

## Chapter 2

# Methods in the Analysis of Maasai Livelihoods

**Suzanne Serneels, Mario Herrero, Shauna BurnSilver, Pippa Chenevix Trench, Kath Cochrane, Katherine Homewood, Patti Kristjanson, Fred Nelson, Maren Radeny, D. Michael Thompson, and Mohammed Yahya Said**

### 2.1 Introduction

Chapter 1 set out the rationale for our focus on Maasai households, taken in political and economic context, as the unit and level of analysis critical to understanding changing land use and livelihoods in Maasailand. It also set out the rationale for focusing on household economy, again taken within social and cultural context, as central to understanding the decisions which people make over how to use their land, labour, and capital, and which drive the interplay of conservation and development. Economic indicators alone cannot capture the complexity, fluidity, and historical contingency of change, but they provide a powerful tool central to our approach, and one allowing for integration of additional perspectives.

The present chapter outlines the common methods of data collection and analysis used by different researchers operating in the five different major case study sites, as well as the methods used in the broader analyses of national level political and institutional contexts. The collaborative work on which this book is based arose from a research programme funded by the Belgian government (Directorate-General for International Cooperation, DGIC), coordinated by the International Livestock Research Institute (ILRI, Nairobi). Field data collection had in several cases begun prior to the emergence of the collaboration. The collaboration drew together independent studies already underway in different parts of Kenyan and Tanzanian Maasailand and provided the forum in which those studies could become more than the sum of their parts. With the establishing of the collaboration, data collection methods in each site were extended and harmonized to allow, as far as possible, for a common core data set. This makes in-depth cross-site comparisons possible, while also continuing with more site- and issue-specific data collection in each case study. Common methods of analysis were developed both during and subsequent to the data collection in the field.

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K. Homewood (✉)

Department of Anthropology, University College, London, UK  
e-mail: k.homewood@ucl.ac.uk

This chapter is structured around the overarching research questions tackled within each of the site studies and put into perspective in the broader national context chapters. Despite methodological hurdles, the ethnic, micro-economic, and ecological continuities across Maasailand make it possible to integrate the different case studies through a cross-border comparative structure, where parallel disturbances or interventions (e.g. impacts of conservation, mechanized agriculture, or urban markets) are played out under contrasting national, regional, and local political and economic circumstances. Considerable time and thought went into developing an appropriate framework for comparative analysis. While each study site calls for its own dedicated analysis of factors of site-specific importance, the collaboration ensured a core set of household economic, social, demographic, and spatial data was available for each site. This allowed for comparative analysis and a synthesis showing how the relative importance of different livelihood strategies varied within and between sites (and where possible through time), the openings for diversification into new land use possibilities and market opportunities, and how these in turn translate into land cover changes, with far reaching implications for vulnerable people and dwindling wildlife.

The main research questions were addressed in each of the study sites using a set of common quantitative survey data collection and statistical analytical techniques combined with more qualitative and descriptive approaches (Table 2.1). This common approach did not preclude each study developing a rather different focus depending on context, salient issues, and site-specific research interests. In all cases, household-level interviews were conducted in Maa by Maasai male and female enumerators, often, but not always, accompanied by the principal researcher.

## 2.2 Design and Implementation of Field Surveys

The five different study sites in part represent the enormous variation found across Maasailand today (Table 2.2). They range from arid to moderately favourable agro-ecological conditions; from top-rated wildlife tourism destinations to sites with little tourist appeal; from remote rural to peri-urban; from areas limited to agropastoralism to those with high value natural resources like gemstones; from fully subdivided, surveyed, and privately titled plots to communal land; and from Kenyan to Tanzanian sites. This array gives us the opportunity to explore the many dimensions of pastoralist diversification and development, and their complex interplay with the social, geographical, and political environment. Livelihoods change among pastoralist communities is a difficult process to analyze, not least because of the complexities of establishing a representative sample in areas where there is no realistic sample frame, where households are scattered, remote, and hard to access, where agropastoralist households may alternately be defined by occupation or by ethnicity, and where there is immense variability within and between households, and within and between years in terms of their composition, activities and strategies. Furthermore, superficially discrete households may in practice be tied

**Table 2.1** Main research questions, methods of data collection, and methods of analysis

Research question	Methods of data collection	Methods of analysis
What is the range of livelihood strategies found in Maasailand? How do livelihood strategies differ in the different sites (pattern, scale, and extent of diversification)?	Household surveys on stratified random samples	Non-parametric cluster analysis
How dependent are people on natural resources-based livelihoods?	Household surveys on stratified random samples	Non-parametric and parametric comparisons of household data based on cluster and other categorizations
What are the main determinants shaping livelihoods and triggering change? To what extent do external factors such as biophysical and eco-climatic/agro-ecological factors on the one hand, and infrastructure and policy on the other, shape livelihood choices? To what extent are livelihoods determined by socio-demographic characteristics of the household?	Household surveys, formal and informal interviews Family portraits Literature survey and background field research plus in-depth key informant interviews, semi-structured interviews, panel/focus groups, participant observation	General linear models Mixed models Qualitative comparison and cross-referencing
How are livelihood strategies impacted by conservation, privatization, and other dimensions of development and change?	Review policy, legal and financial documents; observe decision making and conflict resolution processes; field research plus key informant interviews	Policy analysis, institutional analysis. Comparative analysis of outcomes of similar policies in contrasting contexts and vice versa
Have any win/win solutions for environment and development emerged, and if so, where, how and why? What are the main policy lessons for managing conservation and development in Maasailand, and more generally across African rangelands?	Household survey data on economic activities and returns; remotely sensed data on agro-ecological variables; data on biophysical, social, economic/demographic variables	Discussion and synthesis from case studies

**Table 2.2** Five in-depth study areas across Maasailand

Site	Area (km <sup>2</sup> )	Rain (mm/pa)	Defining conditions	Protected areas; Conservation/eco-tourism projects
Mara (Kenya)	6,500	400–1,200	Private land: wildlife tourism/commercial crops: Maasai Mara National Reserve (MMNR) is Kenya's highest-earning PA (gate fees ~\$20 million pa). Further from the MMNR, large scale cereal cultivation and irrigation for export crops along the Mara river have had far reaching ecosystem impacts	MMNR Numerous wildlife associations/tourism operations etc.
Kitengela (Kenya)	390	<600	Peri-urban: close proximity of Nairobi (population 3 million); urban markets and land values transform the local economy	Nairobi National Park; Kitengela Landowners Association (KILA) operates lease back scheme
Amboseli (Kenya)	8,400	350–600	Subdividing land: wildlife/agropastoralism: pastoralism and wildlife in arid Amboseli depend on wetlands fed by Kilimanjaro precipitation. These key resources are being converted to cropping. Subdivision further threatens mobility and access	Amboseli National Park/Reserve; Numerous small tourism operations
Longido (Tanzania)	9,220	300–600	Communal land: agropastoralism squeezed by set-aside. Arid area, limited cultivable land and dry season grazing; increasing importance as wildlife migration corridor attracting conservation NGO investment	Ringed by PAs (Ngorongoro, Manyara, Arusha, Kilimanjaro, Amboseli); site of new Enduimet Wildlife Management Area
Tarangire (Tanzania)	22,200	650	Privatizing land; gemstone mining. Agroecological and spatial factors encourage commercial cereal cultivation. Tanzanite and other gemstone finds have fuelled a mining rush which interacts with cultivation, livestock, and wildlife land use choices	Tarangire NP; Manyara NP; Emboreet Community Based Conservation Scheme; Manyara Ranch etc.

into a wider multi-local array of more or less closely related and involved homesteads in pastoral, cultivating or urban areas, creating further challenges in defining sampling units. In this section, we lay out the commonalities and differences in the sampling frame for each case study and some important definitions.

