Livelihoods and Land Use in Southern Africa

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Background

The driving forces of land cover include both biophysical and socioeconomic factors (Geist and Lambin 2001; Keys and McConnell 2005). In this study we asses the relative strength of these complex push factors and analyze how well conservation efforts are working in Botswana, Namibia, and Zambia. As part of NASA project NNX09AI25G, we look to assess how social factors influence land use, which in turn conditions land cover in the KAZA region. We contend that socioeconomic institutions are the main instruments of human adaptation to climate variability and change and that the observable outcomes of these adaptations are expressed as land use and land cover change. In terms of biophysical variability, people confront precipitation variability, crop and property damage from large animals, and local edaphic factors.

State and non-state institutions play an increasingly important role. Institutions of central importance to people include conservation trusts (Botswana) and conservancies (Namibia), which provide income to community members. The distribution of this income is mediated through local power structures. Some communities distribute conservation funds relatively equally while others seem to hold most of the income at the level of the chief and other village heads. State policies regarding hunting and tourism influence the degree to which a community may be engaged in and benefit from these activities.

Our research links people to the land and describes adaptation and livelihood strategies. To date 450 surveys have been carried out in Botswana and Namibia in a range of communities with differing livelihood strategies. Another 1,000 surveys have been collected in Zambia through a cooperative agreement with the World Wildlife Fund. Other than livelihoods based on wild food gathering and cultivation, we find that tourism and conservation based livelihoods are increasingly important in both countries. An individual's ability to obtain these jobs is linked to the location of his or her village relative to tourism sites, as well as education level and English proficiency. Most households still engage in field agriculture and consume wild foods.

