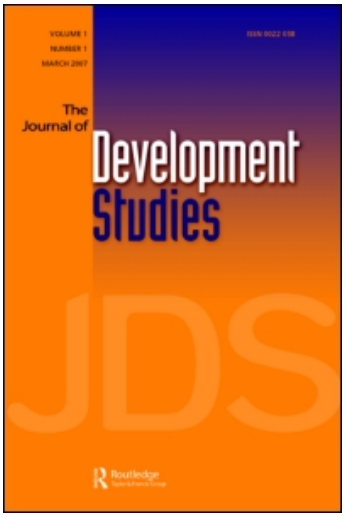

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Jonathan Davies[a]; Richard Bennett[a]
[a] The University of Reading, Reading, UK

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Livelihood Adaptation to Risk: Constraints and Opportunities for Pastoral Development in Ethiopia's Afar Region

JONATHAN DAVIES & RICHARD BENNETT
The University of Reading, Reading, UK

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ABSTRACT *Development policies in the pastoral areas of Africa assume that pastoralists are poor. Using the Afar pastoralists of Ethiopia as the focus of research this article challenges this depiction of pastoralism by exploring pastoral livelihood goals and traditional strategies for managing risk. Investment in social institutions to minimise the risk of outright destitution, sometimes at the cost of increased poverty, and significant manipulation of local markets enable the Afar to exploit a highly uncertain and marginal environment. Improved development assistance and enhanced targeting of the truly vulnerable within pastoral societies demands an acceptance that pastoral poverty is neither uniform nor universal.*

I. Introduction

This research on pastoral livelihoods in eastern Ethiopia describes how livelihoods are adapted to cope with uncertainty and how change can affect such adaptations. The paper presents the core elements of the livelihoods of Afar pastoralists, focuses on the vulnerability context in which their livelihoods are constructed, and examines the goals and aspirations of the people who are subject to that vulnerability. This paper explores the distinction between poverty and vulnerability and highlights potential inconsistencies between poverty reduction and vulnerability reduction strategies.

The term 'livelihood' describes the 'capabilities, assets (stores, resources, claims and access) and activities required for a means of living' (Chambers and Conway, 1992, pp. 7–8), drawing attention to the fact that it is not the availability of, so much as accessibility to, resources that determines poverty (Sen, 1981). The livelihoods approach has arisen from failures in socio-economic research, particularly the overt

Correspondence Address: Richard Bennett, Department of Agricultural and Food Economics, The University of Reading, PO Box 237, Reading RG6 6AR, UK. Email: r.m.bennett@rdg.ac.uk

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focus on income and consumption, or costs and benefits, and the failure to explore the indirect impacts of change, distribution and entry-barriers (Boyd et al., 1999).

The livelihoods approach puts people, particularly the poor, at the centre of development planning, which demands a recognition of their goals and aspirations. This in turn requires a sound knowledge of poverty and of what people lack when they are impoverished. This is particularly pertinent in the lowland areas of Ethiopia where pastoralists have survived for centuries in their rangeland environments through the development of complex livelihood strategies. A failure to understand how these strategies operate can allow policies to be adopted that will undermine existing survival mechanisms.

The Afar region of Ethiopia (see Figure 1) is one of the hottest inhabited places on earth, with temperatures exceeding 50°C and less than 200 mm rainfall per annum (Federal Democratic Republic of Ethiopia, 2000). The majority of Ethiopia's Afar (population 1,106,383[1]) follow a pastoral, transhumant lifestyle keeping multi-species, multi-purpose stock to provide sufficient milk and meat for consumption, social exchange and occasional sale (Getachew, 2001). They form a highly traditional society that has received less development attention than many comparable societies in Africa where traditional practices and institutions remain strong.

Nearly half of the African continent south of the Sahara desert is composed of arid or semi-arid grassland that is best suited to extensive livestock production (Cossins, 1983) and the least developed countries in Africa also turn out to be those with the

Figure 1. Map of Ethiopia by region

greatest proportions of pastoralists (Konczacki, 1978). However, pastoralism is highly diverse in terms of the type of stock reared, the level of self-sufficiency, the migration strategies followed, and exploitation of alternative livelihood strategies (Jahnke, 1982). Many pastoral societies follow a diverse range of economic activities based on a range of assets (McPeak and Barrett, 2001) which often blurs the distinction between pastoral and non-pastoral populations (Hogg, 1997).