## 2.2.1 *Household Sampling Strategies*

### 2.2.1.1 Definition of ‘Household’

In all case studies, the ‘household’ refers to the Maasai entity of an *olmarei* (pl. *Ilmareita*) within the homestead (Maa *enkang* Pl. *Inkang’itie*), that is, one household head with his or her dependents, which may include, in the case of male-headed households, more than one wife and her children and grandchildren, parents and dependent siblings, as well as non-related individuals who reside with the family and depend on them for food in return for assistance with household chores (most commonly herding). Customarily each wife builds a small house (*aji*) for herself, her children, and the occasional presence of her husband. The positioning and occupancy of such houses have been described elsewhere (Spencer, 1988; Homewood and Rodgers, 1991; Coast, 2002), but broadly speaking the *enkang* comprises a number of these *enkaji* (Pl. *inkajijik*) built around one or more linked livestock corrals. Men traditionally have lived in their wife’s house or moved between several wives’ houses. Increasingly, men invest if they can in a house of their own, built to a ‘modern’, non-traditional design (rectangular plan, mud and wattle walls, if possible with plaster, cement floor and corrugated iron roof). Such houses may be built at the rural homestead (and often used as a store and site of more formal meetings). In some cases men invest in modern houses located in trading centres or urban sites as a property investment, and/or generating a multi-local household. The present set of studies tried to establish as far as possible the extent to which the homestead that formed part of the sample represented a component of a multi-local household as one of two or more related bases. Where this occurred they might often be in complementary locations (pastoral; upland or swamp-based farm; urban settlement); only the one initially sampled could be visited.

### 2.2.1.2 Villages and Group Ranches

Beyond the household level, the unit of study for each area described in this book differs due to local variation in social structures, land tenure and mobility of, and within, households. Thus in Tanzania, historical processes and policy placed individual households within government-defined administrative units called villages (often comprising several sub-villages, particularly with the dispersed nature of Maasai homesteads; Chaps. 6 and 7). In Kenya, the units of study may be group ranches, sub-locations or trading centres (akin to village centres), according to

whether or not land is held in Trust, as a Group Ranch or has been subdivided and is therefore under private property. The extent of the area covered may vary according to the mobility of households and their relationship to a particular geographical area (Chaps. 3–5).

### 2.2.1.3 Sample Selection

For each of the studies in this volume, the first challenge was to decide upon the area to cover, how to choose the sample of households to interview, and how many households to cover in order to ensure the results are representative and support statistical analyses. In all sites, a range of study sub-sites was chosen to represent variation in access to all-weather roads, markets and other services, as well as in distance to, and impacts of, protected areas and wildlife conservation across the region.

*In the Mara*, 219 household interviews were conducted in six villages across three group ranches. 85 of these households had been previously sampled in 1998 (Thompson, 2002). The selection of the same households per location for both periods permitted an analysis of changes in livelihood activities and income over the 5-year period for that sub-sample. This comparison also allowed some evaluation of the impacts of group ranch subdivision on household activities as it included a subdivided group ranch (Lemek), a group ranch that underwent subdivision between the two surveys (Koyiaki) and a group ranch that has not yet been subdivided (Siana).

*In Kitengela*, a random sample of 150 households was drawn in proportion to the overall population distribution across the area. An additional 27 households that had been surveyed in 2000 from an area adjacent to Nairobi National Park, were also included in order to be able to look at changes in the last 5 years for this smaller sub-sample. The survey focused on Maasai households that have been in this area since the group ranch subdivision, and did not include in-migrants who have purchased small parcels of land around the urban centres. As elsewhere, the Kitengela household was defined as the *Olmarei*. Because of the typical land tenure conditions in the area (already privately owned by all households for at least the last 21 years, with all subdivision of the group ranches complete here by 1985–1986), most households are becoming smaller. Increasingly, nuclear households choose to be located on their own land holding, which has meant a trend away from the customarily large *enkang*, that traditionally would have included married sons of the *olmarei* head (Grandin, 1986; Homewood, 1992). Kitengela households are, as a result, smaller compared to those in other case study areas. The houses in Kitengela are now predominantly made of corrugated metal sheeting, and women play a lesser role in physically building the houses (though they contribute or pay to buy materials).

*In Amboseli*, 184 households were chosen using a proportional stratified random sampling strategy based on wealth rank and location. A wealth ranking exercise (Grandin, 1988) was carried out in each of six study sub-sites, distributed across four group ranches selected on the basis of land tenure conditions, land uses and

degree of access to resources. Community informants from each study area were asked to categorize all the households from each study area based on locally relevant wealth indicators. The criteria cited most often that identified wealthy versus poor households in this exercise were (in order of importance) (1) number of animals, (2) family size, and (3) access to 'new' sources of wealth (e.g. salaries, a vehicle or agriculture). Male heads of households were interviewed except in one case where the head of the household was female. Two survey strategies were pursued with households: a small sub-sample of households ( $n = 38$ ), evenly spread across the six study areas, was interviewed twice (once in the dry season and once in the wet season); a larger sample of 146 households was interviewed once.

*In Longido*, following initial work in one site in 2000–2001 (Mairowa village; Homewood et al., 2006) a wealth ranking exercise was carried out in each of six study sites so as to select a stratified random sample of households representing the range of socio-economic circumstances in each study site. Working with the local village chairman, study site households were listed and representatives of the local community then allocated each household to one of three or four categories ranging from poorest to wealthiest (Grandin, 1988). A proportional random sample from each category was chosen for interview. A total of 229 households were surveyed.

*In Tarangire*, households from all seven sub-villages within Emboreet village were listed based on sub-village census data and these lists were then updated by each sub-village chairman. A wealth ranking exercise was initially carried out by the Village Executive Officer and two Community Animal Health Workers. The revised list was cross-checked by focal groups in each sub-village to further corroborate the list and wealth ranking and finally, the list was verified at each *enkang*. Out of a total of 437 households, 226 were selected on a stratified random basis for each sub-village for a broad scale survey. A sub-sample of 37 households from three sub-villages was selected for a more in-depth, 15-month, multi-round, repeat survey, of which 27 were also interviewed in the broad scale survey.

Studies in this book could not capture the very wealthiest households, who are frequently absentee landowners and whose decisions can have a massive influence on land use and land cover change, but who are not available to survey. Also, the very poorest people are often socially invisible in household surveys, existing as dependents in other households, as landless and homeless people on the periphery of rural trading centres, and missing from any local government lists of independent households. The poorest individuals and families – those without social networks of support – may leave the area altogether as urban migrants, leaving little or no trace of their past presence. The studies in this book represent independent households resident in the rural landscape, but cannot represent those who through extremes of wealth or poverty no longer form part of that category of local resident.