Study Site

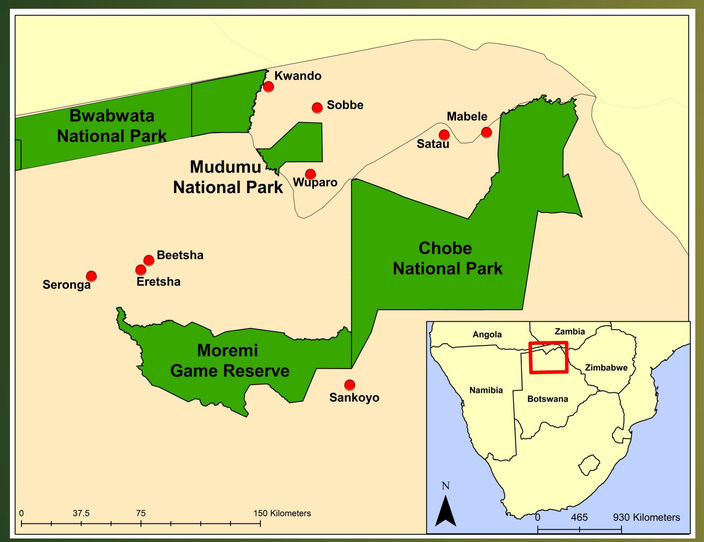


Figure 1. Study communities in southern Africa

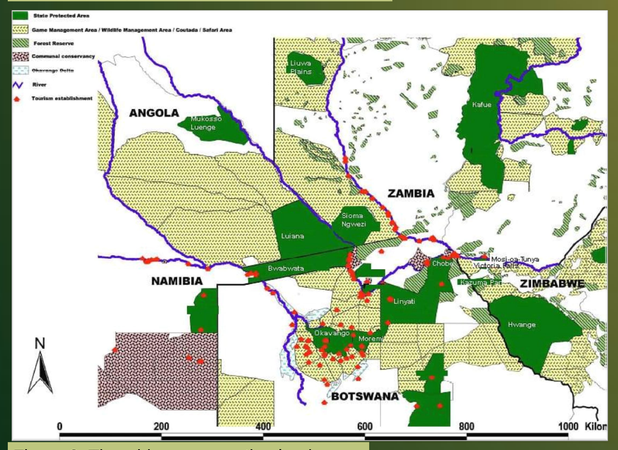


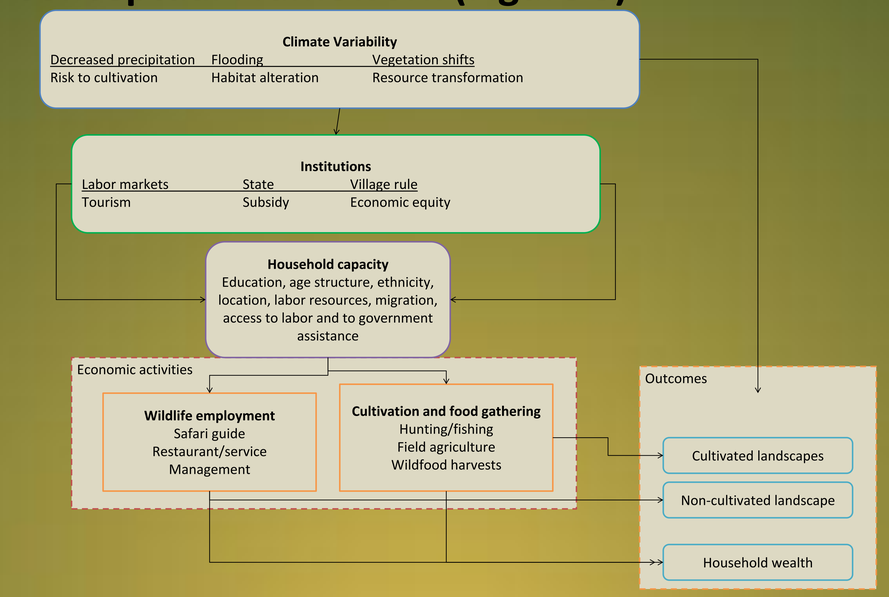
Figure 2. The wider conservation landscape

The study area (Figure 1) is dominated by the savanna biome. African savannas by nature are highly heterogeneous mixed woody-herbaceous systems which are capable of existing in multiple states (Scholes & Walker 1993, Hanan & Lehmann 2011).

Savannas ideally have high vegetation cover and heterogeneity and when considering shifts from one state to another, both vegetation amount and heterogeneity ought to be considered (Scholes & Walker 1993).

The study region (Figure 2) features five national parks and multiple conservation areas that are designed to protect the flora and fauna of the region. Outside of the parks are other conservation areas that are organized from the village to the district level.

Conceptual Framework (Figure 3)



Economics and Land Use

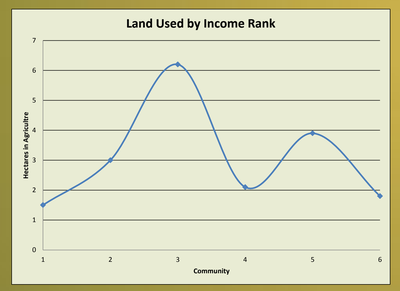


Figure 4. The amount of land in use for field agriculture is lowest at the lowest and highest income categories. This suggests that the highest income group is able to forego the opportunity cost of agriculture for more lucrative activities in off farm employment, largely related to tourism, conservation, and related jobs. This implies that conservation-with-development goals are being met.

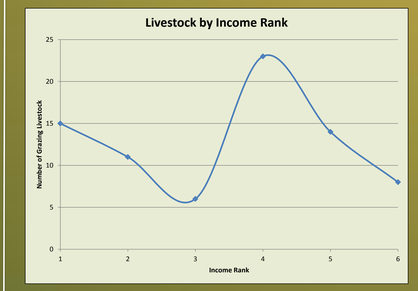


Figure 5. Livestock ownership appears to peak among middle income communities and decline at the left and right tails. This suggests a Kuznet's curve like relationship although cultural, geographical, and other factors most likely are at play here.

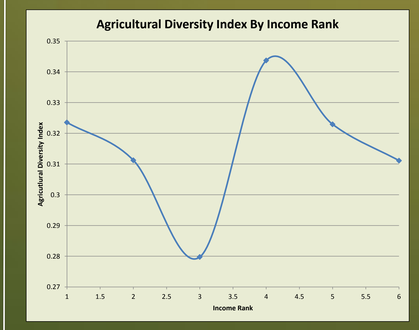


Figure 6. Agricultural diversity does not correlate well to income rank using a simple comparison. Lower numbers indicate higher diversity, showing that the two middle income communities have opposite diversity indices. Agricultural diversity is implicated in resilience to hazards and shocks.

Data & Methods

Survey Design:

•Research assistants from each village were hired, trained, and monitored to help with data collection. During the training process, each survey question was reviewed with the research team to ensure the research assistants understood each question and to achieve consensus on the translation of each question from English into the native language of the village.

•Data were collected in each village using semi-structured interviews and focus groups.

•Overall we conducted personal interviews with the head of the household if that person was available, or a close family member if not, to record the activities of the entire household.

•To try to get as close to random as possible sampling was done by dividing research team members into geographic areas of the villages. Convenience sampling was then employed in these quadrants to gather surveys. All interviews lasted between 30 and 120 minutes. In order to maintain the confidentiality of participants, each questionnaire was coded by village and number.