An important pastoral commonality is the focus on livestock production for food provision and for the accumulation of social capital to insure against shocks, particularly drought (Widstrand, 1975). Reliance on milk enables many pastoral societies to maintain a degree of independence from sedentary, agricultural neighbours, although many pastoralists do not have sufficient animals to be 'purely pastoral' and have become increasingly dependent on grain as a part of their diet (Hogg, 1997). Nevertheless, pastoralists are able to exploit their remote and inhospitable natural resource base owing largely to their unique social adaptation, which is of fundamental importance to understanding their livelihoods (Kratli, 2001).

Development agents have long failed to understand the goals and strategies of pastoralists and have applied inappropriate theories of common resource mismanagement, supporting such claims with observations of widespread pasture degradation in the aftermath of severe droughts during the 1970s and 1980s (Warren, 1995). Misunderstanding has been compounded by distrust between central government and pastoral populations over the essential mobility of pastoralists, which has led to their steady marginalisation (Hogg, 1997). This distrust, exacerbated by the portrayal of pastoralists as reckless and irresponsible users of their own natural resources, has led to the promotion of settlement policies (Scoones, 1993).

Indeed, settlement of pastoralists, with associated cultural transformations, remains integral to Ethiopia's poverty reduction strategy to the extent that three of the four pastoral development strategies outlined in the PRSP are explicitly aimed at sedenterisation. The PRSP acknowledges the failure of top-down interventions in Ethiopia's pastoral areas, blaming the failure on unclear and inappropriate strategies for pastoral development, yet it outlines policy recommendations that will perpetuate those same strategies (Federal Democratic Republic of Ethiopia, 2002).

In recent years, there has been a growing acceptance of pastoralists as innovative and rational managers (Payne, 1990) and it is now widely agreed that pastoral populations aim to maximise the 'human support capacity' of their resource base through the production and consumption of milk. Development agents are realising that pastoral livestock should not be viewed as commodities for sale, but as primarily a means of food production with sale as a less remunerative secondary option (Behnke and Kerven, 1994). Yet despite this shift in understanding, many interventions still tend to focus on this secondary option, the sale of livestock, and fail to focus on the specific needs of pastoral people (Hodgson, 1999).

There remains an overriding view that pastoralists are poor and that pastoralism is in decline, perhaps tainted by the tendency to focus attention on pastoral areas during drought periods (Majok and Schwabe, 1996). There is a tendency to overlook the goals and aspirations of pastoralists (Zaal, 1998), and their ability as dynamic managers of risk (Roe et al., 1998), which is tantamount to ignoring their capacities and the resilience of their livelihoods.

The risks inherent in the pastoral production system are often understated, and examples of drought-induced livestock loss show that figures of between 35 per cent and 60 per cent are not uncommon, yet the rate of return from pastoral herds in good years is high (Livingstone, 1986). The risks to pastoralists may have changed in recent decades, due in particular to loss of valuable resource patches to agricultural projects, and the growing restriction in access to the natural resource base may now be the greatest challenge faced by Ethiopia's pastoral populations (Abdulkarim and Kibre, 2004). Nevertheless, traditional means of risk management remain, including herd management strategies and the maintenance of strong social bonds, based on livestock transfers and marriage (Jahnke, 1982).

The guarantee of a subsistence-minimum provided by the community is particularly evident in societies with a high degree of risk related to food supply, a concurrent demand for insurance and a willingness to pay for this during periods of glut (Posner, 1980). This can be thought of as a type of insurance that is enforced through social institutions of reciprocity and obligation, commonly referred to as social capital (Ellis, 2000), although of the kind that Putnam (2000) describes as 'bonding' (inward looking and cementing exclusivity and group homogeneity), rather than 'bridging' (outward looking, fostering external relations).

There is a lack of consensus regarding the value of social capital mechanisms for providing insurance, which may reflect different degrees of egalitarianism between pastoral societies (Toulmin, 1983) or different extents to which social capital mechanisms have weakened over recent years (Toulmin, 1995). However, the lack of consensus may equally stem from the fact that the different forms of social capital (bridging and bonding) are not interchangeable, manifest themselves very differently and do not always have positive external effects (Putnam, 2000).