Household level studies may also identify households resident in the area while failing to capture the crucial links between superficially distinct but essentially mutually dependent, complementary farming and herding and/or urban and rural households. We made every effort to capture the full range of wealth and poverty, and to identify multi-local households where these occurred.

## 2.2.2 Characterizing the Biophysical and Socio-Demographic Environment

### 2.2.2.1 Spatial Variables

Spatial factors such as market access, population increase, service provision, and urbanization among others, are known drivers of change (see Chap. 1, also Kristjanson et al., 2002; Herrero et al., 2003). Therefore, in all of the studies, several spatially referenced variables were used to characterize the locations of households in relation to availability and use of resources and services. The variables characterizing the biophysical environment were assembled using geographical information systems (GIS), making it possible to extract the information for each of the homestead locations in our database. Distances to the nearest road, nearest permanent water source, nearest town centre and distance to the national parks were calculated per kilometre. Normalized Differentiated Vegetation Index (NDVI) or NDVI-CV (the coefficient of variation for monthly NDVI) was used as a proxy measure of agro-ecological/eco-climatic potential (c.f. Pratt and Gwynne, 1977). NDVI and NDVI-CV values were calculated as the average monthly NDVI over a 10-year period for the nearest  $5 \times 5$  km pixel to the homestead (Kitengela, Mara), and for the surrounding  $10 \text{ km}^2$  in Amboseli and for Longido. Table 2.3 summarizes the main spatial variables used in the study.

In each study site, proportion of pasture available in the area around the homestead was calculated as:

$$\% \text{ pasture available} = 100 \times \frac{(\text{total area} - \text{cultivated land} - \text{urban area} - \text{national park})}{\text{total area}}$$

The area used to calculate percentage of rangeland pasture differed slightly for the different sites. For the Mara site, this was calculated as the percentage of grassland, savanna and bushland available in a radius of 5 km around the homestead, derived from the Africover classification. In Amboseli, proportion of pasture within  $10 \text{ km}^2$  was used, and in arid Longido, figures were based on a 10 km radius. Wildlife

**Table 2.3** Spatial variables used for characterizing the biophysical locations of *enkangs* in relation to access to resources and livelihoods options<sup>a</sup>

Variable	Kitengela	Mara	Longido	Amboseli
NDVI average	*	*	*	*
NDVI coefficient of variation	*	*	*	*
Distance to nearest road (km)	*	*	*	*
Distance to nearest major town	*	*	*	*
Distance to nearest primary school/services (km)	*		*	*
Distance to permanent water (km)	*	*	*	*
Distance to protected area (km)	*	*	*	*
Distance to livestock market (km)	*	*	*	*
Proportion of land area available as pasture	*	*	*	*
Wildlife density (kg/5 km <sup>2</sup> )	*	*		*

<sup>a</sup>No equivalent regression analysis was undertaken for Tarangire site data



densities were available for all sites except for Longido. In the Kenya study sites, average wildlife and livestock densities<sup>1</sup> were available, calculated based on three aerial surveys conducted by Department of Resource Surveys and Remote Sensing (DRSRS) at a scale of 5 × 5 km for the years 1997, 2000, and 2002. In Kitengela, cattle densities and permanently fenced areas were also geo-referenced.

### 2.2.2.2 Household-Level Variables

In all the study areas (Mara, Kitengela, Amboseli, Longido, and Tarangire), the studies combined household surveys using questionnaires as well as formal and informal semi-structured interviews with household members and community groups. The questionnaires were used to gather information on household structure and education levels, crop production (cultivars and acreages grown, yields and production techniques used), livestock production (herd size and structure, milking patterns, off-take rates, and marketing arrangements), and household income characteristics (other economic activities and predicted future production choices) (Table 2.4). Detailed interviews were conducted with household heads. In Longido and Kitengela, additional questionnaires were developed asking women of the household about their activities and income sources.

Studies quantifying the returns to livestock production (i.e. live animals, meat, milk, hides and skins, and manure) versus other livelihood and land use options, such as cropping, quarrying, running a campsite for tourists, or producing and selling honey, face considerable methodological challenges. To measure the benefits versus the costs of livestock production, models are required that take into account herd composition, movement and life cycles, multiple outputs, and feed inputs coming from outside the ranch or landowners acreage. Figuring out how to account for and/or integrate the value of Maasai livestock as an asset/bank account or stock on the one hand, or as an income flow on the other, provides yet another challenge. Several recent case studies have addressed this issue, and compare returns to different land use options, for Kitengela (Kristjanson et al., 2002), Amboseli (BurnSilver, 2007), and Maasai Mara (Thompson, 2002). In the absence of details on herd dynamics for each study site, the analyses in this book focus on livestock productivity as measured by transfers to cash or for consumption for the household, that is, livestock sales, livestock slaughtered and consumed by the household, and sales of livestock products such as hides and, where available, milk.

In most cases, as with livestock production, analyzing the value of different income streams to individual households required aggregating different variables. This was a crucial part of the collaboration to ensure that like could be compared with like across the different case studies. For example, off-farm income was divided into four or five categories: wage or salary income, petty trade income, business income, income from wildlife and conservation related activities, and income from remittances. Considerable

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<sup>1</sup>Livestock densities are expressed in Livestock equivalents (LE) or Tropical livestock units (TLU) per unit area. Exact definitions vary. In the context of these studies, one LE or TLU = 250 kg weight. Adult Maasai cow = 0.71; adult sheep/goat = 0.17 TLU or LE. See, for example, ILCA (1981) and Sellen (2003).

**Table 2.4** Variables characterizing household socio-demographic conditions and household economy

Category	Variable
Household assets	Area under rainfed cultivation <sup>a</sup> (ha)
	Area under irrigated cultivation (ha)
	Livestock owned (TLU)
Household socio-demography	Total AU (see section 2.4 for definition)
	Sex of household head
	Age household head
	Dependency ratio
	Education of household head (years educated)
	Education, all children (proportion of children 6–15 in school)
Household economy	Years resident
	Gross annual revenues from milk sold (\$)
	Gross annual revenues from livestock sales (include skins and hides)(\$)
	Gross annual value of livestock consumed and gifted out (\$)
	Value of annual purchases of livestock (\$)
	Gross annual value of crop consumed (\$)
	Gross annual value of crop sold (\$)
	Annual income from petty trade activities (\$)
	Annual income from business activities (\$)
	Annual income from salary/wage activities (\$)
	Annual income from conservation/wildlife related activities (including land leasing, beads and crafts, tourist guide, ranger etc.) (\$)
	Land rental income (cropping, etc.) (\$)
Household connections	Total number of off-land activities
	Influence/no influence on allocation of resources (based on range of factors – networks, political influence, leadership, gate-keeper position to opportunities)

<sup>a</sup>The idea of dividing this into high potential and low potential rainfed area was eventually rejected on the basis that the information that it represented would come from the NDVI regression variable and the value of the crop

effort was put into agreeing these categories and what to include within them. Because of the way multi-local households operate, and the circular migration increasingly common in Maasai households (Coast, 2002; May, 2002), remittances were an important element of household income in many sites, but with a nature different to other income streams and therefore placed in a category of their own. Wildlife related income was differentiated from other activities on the basis that conservation and wildlife-related activities are specific to Maasailand in a way that the other activities described are not. In some areas, highly specific income streams of significant value were also differentiated from these categories. In Tarangire, for example, mining income was separated from other business income streams due to the focus of the study on the role of mining and the particular value that the Tanzanite mining trade has within the Maasai communities in the area. In the Mara, land leasing for wheat cultivation was similarly differentiated from other income streams as one that had a significant impact on land use in the area. Table 2.5 summarizes how values were calculated for agricultural production, livestock production and off-farm income streams.