•The prepared questions were on household size and structure; livelihood strategies including access to technologies and tools, jobs, farming, subsistence activities, subsidies; changes in environment over the past five years; and perceived threats and challenges to household livelihood and prosperity.

Preliminary Results: Livelihood Assessment

Table 1. Land and environmental use

Community	Number of Interviews	Average household size (calculated average)	Average Ha in agriculture	Livestock per household (calculated average)	Natural product dependence
Beetsha	36	5 (5.29)	1.8	15(14.69)	6 (5.8)
Eretsha	37	5 (5.21)	2.1	6 (6.48)	7 (6.7)
Mabele	56	5 (5.38)	6.2	23 (23.14)	7 (6.5)
Sankoyo	34	7 (7.0)	1.5	8 (8.05)	6 (6.02)
Satau	56	4 (4.27)	3.9	11 (11.2)	5 (4.8)
Seronga	49	4 (3.6)	3	14 (13.8)	6 (5.9)
Wuparo	62	5 (4.9)	4.45	5 (4.6)	4 (3.7)
Summary	330	5 (4.94)	3.3	12 (11.9)	6 (5.51)

Variation in land used and cattle vary across the communities while dependence on natural products and household size show little variation.

Table 2. Participation in the cash economy

Community (n)	% with regular employment (n)	% of employed in tourism (n)	% of employed in public sector (n)	% of employed in private sector (n)	Cash dependence (US$/household member/month)	Expenditure percent relative to sample average
Beetsha (36)	33% (12)	33% (4)	66% (8)	33% (4)	$144.69	67%
Eretsha (37)	22% (8)	38% (3)	38% (3)	63% (5)	$333.97	155%
Mabele (56)	91% (51)	9% (5)	61% (31)	39% (20)	$398.19	184%
Sankoyo (34)	78% (26)	58% (15)	58% (15)	42% (11)	$666.12	309%
Satau (56)	53% (29)	17% (5)	72% (21)	28% (8)	$165.01	76%
Seronga (49)	73% (35)	14% (5)	57% (20)	43% (15)	$544.05	252%
Wuparo (62)	16% (10)	30% (3)	70% (7)	30% (3)	$186.16	86%
Summary (330)	53% (171)	23% (40)	61% (105)	39% (66)	$215.38	100%

There is significant variation in household economies related primarily to the availability of tourism and conservation- related employment. Consequently, expenditures are highly variable.

Table 3. Land use relative to average

Community	Average household size (calculated average)	Average Ha in agriculture	Land use relative to mean (%)	Livestock per household (calculated average)	Livestock relatives to mean (%)
Beetsha (36)	5 (5.29)	1.8	54%	15(14.69)	125%
Eretsha (37)	5 (5.21)	2.1	63%	6 (6.48)	50%
Mabele (56)	5 (5.38)	6.2	187%	23 (23.14)	192%
Sankoyo (34)	7 (7.0)	1.5	45%	8 (8.05)	67%
Satau (56)	4 (4.27)	3.9	118%	11 (11.2)	92%
Seronga (49)	4 (3.6)	3	91%	14 (13.8)	116%
Wuparo (62)	5 (4.9)	4.45	135%	5 (4.6)	42%
Summary (330)	5 (4.94)	3.3	100%	12 (11.9)	100%

Relative amounts of land used and cattle owned vary across the sample. Sankoyo, which has the longest history with tourism and is the wealthiest community has the lowest land used and relatively low numbers of cattle. Mabele, also relatively wealthy, has high land use and cattle numbers, most likely due to the temporary nature of employment.

Table 4. Cattle (livestock) numbers clarified

Community	Households With Cattle	Total Livestock	Average Cattle Livestock Owners	Cattle, min/max	Skew
Beetsha (36)	22 (61%)	514	23	1/175	+3.49
Erestha (37)	21 (57%)	240	45	1/45	+1.82
Mabele (56)	44 (79%)	1296	29	3/135	+2.09
Sankoyo (34)	17 (50%)	274	16	1/80	+2.78
Satau (56)	25 (45%)	631	20	1/101	+2.14
Seronga (49)	32 (65%)	674	21	1/230	+4.78
Wuparo (61)	42 (68%)	288	7	1/45	+3.29
Summary (330)	209 (63%)	3917	19	1/230	+3.98

Cattle is widely held, most likely as economic security although there is much variability in number of cattle owned, range of cattle owned, and skew.

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