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The Use of Sociological Methods to Assess Land-use Change: A Case Study of Lambwe Valley, Kenya

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ABSTRACT Land-use history, not readily available for most places, remains the weakest link in nearly all studies of historic vegetation change, in Africa as well as other places in the world. Notwithstanding, communities hold a great wealth of knowledge on the processes and events influencing change on the land they occupy. The Lambwe Valley, southwestern Kenya, has a multi-ethnic population of settlers from the early 1950s. These people have seen the transformation of an initially forested area with diverse challenges to their survival, to present-day scramble for the remaining high potential land. A large part of the forces driving human settlement and consequent changes in land-use and cover is attributed to the control of tsetse and trypanosomosis. The application of a socio-economic method of mapping land-use change with the participation of the community in this study depicted trends and the underlying causes. The control of tsetse fly and therefore trypanosomosis infection was significant in driving the changes in the valley. Agricultural intensification is suggested as a means to support the resultant higher populations of people and livestock.

INTRODUCTION

In many countries infested by tsetse fly, its control is viewed as a step towards a greater purpose - the beneficial use of land, the conservation of its fertility, and continued production. The control of tsetse has been associated variously with land-use change (Muriuki, 2002; Swallow, 2000; Reid, 1999; Otsyina, 1996). The benefits of controlling tsetse can only be sustainable if the affected communities can accrue these benefits directly to their welfare.

Changes in land-use can affect social, economic, and ecological conditions, including changes in standards of living, education, employment, and health. Changes also frequently disrupt and may destroy the lifestyles of indigenous populations (Dale, 1993). The social effects of change include changes in standards of living, education, employment opportunities, and health conditions.

In the Lambwe Valley in south-western Kenya, concerted efforts in the past to control tsetse have resulted in an influx of people, and thereby resulted in various changes in land-use over the past 50 years. Uncoordinated tsetse control activities over the years may have lifted an important constraint to human settlement, which can be responsible for driving a series of the rapid land use changes currently being experienced in the valley. This study sought to investigate change from the people most affected by the change, and who have experienced it over the years. Proportional piling (Catley, 2002) was combined with colour photographs and complemented by a community time-line and questionnaires. The results showed a decrease in forested area from 5% to less than 1% and a consequent increase in cultivation from 2% to almost 10% over a period of four decades. Conflicts were highlighted by the respondents as a result of human population increase. The sustainability of tsetse control depends on how judiciously the available resources are distributed among the various stakeholders.

STUDY AREA

Lambwe valley, southwestern Kenya, is located in present day Suba district, about 72 km south of the equator. It has a total land surface of 324 km^2 of which 120 km^2 in the valley bottom is the Ruma National Park. It lies within latitudes 34° 10' and 34° 20' East and longitudes 0°30' and 0°50' south (Allsopp, 1972; Wellde, 1989; Kenya, 1994). The valley is a major geographical feature of the region, ringed by undulating hills and drained by a number of mostly seasonal rivers. To the west, the valley is bound by the Gwassi

hills, to the East by the Kanyamwa escarpment, and Miriya hill in the south. In its northern end are the Ruri and Gembe hills.

Located just south of the equator and adjacent to Lake Victoria, the area has a warm and humid climate, with a mean annual temperature of 22°C and mean daily minima and maxima ranging from 17° C to 30°C. The influence of the mountains surrounding the valley tends to give the valley a cool climate. The Lambwe Valley is classified as sub-humid to semi-arid and has a medium agricultural potential (Jaetzold, 1983).

Long-term rainfall data was collected from the Lambwe forest station and the Kenya Meteorological Department and indicate a bimodal rainfall pattern.

METHODS

Simple random sampling was used to select villages from which to obtain respondents. Since the unit of analysis was the household, a purposive sampling design was used at the next stage to get the required sample population. Assistant chiefs were used to generate a list of households that met more than one or all of the criteria set. These included, history of sleeping sickness, close proximity to the Ruma National Park, ethnicity (the 3 major ethnic groups in the valley were represented, namely Suba, Luo, and Kisii), have lived in the valley for at least 20 years as adults and a range of economic activities, to include farmers, traders, fishermen.

Both qualitative and quantitative methods were applied. Questionnaires contained both open-ended and closed-ended questions to allow for appropriate flexibility of respondents as well as to restrict respondents to relevant issues. The questions were related to land tenure, animal diseases and production, land use change, trypanosomosis and tsetse, and wildlife conservation/conflicts issues. The qualitative approach involved trend analysis in semi-structured group interviews and a piling approach for land-use change using a fixed number of counters. Respondents were provided with five photographs, one each of forests, bare ground, shrublands, grasslands and cultivation. They were then required to distribute the counters among these five categories of land-use for each 10-year period, starting with the current decade and going backwards to the 1960s.