Livestock marketing in pastoral areas contributes significantly to national economies, although it is often undervalued. In Ethiopia, 45 per cent of GDP is generated by the agricultural sector, a third of which is provided by livestock industries and much of this is vested in the pastoral areas, including 40 per cent of the country's cattle and 75 per cent of goats (Hogg, 1997). A significant recent change in all of Ethiopia's pastoral areas is the growth of livestock marketing and the growing vulnerability of pastoralists to volatile terms of trade (Helland, 1997).

Despite the prioritisation of milk for consumption within pastoral production systems, market access determines pastoral poverty to some extent (Barrett et al., 2002) and the sale of livestock assets could be facilitated through improved transportation, market chain regulation and more transparent price fixing (Sandford, 1983). Most pastoralists are dependent upon markets (Hogg, 1997) but they are often considered to act irrationally with regard to the marketplace because their dual goals, of subsistence and commercialisation, cannot be separated (Zaal, 1998).

Assets play a particularly important role in determining poverty (Ashley and Carney, 1999), reducing vulnerability by enabling a household to exploit available opportunities, reducing their sensitivity to shocks and increasing livelihood resilience (Moser, 1998). It is particularly necessary to differentiate the dynamic and multi-dimensional concept of vulnerability from the more static concept of poverty: although poor people are generally vulnerable, not all vulnerable people are poor. This distinction is necessary for shifting attention away from the constraints that the poor face and towards their capabilities (Moser, 1998).

The following section in this paper outlines the research methods used, Section III presents the key findings of the research, Section IV discusses the implications of these findings for pastoral development, and the concluding section presents policy considerations that emerge from the research.

II. Research Methods

It would be difficult to ascribe a typical livelihood to such a large population as the Afar, so this research relates specifically to a population living in three districts of central Afar, focusing mainly on uncultivable areas where the population is perforce 'purely pastoral'. Nevertheless, no prior assumptions were held regarding the option to engage in non-pastoral livelihood activities and this issue formed a central part of the qualitative research. The research was conducted prior to and during the 2002 'drought',[2] which was manifested by a poor short rainy season in early 2002 and poor and late main rains in mid 2002.

Research was conducted along a transect drawn north west for approximately 150 kilometres from the region's main market in Ayssaita, limited to the north due to security concerns: thus the research was focused on communities from the districts of Ayssaita, Elidaar and Dubti (see Figure 2). For quantitative survey, the transect was divided into four sections, targeting a minimum of 30 households in each sector, to ensure a good spatial distribution, and within each sector households were selected randomly. Despite the difficulties of access, all interviews were conducted *in situ* (rather than in the market places) in order to avoid bias.

A 'household' is difficult to define and can contain non-family members, or may be missing family members, but it is the unit of most intense social and economic interdependence; the term 'family' is more vague and can be extended over an indeterminate number of households. The household is therefore the appropriate unit of analysis for investigating livelihoods (Ellis, 1993). Interpretation of the term 'household' can be complicated in Afar because most households are headed by men who are usually polygamous and whose wives must each live in their own tent, so a 'household' can consist of more than one 'house'.

A number of research tools were used to gather data for this study: interviews with local leaders and key informants; focus group discussions (using participatory tools) with pastoralists; structured interviews of individual households; and price monitoring in key market centres. The interviews of key informants were informal and were designed to gather qualitative data on the general Afar context, the pastoral environment and the nature of Afar livelihood strategies. These interviews were particularly appropriate for investigating internal exchange issues and for identifying diverse livelihood strategies and non-pastoral activities.