**Table 2.5** Definitions/calculations for aggregated income streams and production values

Aggregated variable	Component variables	Comments
Gross livestock income/ production value	Value of livestock sold; Value of hides/skins sold; Value of milk sold; Value of livestock slaughtered; Value of livestock received as gifts Value of milk consumed where available; Income from manure sale; Revenue from traction	Value of milk consumed not available for Longido or Mara; Value of hides traded as part of a regular business would be included in business income
Gross agricultural income/ production value	Value of crops sold; Value of crops consumed	
Gross wildlife income	Value of income from tourism related activities (bead/other craft work, guiding, etc.); Value of income from land-leasing scheme Value of land from rents off tourism related ventures	Includes activities that would otherwise come under business or salary, but would not be available as opportunities without the wildlife
Gross petty trade income	Sale of firewood; Bee-keeping/honey sales; tobacco sales; beer (occasional); herbalist/traditional medicine; tea/sugar/soap, etc.; Vegetable trade (tomatoes, onions, etc); selling <i>shukas</i> ; selling fod- der ( <i>sagarami</i> ); carrying water by bicycle; livestock association; <i>Moran</i> in Malindi	May be differentiated from business income due to scale and investment (e.g. occasional sales of small quantities of tea and sugar at weekly markets ver- sus selling tea and sugar in a shop)
Gross business income	Trader; shopkeeper/butchery/ <i>duka</i> Livestock trader; <i>Fundi</i> (dam builder, carpenter, artisan, well digger, blacksmith, fence builder); midwife; beer/pub; <i>Posho</i> mill; mineral dealer; hotel owner; skins/ hides trader; property/business rental; milk vendor; livestock holding pen	
Gross wage/salary income	Government employee (chief, sub-location chairman...); employee; MP; councillor; teacher; church; salaried position on association/ board; paid shepherd; watchman; labourer/ <i>Kibaruua</i> ; driver; school sponsorship; farm labourer; livestock driver/trekker; employed in shop/butchery; borehole minder	Includes formal and informal, regular and irregular
Gross annual income	Sum of: Gross livestock income; Gross agricultural income; Gross petty trade income; Gross business income; Gross conservation income; Gross wage/salary income	

Other secondary sources of data included information on crop and livestock prices in local markets (based on interviews with key informants). In some case study sites, additional information was collected to delve further into identifying the factors explaining the range of livelihood strategies found in the study sites. For example, in Kitengela, other data collected at the household level included changes in land ownership over time (land sales and fencing issues), probable future land-use plans, drought coping strategies based on the two previous droughts of 1997 and 2000, household consumption patterns across seasons, peoples' attitudes towards wildlife, wildlife populations and dynamics over the past 5 years, and perceptions as to how the land-leasing programme is impacting on people's attitudes towards wildlife.

### ***2.2.3 Family Portraits***

Detailed qualitative studies of a small sample of households brought additional depth to the quantitative data for Mara, Amboseli, Tarangire, and Longido using 'family portraits'. Family Portraits methodology involves a participatory action research approach, developed for pastoral communities in West Africa (Thébaud, 2004; IIED, 2005) and adapted to Maasailand by Cochrane et al. (2005). In the context of this research, the family portraits are used to inform, enrich, and support the conclusions of the quantitative analysis by providing narratives of livelihood aspects difficult to capture with quantitative methods, and historical timeline perspectives not addressed by horizontal snapshot surveys.

The implementation of family portrait methodology starts with the communities selecting families according to specific criteria (see below). These families then take ownership of a process of recording their 'story'. Together with a team of facilitators (including men and women, and in this case all Maasai), household members build up a picture of the family, their history, their livelihood system, the institutions they interact with and the relationships they have. Most important are the family's analyses of how these different dimensions are changing, what is driving these changes and how they have been able to respond.

Although family portraits cannot equate to long term ethnographic work, and are inevitably subject to some of the caveats that apply to rapid 'participatory' methods (IIED, 1995; Kiwasila and Homewood, 1999), they involve a considerably more in-depth and sensitive process than do standard household survey and PRA techniques. A team of facilitators initially stays with the family for 3 or 4 days, talking and gathering information loosely based on an interview guide developed ahead of time that defines the areas for discussion. Information is gathered using a combination of techniques including formal and informal interviews with different members of the family, group interviews using visual and participatory techniques, and observation. On the basis of this initial stay, the team writes up the family's story, and then returns for a shorter period (1–2 days) to follow up on any issues that have not been covered or that require clarification. The team translates the story into Maa and then returns for a third time to feed their work back to the family. Once the family has

considered, amended and verified the accuracy of the work, a copy of the final version of the story, translated into the appropriate language (in this case Maa) and including photographs, is given to the family to keep. A factor that distinguishes the method from classic rural appraisal and academic research techniques is that from the outset it is made clear to the family that the portrait belongs to the family. The method was developed primarily as a development tool, intended to promote analysis within families and communities and to engender ownership of both the analysis and its outcomes. Any further use of the portrait must be agreed by the family members, who may decide that portions of the portrait should remain confidential.<sup>2</sup>

The final stage in the process involves feeding back a number of family portraits to the community as a whole. This is an opportunity for the community to verify whether the experience of the families concerned is representative of others in the community. The analysis and discussion of the portraits can help the community identify problems facing specific parts of the community or the community as a whole, and in some cases these findings challenge commonly stated assumptions and sticking points.

The selection of families is critical to the success of the process. The families concerned need to be prepared to discuss their livelihoods in some depth, and to be interested in owning their own story, if they are to take an active role in the process. The follow-up with communities tends to be more productive if the communities concerned are aware of the process and involved in the selection of families from the start (Cochrane et al., 2005). In this case, families from Longido, Mara, and Amboseli areas were selected in order to cover the following household types:

- Households representing different levels of wealth or poverty, according to their communities.
- Households located close to protected wildlife areas.
- Households that had an older head of household (60–70 years old) or a younger head of household (~40 years old).
- Households that illustrated any very significant differences in land tenure in the area. For example, in Amboseli and in Mara, households were selected from group ranches that had not been subdivided and from an area where land had already been subdivided.

In the case of Tarangire, only one family was selected for a formal family portrait. The second portrait presented in this book derives from semi-structured interviews conducted with the individual portrayed, his family, associates, and other observers.

## ***2.2.4 Institutional and Policy Analyses***

Policy chapters (8 and 9) and areas of policy and institutional analysis in individual case study chapters (e.g. Chap. 6: Longido) draw primarily on informal

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<sup>2</sup>In the case of this book, abridged versions were produced and the families revisited in 2007 to seek their consent for these versions to be published as they appear in the book.

semi-structured discussions and on formal village meetings with local community members. They also draw on informal discussions with other stakeholders (such as NGOs, private companies, and researchers), review of many unpublished documents from village and district levels of government, and attendance at various planning workshops concerning the area over a period of 5–10 years in each case (see e.g. Nelson, 2007). The historical/legal review for Tanzania contains a synthesis of the way that rights and power have been defined by wildlife management institutions over time and how those rights have changed in light of the community wildlife management narrative (see Chaps. 1, 8 and 9).