The study made use of descriptive statistics (percentages, frequencies, standard deviations and means) using SAS statistical package. The data were then summarised in tables and graphs where applicable using Microsoft Excel.

RESULTS AND DISCUSSION

Land Tenure and Agriculture

The predominant land tenure (85.3%) is freehold. Communal land tenure only constituted 2.9%, while the other 12% were farmers on land whose adjudication was incomplete. There is therefore sufficient incentive for investments in agricultural intensification and development, as the majority of residents own titles to the land.

The original homelands and cultures were thought to be likely to influence land-use activities, especially if the migrants were farming communities. A majority (50%) originated from Kisumu, 11.8% from Bondo, 5.9% each from Homa Bay and Siaya districts, all predominantly Luo speaking, and 8.8% from Tanzania and Uganda. Historical evidence shows that the majority Luo are a primarily fishing community, with agriculture being secondary. Most of these settlers acquired land through allocation (47.1%) during the Lambwe Valley Settlement Scheme. Purchases accounted for 32.4%, while the rest were by inheritance from initial allottees. To date, the majority of land holdings are in excess of 10 acres (47.1%), and 6-10 acre holdings comprised 38.2%. Upon initial settlement, preparation of land for planting and settlement depended on livestock 59% of the time, hand preparation taking the rest of the portion. But over the years, animal traction for land preparation and cultivation comprises about 74%.

Livestock

Every household (n=34 for questionnaires; n=72 for semi-structured interviews) in the Lambwe Valley keeps one form or other of livestock. The values attached to livestock include milk and meat (subsistence), comprising 27%, draught power (24%), with savings, transport and dowry following respectively.

The major constraints to livestock production from the socio-economic survey were classified as shown in Table 1.

Table 1: Constraints to livestock production in Lambwe Valley

Constraint	*Frequency(N=34)*	*Percentage*
Diseases	34	100
Vet Services	23	68
Drought	17	50
Other	11	32
Credit	8	24
Marketing	4	12
Fodder	3	9
Breeding	2	6

Indigenous cattle are the majority due to their hardiness as draught animals and their resistance to trypanosomosis and tick-borne diseases. Their productivity is also low compared to exotic breeds, thus resulting in slow increase in herd size.

The Role of Tsetse and Their Control

All the respondents had witnessed one form or other of tsetse control in the valley, including aerial spraying, ground spraying, traps and targets, and bush clearing. They listed the benefits of control as: increased livestock numbers (30%), healthier bulls for cultivation (24%), and more milk and meat (20%). Only 2% reported that tsetse control had enabled improvement of livestock breeds through introduction of crosses between exotic and indigenous breeds

Table 2: Livestock diseases in order of importance in Lambwe Valley

Disease	*Frequency*	*Percentage*
Trypanosomosis	31	35.2
Tick-borne	24	27.3
Anthrax	18	20.5
FMD	8	9.1
Diarrhoea	3	3.4
Bloat	1	1.1

Source: Survey data

Common indicators of importance of a particular disease were mortality, morbidity, difficult diagnosis and treatment, and reduced animal productivity. Based on a combination of these factors, trypanosomosis ranked first among the most important livestock diseases in the Lambwe valley to date, removal of which would enhance intensification in agriculture. The benefits were listed (Table 3) as increased livestock numbers (76%), healthier bulls for cultivation (62%), and more milk and meat (53%).

Table 3: Benefits of tsetse control

Benefit	*Frequency*	*Percentages*
More livestock	26	76
Healthier bulls	21	62
More milk and meat	18	52
Better breeds	8	24
No abortions	6	18
Reduced mortality	3	9
Better life	3	9
Can keep donkeys	2	6

Land Use Change Trends From Community Man Scores

Respondents showed a good understanding of land use change over time, defining change according to the characteristics outlined in Table 4.

Table 4: Characteristics defining land use change by community

Changes	*Frequency*	*Percentage*
Cultivation of more land	27	79.4
Fewer large trees	25	73.5
More bare ground	11	32.0
Cash crops	7	20.6
Other	1	2.9

Source: Survey data

The drivers of these changes were reported as mainly more people (94%) and more livestock (88%). Among the reasons attributed to increase in more people and livestock was the control of both human and livestock trypanosomosis. The 1999 population census gave a population density of 120 people per km^2 in the valley (Kenya, 2001). The community elaborately described in a time line, the efforts put in to control of the tsetsefly, the vector for both, in the past, and subsequent settlement and expansion of agriculture through cultivation.

Counters placed on each land-use, for each decade were summed from all respondents (n=34 for questionnaires, and n=5 focus groups, ranging in size from 6 to 15 people per group), and a mean number of counts calculated.

