and homegarden crops, can be found at the smallholder level in Sri Lanka and under each crop different land use practices are evident. Although numerous researchers in other countries have pointed out that land related factors such as size, ownership, type and proximity of the land have an important role in the selection of different crops, cultivation methods, as well as land productivity (Buckles and Triomphe, 1999; Comhiel *et al.*, 1999), a few socio-economic studies have been undertaken in Sri Lanka. The aim of this study is to i) identify the major land use systems in the study area, ii) analyze the relationship between land size and cropping intensity, and iii) to determine how land size, land ownership, proximity to land from the homestead and water accessibility influences the selection of different cropping systems.

Methodology

Four villages, two from the intermediate Zone (Pallekiruwa and Bookandayaya) and two from the Wet Zone (Kobawaka and Pannila) were selected. A selection of permanent (rubber and tea), semi permanent (banana and citronella grass), homegarden (pepper and arecanut) and seasonal (paddy and chena crops) crops provided the basis for assessing different cropping systems across agro-climatic Zones. Stratified random sampling was used to obtain a representative sample. A sample 0f 24 households from each village including at least three households with each major cropping system was selected. To collect data, five different methods were employed, population survey, semi structured interviews, direct observation, case studies and farm sketches. Data were analyzed using a variety of statistical methods including chi-square and general linear model (GLM).

Discussion and Conclusion

There was a significant difference in average land size (ha) between villages. Average land size of crops common to villages in both zones was greater in the villages of the Intermediate than the Wet Zone, except for rubber. Also, there were marked differences in the average land size of tea and *chena* crops even within similar zones for example, chena lands were greater (0.4 ha) in *Pallekiruwa* than *Bookandayaya* (0.3 ha) whilst tea lands were slightly larger in *Pannila* (0.5 ha) than *Kobawaka* (0.4 ha). Several authors contend

that the availability of land has a significant influence on the intensity of cropping in homegardens and on rubber smallholdings. The number of crops grown for a given area was strongly dependent on the land size ($r^2= 0.915$), when land size was <0.2 ha, then between 10 and 11 crop types were grown whereas when land size was >1 ha, between 3 to 4 varieties of crops were grown in an area of 16 m^2 area (Fig. 1).
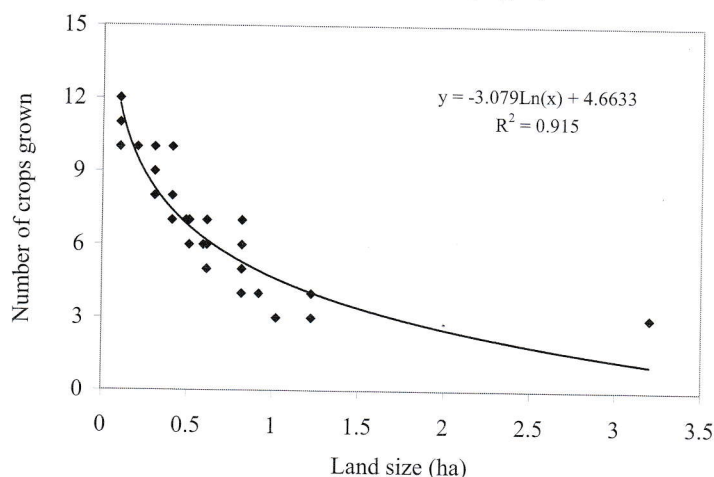

Figure 1: Relationship between the land size of homegardens and the number of crops grown. The number of crops grown was measured in a sample area of 16m^2 within each homegarden.

Further the study illustrates how farmers can intensify the use of a limited amount of land (< 1 ha). In order that the land meets the main objectives of smallholders in terms of subsistence and provision of incidentals, income and fixed assets the variety of crops are generally grown. Cropping intensity of rubber smallholdings was also dependent on the availability of land. Where there was also a greater amount of land available, lower priority was given to intercropping of rubber smallholdings and *vice versa* as has been reported in other research in Sri Lanka (Stirling *et al.*, 2001; Rodrigo *et al.*, 2001b). It was evident from the case studies undertaken for the households which owned ≤ 1 and > 1 ha of land that those who owned ≤ 1 ha of land, cultivated *ca.* five types of crops such as permanent crops, subsistence cereals, short-term cash crops, medicinal plants and timber trees, whilst farmers who owned > 1 ha cultivated only rubber and in some cases banana with rubber.

There was a significant relationship between crop type and land ownership class (p<0.001). Most of the *chena* crops were on crown land (43%) followed by private (35%) and reservation (23%) lands. Paddy land was mostly located on private land (84%) followed by shared land (16%), whilst tea and citronella grass were grown solely on private land. As Filius (1982) observed, owner-cultivated smallholdings comprised a mixture of both short-term cash crops such as fruits vegetables, food crops and some permanent crops. Tenant cultivated smallholdings, however, consisted solely of short-term crops such as fruits, vegetables and cereals. Distance of the land from the homestead had a significant effect on the selection or non-selection of cropping systems (Masae *et al.*, 1995), in particular rubber-based intercropping systems. Of the total rubber lands intercropped with banana, short-term cash crops, pineapple and passion fruits, more than 50% were located ≤0.5 km away from the homestead. In contrast, of the total rubber lands intercropped with citronella grass and cinnamon, more than 50% were located >0.5 km away as was evidence from farmer interviews undertaken during the ethnographic study. Banana was usually cultivated at a

close distance to the homestead due to susceptibility to pest damage and theft, whilst citronella grass was located far away from the home as the crop generally required less attention and risk of theft was low Rubber smallholdings were located a far distance from the homestead and sometimes were left as sole crops, particularly where there was insufficient family labour for intercropping .

The income level of the household had a considerable influence on several factors including, selection of cropping systems, size of land holding, and allocation of land to different crops. Access to water had a considerable influence on the selection of crops and cropping practices, even within the same agro-climatic zone (Harwood, 1979). In addition, banana and cassava mixed cropping systems (grown as mixtures in homegardens and chena lands) were replaced by mono cropping, due to the availability of fertile land. From the above sections, it is evident in that the intensity of cropping systems, and selection of different crops was not only influenced by land size and quality, but also the combined effects of land ownership, income sources, proximity to homestead, access to the water and farmer priorities.

The main conclusions are:
- Mean land size per household differed significantly between villages and was lower in the Wet than Intermediate Zone due to the higher population density and encroachment of urban development.
- A decrease in land size resulted in an increase in the number of crops grown per unit area in homegardens and rubber smallholdings. Also the number of crops grown was positively correlated with increase in labour availability, market accessibility and time of residence, and with lower household income.
- Owner cultivated rubber smallholdings involved many crops grown in a mixture including permanent intercrops, and soil protection methods were employed, whilst tenant cultivated land involved of one or two short-term crops with less priority to soil conservation.
- Crop selection was strongly related to proximity of land to the home. With increasing distance to land, crops with less risk and maintenance (citronella, and rubber as compared to banana and tea) were grown.

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