### **2.2.5 Participatory- and Action- Research**

The studies reported here were all linked into ILRI's DGIC-funded *Reto-o-reto* programme led by Robin Reid (then of ILRI; now of Colorado State University Center for Collaborative Conservation). That programme as a whole was predicated on the fundamental importance of two-way communication and engagement in development-related research. It was particularly aware of the problems of outsider formulation of priority research issues, results, and conclusions, and the potential bias and lack of relevance to local priorities that such approaches can entail. As part of the *Reto-o-reto* programme, skilled local facilitators were active in two-way engagement, and researchers attended frequent, lively meetings in each site with local stakeholders, formulating research issues, testing preliminary findings, and facilitating exchanges of insights and understanding. Those meetings were inevitably political as much as scientific. Without claiming to be expert observers, facilitators or analysts of such processes, the researchers contributing to this volume learnt from their involvement, and that learning process has contributed to the insights that shape our findings.

## **2.3 Characterizing Livelihood Strategies**

### **2.3.1 Identifying Groups of Pastoralists with Similar Livelihood Strategies**

Previous sections have set out the full range of common variables on which quantitative data were collected for each of the five main study areas. The present section looks at how these data were analyzed and integrated to tackle the central research questions.

People across Maasailand are operating in a complex social, economic, and policy environment that is constantly changing. Past studies have established considerable knowledge of qualitative patterns from social, cultural, historical, and

political points of view (see Chap. 1). However, those well-established, qualitative works have left open some running debates, not least over issues of perceived land degradation, and over the role of wildlife conservation in local development. Maasai households are well documented as diversifying the range of activities in which they are involved (Thompson and Homewood, 2002; Kristjanson et al., 2002; Brockington, 2001). This book seeks to understand Maasai livelihoods, and in particular the economic drivers underlying household decisions to diversify, particularly in ways that may be on the one hand compatible with, and in other cases conflicting with wildlife conservation. For the purposes of this study, we wanted to compare livelihood diversification across, as well as within, different sites, and to look at economic drivers and correlates at household level. We sought a method of analysis that would allow us to characterize in an objective way the range of livelihood strategies that pastoralists are involved in, that is, to identify relatively homogenous categories or groups of households engaged in similar economic activities/livelihood strategies.

One of the statistical techniques available for doing this is cluster analysis. Cluster analysis classifies a set of observations into two or more mutually exclusive *unknown* groups based on combinations of interval variables. The purpose of cluster analysis is to discover a system of organizing observations, in this case households, into groups where members of the groups share properties in common. It is cognitively easier for people to predict behaviour or properties of people or objects based on group membership, all of whom share similar properties. It is generally cognitively difficult to deal with a multitude of individuals and to predict behaviour or properties based on observations of the full, ungrouped range of variability in other behaviours or properties.

Each study needed a common clustering method that could classify households on the basis of the range of livelihood activities. As preliminary steps we tried a range of clustering methods, and experimented with the use of principal components as a procedure prior to cluster analysis to reduce collinearity in the selected variables. In most cases, we could not achieve a level of cluster segregation yielding clear groups of pastoralist livelihood strategies. To achieve greater separation between the clusters, we then decided to treat the livelihood options as binary variables (e.g. engaged in cropping: yes/no) because this reflected more closely questions as to what the diversification strategies are, independent of the level of investment or return in each activity (e.g. number of hectares of cropping). For doing this, we used the statistical procedures available in the SAS software (SAS Institute 2002, version 9.1).

The CLUSTER procedure in SAS finds hierarchical clusters of the observations in a data set. The data can be coordinates or distances. To perform a non-parametric cluster analysis on binary data (non-Euclidean distances), we use the DISTANCE procedure. This procedure can produce an appropriate distance data that can then be used set as input to PROC CLUSTER. The DISTANCE procedure computes various measures of distance, dissimilarity, or similarity between the observations of a SAS data set. These proximity measures are stored as a lower triangular matrix or a square matrix in an output data set that can then be used as input to the



CLUSTER procedure. The input data set contains asymmetric binary variables, of which the two possible outcomes: 1 (positive/present) or 0 (negative/absent) are not equally important. The most important outcome is coded as 1 (present) and the other is coded as 0 (absent). The agreement of two 1's (a present–present match or a positive match) is more significant than the agreement of two 0's (an absent–absent match or a negative match). If a variable is defined as an asymmetric nominal variable and two data units score the same but fall into the absent category, the absent–absent match is excluded from the computation of the proximity measure. The measure used to calculate the distances between the asymmetric binary variables is the JACCARD dissimilarity coefficient.

All clustering methods are based on the usual agglomerative hierarchical clustering procedure. Each observation begins in a cluster by itself. The two closest clusters are merged to form a new cluster that replaces the two old clusters. Merging of the two closest clusters is repeated until only one cluster is left. The various clustering methods differ in how the distance between two clusters is computed. In Ward's minimum-variance method, a common clustering method used for classifying household data, the distance between two clusters is the *ANOVA* sum of squares between the two clusters added up over all the variables. At each generation, the within-cluster sum of squares is minimized over all partitions obtainable by merging two clusters from the previous generation. The sums of squares are easier to interpret when they are divided by the total sum of squares to give proportions of variance (squared semi-partial correlations). Ward's method joins clusters to maximize the likelihood at each level of the hierarchy under the following assumptions:

- multivariate normal mixture
- equal spherical covariance matrices
- equal sampling probabilities

Ward's method tends to join clusters with a small number of observations, and it is strongly biased towards producing clusters with roughly the same number of observations. It is also very sensitive to outliers. One of the decisions facing the investigator is the choice of level (and therefore number) of clusters appropriate to show statistically significant and inherently meaningful categories in any given analysis. Pseudo-*F* and pseudo-*T* statistics were used here to select the appropriate number of clusters.

Clustering has been used in a range of studies for characterizing households in studies of mixed crop-livestock systems (Solano et al., 2001, 2003; Waithaka et al., 2003; Baltenweck et al., 2003) and pastoral studies (Thompson et al., 2002; Williams, 1994).

It is a technique that has well-recognized limitations. For example, the clusters selected may lack mutual exclusivity; there may be wide ranges in levels of the variables selected (e.g. someone with 50 cows could be in the same cluster as one with 1,000 cows); the clusters reflect statistical groupings, which may not represent the way people group systems on the ground; choosing the number of clusters sometimes involves subjective decisions. Nevertheless, we found that using non-parametric binary clustering techniques for representing livelihood choices provided an improvement over methods using continuous variables. Non-parametric binary clustering



techniques gave us a useful tool for tackling the range and fluidity of different activities contributing to multi-stranded livelihoods.

### 2.3.2 *Variables Representing Livelihood Strategies of Maasai Pastoralists*

Key to this clustering approach is the choice of factors or variables that provide the basis for the clustering. Unlike other pastoral studies, we chose not to group people *a priori* based solely on their assets or a wealth ranking. Instead, based upon discussions and consultations within the socio-economic team and key informants from the different pastoral systems, key variables that incorporated income, assets, and investment strategies were identified as factors critical to opportunities and subsequent choice of livelihood strategies in pastoral systems.