Focus group discussions were primarily used for gathering quantitative data of the type that could not realistically be gathered through a formal survey-based approach, although extensive discussion of the responses also generated substantial qualitative data. A number of different participatory tools (Chambers, 1997) were developed or adapted for use with the focus groups, including wealth ranking, depiction of seasonal calendars and herd-profiling (distribution of sex and age in different herds according to wealth), and focus groups also provided data on herd productivity and on market conditions and constraints. The means of estimating

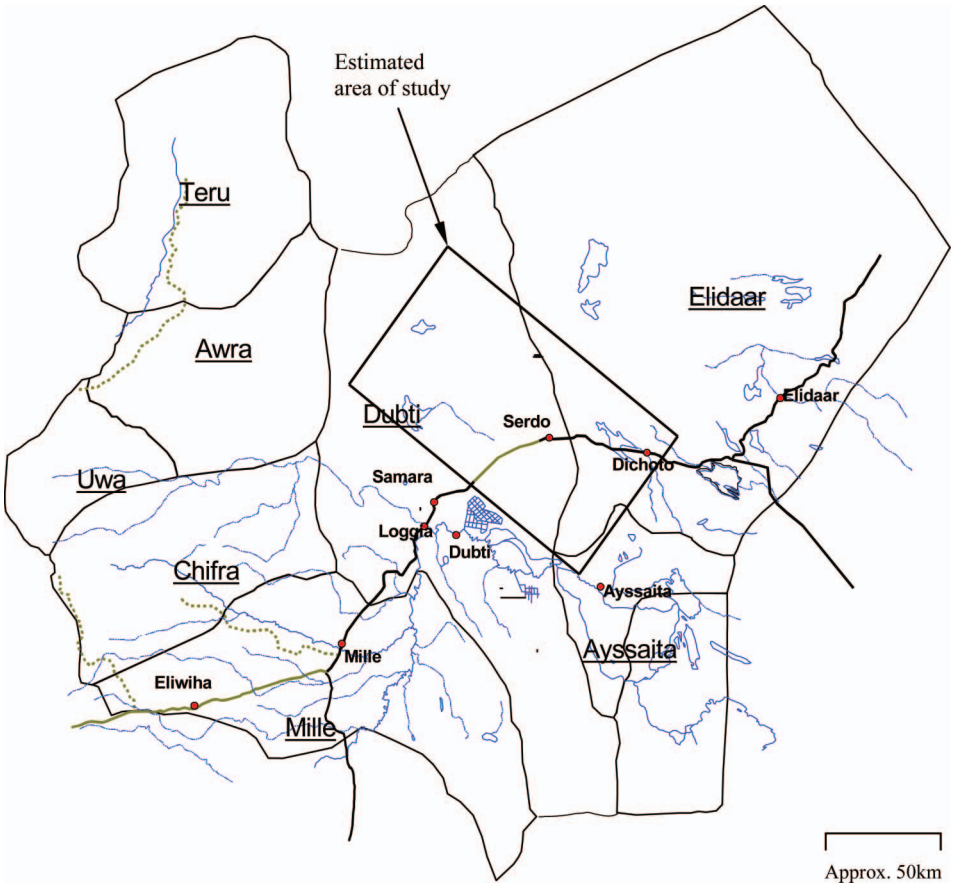

Figure 2. Map of central Afar with details of study area

herd sizes was formulated in consultation with local pastoral informants, who recommended focusing on ascertaining ownership of adult female stock, which is less changeable and over which individual ownership is more clearly defined. Overall herd sizes and milk productivity were estimated effectively from this data and compare very favourably with a wide range of data from other pastoral areas.

The formal surveys were used cautiously as early experience had indicated limitations of such invasive, mono-directional methods. The Afar have typically responded to questionnaire-based interviews with unrealistic responses and therefore these surveys were made as informal as possible by using trained local interlocutors and dispensing with check-sheets (the use of cassette recorders was particularly successful). The survey gathered data on marketing behaviour (frequency and volume of trade by season) according to household and herd characteristics. A formal approach was also used for weekly price monitoring (livestock and grain prices) in two formal and two informal market centres in the region.

III. Findings on Key Elements of the Afar Livelihood

Livelihood Assets in Afar

Focus group discussions revealed that Afars tend to judge wealth on two levels: by ownership of livestock and by support of the poor. When pushed to describe a rich or poor household, however, the respondents invariably described wealth in terms of livestock ownership, which generated categories of different wealth: >7.85 TLU[3] per capita for rich and <2.80 TLU per capita for poor. Survey data was thus categorised into wealth bands, as illustrated in Table 1, and means for each category were calculated thereafter. