The interactions of human mobility and farming systems and impacts on biodiversity and soil quality in the Western Highlands of Cameroon

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Summary

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Keywords

Human mobility, farming systems, sustainability, biodiversity, soil quality, Western Highlands of Cameroon.

This thesis draws on the findings from studies conducted between 2009 and 2011 in the Western Highlands of Cameroon. Population growth and a significant drop in the returns from the major cash crop for small farmers are the main drivers that have accounted for rural-urban and rural-rural interactions shaping the local economies and livelihoods of large numbers of people in Cameroon in general and the Western Highlands of Cameroon (WHC) in particular. The livelihood of the majority of the population, which is mostly poor, is being threatened by the rapid depletion of natural resources such as forests, and declining soil fertility. Principal threats to biodiversity in Africa include land use and land cover change, mainly through the conversion of natural ecosystems, particularly forests and grasslands, to agricultural land and urban areas. It is likely that land clearing and deforestation will continue and hence threaten genetic diversity as species loss occurs. The nature of farming is changing in many African countries because of demographic changes: the rural workers are migrating to urban areas, and many rural areas are becoming intensively cultivated. Trends in flows of people and information, and patterns of land use and occupational diversification reflect a dynamic process of economic, social and cultural transformation which needs to be better understood. The main objective of this research activity was to determine the interactions between farming systems and human mobility influenced by the drivers mentioned above, and the impact on local plant diversity and soil nutrient balance in order to develop guidelines to prevent land degradation and improve sustainability.

In order to better understand the determinants and impact of human mobility dynamics in the WHC, a comparative study was conducted through household and field surveys in three villages in the region and conceptualized based on the systems approach. The different types of mobility identified in this region were, rural-urban migration, urban-rural migration, rural-rural and rural-urban commuting as well as social mobility. A combination of house-

hold social factors (age of the head of the household and number of members in the household) significantly determined rural-urban migration. However, economic factors such as the possession of 'high-valued' farm plots discouraged this type of migration. 'High valued' farm plots were located at the high altitudes which provided the appropriate niche required for the production of vegetable cash crops. Rural-urban commuting was provoked by the need for conventional farmers to make ends meet. Commuting to the urban cities enabled them to sell their products produced under high cost off-farm inputs systems, at prices that could enable them make some profit. There was equally a high demand on land close to water bodies which favoured off-season production. The quest for 'high valued' farm plots and hired labour were the main determinants of rural-rural commuting. Urban-rural migration was orchestrated by a multitude of causes that rendered the urban milieu inappropriate. This type of migration contributed immensely to occupation diversification in the rural areas but also provoked social mobility.

Farming systems in the WHC have evolved over time, yielding both positive and negative contributions to rural welfare and livelihood. The traditional on-farm input-dependent system characterized by shifting cultivation and intercropping has fallen short of satisfying the new ambitions of the rural population which are highly concerned with income generation especially after the drastic drop in the market value of the original cash crop, coffee.In order to gain an insight into the farming system of the WHC, a field survey was carried out in three villages in this agro-ecological zone and analysed to understand the sustainability, general characteristics of the households and other drivers of the farming systems. The results revealed that the household characteristics were very similar across the villages while the sustainability though generally low, differed depending on the intensity of off-farm inputs in the production systems and other socio-economic factors. Sustainability had significant negative relationships with the intensity of land use, off-farm inputs, and sole cropping practice and a positive relationship with the age of the head of the household. The latent variables that influenced sustainability were land use intensity over space, intensity of off-farm inputs, the household adjustment factor and mobility of the household, in descending order of importance and they explained 62.15% of the total variation of sustainability in the study area.

Loss of biodiversity in the tropics is principally due to the destruction of habitat by anthropogenic activities especially the clearing of natural vegetation and conversion into agricultural cropland. Biodiversity provides many services essential to human existence. Increased species diversity provides more opportunity for species interactions, improved resource use, and ecosystem efficiency and productivity. In order to quantify the effects of land use on biodiversity in the WHC, an effort was made to investigate the extent of tree,

shrub and herbaceous plant species richness in the sacred groves as dictated by topographic features and abiotic factors and quantify the impact of human disturbance through the evaluation of the herbaceous species in the fallowed lands with a view to generating baseline data of use to conservation. Data were collected at different altitudinal levels across the undisturbed (sacred groves) and disturbed vegetation (fallows) of the study area. The results revealed that sacred groves were rich in plant genetic diversity composed of a total of 42, 65 and 82 ethno-botanical species of herbs, shrubs and trees respectively, of varied ecological and economic importance. The herbaceous α-diversity was significantly higher in the fallows than the sacred groves at low altitude. The tree species richness was higher at low altitude compared to the high altitude with tree ß-diversity increasing with altitude. Varying combinations of soil pH, total P, total K, CEC and slope percent were related to herbaceous species richness, herbaceous Shannon index and shrub species richness. Intensive land-use has completely changed the structure of the native vegetation and caused severe plant diversity losses, though some useful forage species have been introduced in the area. Habitat changes in the sacred groves may be governed by biophysical drivers while a combination of human and biophysical drivers could be considered in the case of rotational fallow vegetation.

The rising demographic pressure has resulted in intensive land use over space and time which in turn demands high amounts of off-farm inputs. Studies were carried out in the WHC during the first and second growing seasons to evaluate the nutrient dynamics at the crop and farm levels. The nutrient budgeting results revealed that nitrogen mining was very common at all levels with the greatest mining carried out by intercropping systems which generally received little or no off-farm inputs. High nutrient budgets were found on market oriented crops. A general picture of the research site showed that only nitrogen was deficient while there were surplus amounts of potassium and phosphorus. The gross margins of green pepper, leeks and onions were negative. Legume intercrops could significantly modify the nutrient balance and sustainability in this region.

The determinants and types of mobility claims advanced here are pertinent to the WHC; the quantitative evaluation of sustainability of farming systems reflects the reality on the ground; the constraints expressed by the farmers are contemporary; the nutrient flux evaluated at the crop and farm levels constitute a valuable database. The magnificent contribution of this work should be indispensable to guide policy decisions and future research.