In the Amboseli, Kitengela, Mara, and Longido sites, households were clustered on the basis of what assets households have (land, labour, and capital), and what they are getting from those assets (income, food), or are doing with the income (purchasing livestock, off-land activities). The clusters were thus derived based on 11 or 12 asymmetric binary variables,<sup>3</sup> representing the different income-generating activities in the region, and on the presence/absence for each of the households of each of those activities.

- Livestock production (four binary variables)
  - Livestock owned
  - Income from livestock or livestock products
  - Livestock slaughtered
  - Livestock purchased.
- Agricultural production (three to four binary variables depending on site)
  - Cultivating lowland/upland (Amboseli, Longido);
  - Cultivating (Mara, Kitengela);
  - Crops harvested for household consumption
  - Crops sold
  - Income from land leasing for commercial cultivation (Mara)
- Income from a wildlife or conservation related activity (one binary variable)
  - Includes irregular sales of crafts to tourists, employment as a tour guide or park ranger, land-leasing programs or wildlife-related land rents).
- Off-farm income (three binary variables)
  - Income from *wage or salaried* position (e.g. permanent skilled employment such as teacher, or government employee, and casual, regular or irregular employment such as night watchman, labourer, herdsman or driver);

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<sup>3</sup>In Amboseli and Longido, cropping was differentiated as lowland or highland, whereas in the other sites only one cropping variable was defined.

- Income from *petty trade* (including regular or irregular small-scale sales of firewood, groceries such as tea, sugar and soap, honey, and hides);
- Income from *business* (including regular trading of livestock or hides; dealing in gems; shop or hotel owner; beer brewing, or artisan).
- Income from *remittances* not included as a binary variable as it was not available for all sites.

The clusters derived were based on binary data (yes or no to each livelihood component). Subsequent analysis of the value of income/assets/investment for each cluster was used to establish the extent to which wealth distribution is influenced by *what* people are doing. Analysis of variance of gross income generated through the different activities (the values of produce consumed as well as sold were included in calculations of gross income), as well as livestock holdings per household, frequently required log or inverse transformation of the variables due to skew in data distribution. All means were calculated using only those households involved in the activity, so as to compare the real returns for each activity. As a result, cluster means for the value of each activity do not include any zero values.

The Tarangire case study provides an exception to this method of analysis, depending on a complex and long-term wealth ranking categorization of households on which to compare economic diversification across the community.

## 2.4 Household Choice of Livelihood Strategy

Multinomial logistic regression analysis was used to identify which factors were influencing membership of households in the different clusters, equivalent to their choice of livelihood strategy (e.g. cropping, livestock, wildlife, off-land, and various combinations thereof). Cluster membership was used as the dependent variable. The independent variables varied slightly across sites to account for regional differences, and included:

- Spatial and geographic variables (NDVI measures, distances to the nearest all-weather road, primary school, dry season domestic water, national park/conservation area, major town and major livestock market, and population density),
- Household demographics (total household size measured in Adult Unit Equivalents (AU)<sup>4</sup> sex and age of household head, proportion of 5-16 year-olds in school, education level of household head, years resident in the area)
- Status of household head (Longido)
- Socio-economic variables (herd size, gross annual income)
- Number of off-farm activities
- Land size (Kitengela)

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<sup>4</sup>Adult equivalents are a system for expressing a group of people in terms of standard reference adult units, with respect to food or metabolic requirements. A reference adult is taken as an adult male: other categories are a fraction of that adult equivalent: Adult male = 1AE; adult female = 0.9AE; M/F 10–14 years = 0.9AE; M/F 5–9 years = 0.6AE; infant/child 2–4 years = 0.52AE (Homewood and Rogers, 1991; Sellen, 2003).

Multinomial logistic regression does not require that continuous variables are normally distributed and it can include categorical as well as continuous independent variables. The analysis does not follow the same rules of parsimony as standard linear regression, and multicollinearity reduces the stability of the model significantly. Selection of the variables to include in the model must therefore be carefully decided before the analysis, as all selected variables are then included within the model. Where factors were highly correlated, variables were selected based on the specifics of the model and the area concerned. For example, in Longido, distance to national park was highly correlated with distance to a major town, although the relationship was not linear. Longido is an important wildlife corridor and distance to the national parks does not correlate strongly with wildlife populations or the potential for damage to crops, therefore distance to major town was included in the model and distance to park was not. The same may not be the case in, for example, Amboseli.

The odds ratios generated by multinomial logistic regression show the relative likelihood of a household with a particular characteristic being allocated to a particular cluster, as opposed to the reference cluster. The reference cluster therefore needs to be selected for carefully. One method for selecting the reference cluster is simply to choose the largest cluster; another is to look for an extreme in terms of the central issue under study – in this case diversification. In Mara, earlier studies used pure pastoralists as the reference category (Thompson et al., 2002). In Kitengela, the reference cluster used was pastoral households with wildlife income. In Amboseli, diversified agropastoralists – the most diversified group of households, one of the richest clusters, and one of the largest – was used as the reference cluster basis for regression analyses. In the case of Longido, the least diversified pastoralist cluster (*undiversified pastoralists*) was chosen so as to identify factors that increased diversification away from the “traditional” model of Maasai pastoralism. Cluster analyses for Tarangire were not available in time for inclusion in the present volume.

## 2.5 Factors Influencing Income and Wealth Levels

Generalized linear regression analysis was used to delve further into the factors influencing income levels obtained from the different livelihood strategies and address the following research questions<sup>5</sup>:

- What factors help explain overall gross annual income levels?
- What factors help explain returns from livestock?
- What factors help explain returns from crops?
- What factors help explain returns from off-land activities?
- What are the determinants of per capita herd sizes?

For this, a series of regression analyses were performed for Mara, Amboseli, Kitengela, and Longido data, based on general linear models using STATA and

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<sup>5</sup>In Mara and Longido, this analysis was limited to examining factors influencing gross annual income according to available data.

SPSS. One advantage of using general linear models is that this method deals well with unbalanced design (since there were different numbers of observations in each category and in each variable that was included in the regressions). Prior to the analysis, data were checked for normality, and some variables were transformed where necessary (where, for example, they contained many zeros). The natural log transformations of some of the variables improved their distribution tremendously so they approximate to a near-normal distribution. These included the dependent variables and a few of the explanatory variables.

Total yearly income was used as the dependent variable in a generalized linear model, to analyze to what extent socio-economic household characteristics and biophysical environment variables help explain variations in family income levels. Total yearly income was defined as the income derived from milk sales, livestock sales, livestock gifts in, livestock slaughtered, crops consumed, crops sold, income from land rent, income from wage petty trade, businesses, and, where relevant, remittances from these various categories (Table 2.5).

Socio-economic variables used include the age of the head of household, number of reference adults in the household, and herd size (livestock equivalents, LE or Tropical livestock units, TLUs). Information on the education level of the head of household as well as his/her leadership position (none, minor, and major leadership position) were also included. Dummy variables were used to indicate whether the household owned land or not and cultivated or not. All variables were tested for multi-collinearity before the mixed model was constructed. In the Mara and Kitengela, SAS MIXED procedure was used to build the models to account for spatial autocorrelation patterns in the data. In Longido and Amboseli, models were likewise tested for spatial auto-correlation and heteroskedasticity using SPSS 12. Non-zero covariance among all of the observations in the dataset was modelled with different covariance structures, with or without nugget<sup>6</sup> effects.