Figure 1 depicts a decrease in forests, grasslands, and shrublands, and an increase in

Table 5: Human perceptions of land-use over time (%)

Cover Type/ Years	*1960s*	*1970s*	*1980s*	*1990s*
Forests	5.4	4.5	2.1	0.6
Grasslands	6.2	5.4	3.9	2.9
Cultivation	2.5	3.9	7.3	9.9
Bare ground	1.2	1.8	2.7	3.6
Shrublands	4.6	4.4	4.0	3.1

cultivation and bare ground as reported by the valley settlers. The community reported that between 1952 and 1968, there were numerous efforts to settle and resettle people in the valley, the largest being the announcement in 1964 for interested settlers to acquire land and settle there, and three chiefdoms that the Government of Kenya used to encourage people to settle.

The control of human trypanosomosis has been shown to be important in agricultural expansion and production (Msellati and Tacher, 1991). Human population growth is usually ranked high among the drivers of change in the rangelands. Robson and Ashkar (1972) report that some time soon after 1915, much of the Lambwe valley area was abandoned, probably mainly because the human population was severely exposed to *Trypanosome gambiense* infection. In Ethiopia, Reid (1999) showed that movement into an agricultural area was highest during the period of tsetse control. A similar study conducted in Zimbabwe found a positive impact of trypanosomosis control on migration. Results indicated that the rate of immigration was more than doubled by the implementation of tsetse control. The trend of major events in Lambwe Valley as described by the community depicts periods of in and out-migration, some due to trypanosomosis, others related to famines and droughts, such as between 1944 and 1948. The influence of tsetse on population growth was significant especially in the early years of the last century.

The control of tsetse in the valley is therefore seen as having ameliorated an important constraint to human settlement in the Lambwe Valley and thereby contributed to land-use change.

CONCLUSION

In many parts of Africa, land use history remains the weakest link in assessments of land-use change. Financial constraints further limit the ability to perform such studies using remote sensing. This study has demonstrated a quick and reliable technique that draws on experiences from the people most responsible for the change. Communities living in areas experiencing change have a deep understanding of the processes and causes of change, and often, elaborate coping-

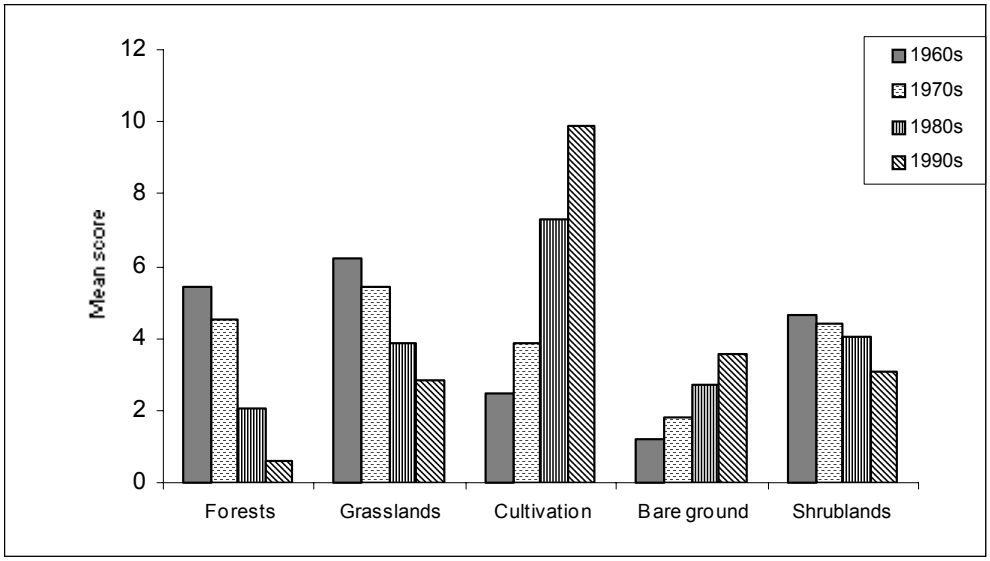

Fig. 1. Community perception of land-use change in Lambwe Valley

mechanisms. Based on these findings, interventions such as upgrading local cattle breeds, small stock, pasture improvements and animal health should be adopted in order to assist the community cope with the increasing demands for livestock and their products. That there is no fodder production (all livestock are freely grazed or tethered in grazing plots) despite the moderate potential for crop production is a gap for intervention.

Concerning future trypanosomosis challenge to livestock, the likelihood of large-scale tsetse control operations in the valley, at least in the magnitude of the past, is unlikely. Options such as the use of pour-ons on livestock by farmers, which would enable them to keep improved/ superior breeds of livestock in lower numbers on the same land area.

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