## 2.6 Discussion

In summary, active collaboration between independent researchers over a 5-year period has allowed for a common cross-border comparative approach, focused on livelihoods, and based on cross-sectional survey data, with common variables, data collection methods, and data analysis across all sites. The household was chosen as the main decision-making unit and hence as the main unit of data collection and analysis. Quantitative and statistical analyses examine livelihoods, and those factors that shape them and are associated with their relative success or failure. Complementary methods, including long term participant observation and more

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<sup>6</sup>When a variogram is extrapolated back to zero distance, it may *not* approach zero variance. The amount by which the variance differs from zero (the constant) is known as the nugget effect. This term derives from mining geostatistics where nuggets literally exist. A pure nugget effect corresponds to the total absence of auto-correlation.

short term participatory work, were used to present the livelihoods material in the context of policy and institutions. And supporting data were gathered on a range of dimensions from historical through social and cultural to development studies on the one hand, and for wildlife trajectories on the other.

There are inevitably pros and cons to the overall methodology used. This section reviews the limitations, puts them in context and explores the measures employed to minimize their effects.

### ***2.6.1 Sustainable Livelihoods Framework***

Although not rigidly formulated within the sustainable livelihoods framework (SLF), all the studies in this volume use the concept of livelihoods, and of the different component dimensions of livelihoods, as a useful way of structuring understanding and analysis of the way people make their living and of the factors influencing their decisions over land use. Qualitative and quantitative data on livelihoods provide a basis for exploring everyday life in Maasailand and, by extrapolation, how it is changing (or staying the same), as well as for unpacking economic and other factors affecting land use decisions, conservation and development for Maasai in East African rangelands.

There are well-recognized limitations to the sustainable livelihoods approach. While offering a useful heuristic tool, it is hardly a grand unifying theory. The focus on cross-sectional data gives little basis for understanding the dynamics of people's lives and strategies, nor the scale of social and cultural factors' influence on people's choices. The concept of 'social capital' offers fewer insights than Sen's concept of entitlements (upon which the SLF draws). The livelihoods approach tends to lack historical and site-specific depth, generating 'thin' descriptions (see, by contrast, Anderson, 2002). It does not capture life cycle effects well (c.f. Chayanov, 1966), nor the long-term dynamics of livelihoods and their interplay with social and cultural institutions. It tends to focus primarily on datum line and threshold concepts of poverty, rather than fully embracing the different implications of structural and conjunctural poverty so salient in pastoralist systems (Iliffe, 1987; Anderson and Broch-Due, 1999; Little et al., 2008). Although it tends to centre on concepts of diversification as a major development trajectory, it may not deal adequately with the very heterogeneous nature of diversification, and particularly with the implications of fragmentation and downward spiral of livelihoods on the one hand, as against specialization, and development of investment portfolios on the other. It deals primarily with those open to sampling by household survey, which means missing absentee landowners who may be major players, as well as potentially missing the poorest – in Maasailand, the landless and stockless migrants, or dependents in patron households.

These potential weaknesses have been addressed in various ways in the case studies and analyses presented in this volume. While relying primarily on cross-sectional panel data, and on quantitative and statistical associations, at the expense

of pursuing more qualitative, dynamic, and historical insights, there is a significant body of expert historical, social, and cultural work, as well as ecological and biodiversity studies, on which all of these case studies have been able to draw. The research questions and questionnaire tools have been formulated on the basis of a combined understanding of that body of knowledge, as well as the interpretation of the results. In addition, in-depth, qualitative family portraits, as mini-ethnographies, go some way towards bridging the gulf between systematic quantitative survey and ‘thick descriptions’ based on more sensitive, long term, qualitative work.

### ***2.6.2 Evaluating Community-Based Conservation***

Given the importance of wildlife and conservation across Maasailand, researchers in this book were particularly concerned with documenting the nature, scale, and importance of wildlife conservation on Maasai livelihoods. Such impacts are diverse and have been measured in detail in a number of different ways, including land tenure issues, household economies, and land use, potential for benefit sharing, for example, from wildlife-based tourism, livestock health, and crop damage, and conflicts of interest, politics, and power.

However, the studies in this book were also concerned with avoiding some of the pitfalls associated with focusing entirely on conservation. Research that focuses directly on people’s attitudes and perceptions to conservation risk operating at face value, without taking sufficient note of the inequalities of power which are involved in developing country contexts, nor of the problems constraining discussion of sensitive issues in such a political context. While concerned with conservation issues in Maasailand, studies in this book took a broader focus on livelihoods issues, in order to provide a more balanced view than a direct focus on conservation impacts. Income and expenditure are in themselves potentially sensitive issues, but they are relatively neutral with respect to conservation impacts and conservation politics *per se*. To help frame questions over the impacts of conservation appropriately, it was important to be aware of the social, political, and economic context of different types of conservation initiatives and approaches, and of the ways those contexts can influence or seriously distort research findings.

### ***2.6.3 Potential for Statistical and Simulation Modelling***

Those interested primarily in social, cultural, and political dynamics may find this approach overly quantified and statistical. However, at the other end of the scale, the approach set out in this and subsequent chapters is open to the criticism that it has not gone far enough with the possibilities offered by available datasets on wildlife and habitat, nor with those offered by modelling techniques, particularly by simulating policy impacts in ways that offer the opportunity for nuanced policy decision

support. The case studies presented focus on comparing and contrasting actual returns to economic activities across all five sites, and teasing out the main factors associated with those returns. In doing so they have established some of the basic data necessary for others to pursue more sophisticated modelling exercises, both statistical modelling of associations between wildlife and economic outcomes (c.f. Homewood et al., 2001) and also simulation of development and conservation outcomes following on specific interventions. For example, Thornton et al. (2006) and Boone et al. (2006) build on BurnSilver's Amboseli data to model the implications of different ecological, economic, and development scenarios.

In spite of inevitable limitations to the scope of the study, the approach, and methodology make possible for the first time an in-depth understanding of the comparative micro-economics of pastoralist and agropastoralist households across a wide range of sites in Kenya and Tanzania Maasailand. They make available a cross-border and cross-site comparative analysis which allows the first comprehensive exploration of the full implications of rural development conditions in East African rangelands and of the role that wildlife plays within people's livelihoods. This work gives new insight into the superficially perverse land use decisions governing trajectories of change for people and wildlife in East African rangelands.

## References

- Anderson, D., 2002, *Eroding the Commons: The Politics of Ecology in Baringo, Kenya 1890–1968*. Oxford, UK: James Currey.
- Anderson, D., and Broch-Due, V., 1999, *The Poor Are Not Us*. Oxford, UK: James Currey.
- Baltenweck, I., Staal, S.J., Ibrahim, M., Manyong, V., Williams, T., Jabbar, M., Holmann, F., Patil, B., Herrero, M., Thornton, P., and de Wolff, T., 2003, SLP Project on Transregional Analysis of Crop-Livestock Systems. Level 1 Report: Broad dimensions of crop-livestock intensification and interaction across three continents. Nairobi, Kenya: ILRI.
- Boone, R., BurnSilver, S., and Thornton, P., 2006, Optimizing aspects of land use intensification in Southern Kajiado District, Kenya. Final Report to the International Livestock Research Institute, Nairobi, Kenya. Reto-o-Reto Project, DGIC, December 2006. Available at: [www.reto-o-reto.org](http://www.reto-o-reto.org)
- Brockington, D., 2001, Women's income and livelihood strategies of dispossessed pastoralists. The case of Mkomazi Game Reserve. *Human Ecology* 29, 307–338.
- BurnSilver, S., 2007, *Pathways of Continuity and Change: Diversification, Intensification and Mobility in Maasailand* Unpublished Ph.D. Thesis. Colorado State University.
- Chayanov, A.V., 1966, *The Theory of Peasant Economy*, Edited by D. Thorner, B. Kerblay, and R.E.F. Smith. Homewood, IL: Richard Irwin (American Economic Association).
- Coast, E., 2002, Maasai socio-economic conditions: cross-border comparison. *Human Ecology* 30(1), 79–105.
- Cochrane, K., Nkedianye, D., Partoip, E., Sumare, S., Kiruswa, S., Kaelo, D., Onetu, L., Nesele, M., Said, M., Homewood, K., Trench, P., Reid, R.S., and Herrero, M., 2005, Family fortunes: Analysis of changing livelihoods in Maasailand. Final Project Report ZC0275. Livestock Production Programme. UK: Department for International Development. 213 pp.
- Grandin, B., 1986, Land tenure, subdivision and residential change on a Maasai group ranch. *Bulletin of the Institute for Development Anthropology* 4(2), 9–13.
- Grandin, B., 1988, *Wealth Ranking in Smallholder Communities: A Field Manual*. Nottingham, UK: IT Publications.



- Herrero, M., Kristjanson, P., Radeny, M., Nkedianye, D., BurnSilver, S., Kamuaro, O., Reid, R., and Thornton, P.K., 2003, Identifying the information needs of decision-makers supporting Maasai pastoralists in Kenya. ILRI, University of Edinburgh and the Maasai pastoralist communities of Kajiado and Narok. Final Technical Report, Project ZC0196 – DfID Livestock Production Research Programme. Nairobi, Kenya: International Livestock Research Institute. 57 p.
- Homewood, K., 1992, Development and the ecology of Maasai food and nutrition. *Ecology of Food and Nutrition* 29, 61–80.
- Homewood, K., and Rogers, W., 1991, *Maasailand Ecology*. Cambridge, UK: Cambridge University Press.
- Homewood, K., Lambin, E.F., Coast, E., Kariuki, A., Kikula, I., Kivelia, J., Said, M., Serneels, S., and Thompson, M., 2001, Long-term changes in Serengeti-Mara wildebeest and land cover: Pastoralism, population or policies? *Proceedings of the National Academy Sciences* 98(22), 12544–12549.
- Homewood, K., Trench, P., Randall, S., Lynen, G., and Bishop, E., 2006, Livestock health and socio-economic impacts of veterinary intervention in Maasailand. *Agricultural Systems* 89, 248–271.
- IIED, 1995, Critical Reflections from Practice. PLA Notes Vol. 24. London: IIED.
- IIED, 2005, Family Portraits. Tool write-up by K. Cochrane, with inputs from S. Vermeulen, E. Morrison, and C. Hesse of IIED. The family portrait tool was originally developed by B. Thébaud. London: IIED.
- ILCA, 1981, *Introduction to the East African Range and Livestock Study*. Nairobi, Kenya: International Livestock Centre for Africa
- Illiffe, J., 1987, *The African Poor: A History*. New York: Cambridge University Press. African Studies Series.
- Kiwasiila, H., and Homewood, K., 1999, Appendix 1: PRA background. In: *Mkomazi: The Ecology, Biodiversity and Conservation of a Tanzanian Savanna*, Edited by M.J. Coe, N.C. McWilliam, G.N. Stone, and M. Packer. London: Royal Geographical Society (with the Institute of British Geographers). pp. 550–552.
- Kristjanson, P., Radeny, M., Nkedianye, D., Kruska, R., Reid, R., Gichohi, H., Atieno, F., and Sandford, R., 2002, *Valuing alternative land use options in the Kitengela wildlife dispersal area of Kenya*. ILRI Impact Assessment Series 10. Nairobi, Kenya: ILRI. 61 pp.
- Little, P., McPeak, J., Barrett C., and Kristjanson, P., 2008, Challenging stereotypes: The complexity of poverty in pastoral areas of East Africa. *Development and Change* 39(4), 585–609.
- May, A., 2002, *Unexpected migrations: Urban labour migration of rural youth and Maasai pastoralists*. Unpublished PhD thesis, University of Colorado.
- Nelson, F., 2007, Emergent or illusory? Community wildlife management in Tanzania. *Drylands Issue Paper* No. 146. London: International Institute for Environment and Development.
- Pratt, D., and Gwynne, M. (eds), 1977, *Rangeland Management and Ecology in East Africa*. London: Hodder and Stoughton.
- Sellen, D., 2003, Nutritional consequences of wealth differentials in East African pastoralists: The case of the Datoga of Northern Tanzania. *Human Ecology* 31(4), 529–570.
- Solano, C., León, H., Perez, E., and Herrero, M., 2001, Characterising objective profiles of Costa Rican dairy farmers. *Agricultural Systems* 67, 153–179.
- Solano, C., León, H., Perez, E., and Herrero, M., 2003, The role of personal information sources on the decision making process of Costa Rican dairy farmers. *Agricultural Systems* 76, 3–18.
- Spencer, P., 1988, *The Maasai of Matapato: Rituals of Rebellion*. Manchester, UK: Manchester University Press.
- Thébaud, B., 2004, *Le pastoralisme au Sahel – module d’animation et de formation*. Dakar, Senegal: ARED.
- Thompson, D.M., 2002, *Livestock, cultivation and tourism: Livelihood choices and conservation in Maasai Mara buffer zones*. Unpublished PhD thesis, Department of Anthropology, University of London.
- Thompson, D.M., Serneels, S., and Lambin, E.F., 2002, Land-use strategies in the Mara Ecosystem (Kenya): A spatial analysis linking socio-economic data with landscape variables. In: *Remote Sensing and GIS Applications for Linking People, Place and Policy*, Edited by S.J. Walsh and K.A. Crews-Meyer. Boston: Kluwer Academic Publishers.



- Thompson, M., and Homewood, K., 2002, Elites, entrepreneurs and exclusion in Maasailand. *Human Ecology* 30 (1), 107–138.
- Thornton, P., BurnSilver, S., Boone, R., and Galvin, K., 2006, Modeling the impacts of group ranch subdivision on agro-pastoral households in Kajiado, Kenya. *Agricultural Systems* 87, 331–356.
- Waithaka, M.M., Ouma, E.A., Kariri, J.M., Ikongo, D.O., Herrero, M., Thornton, P.K., Shepherd, K.D., 2003, Report on characterisation of Kilifi farmers. Nairobi, Kenya: PROSAM Project. International Livestock Research Institute. 21 pp.
- Williams, T., 1994, Identifying target groups for livestock improvement research: The classification of sedentary livestock producers in Western Niger. *Agricultural Systems* 46(2), 227–237.



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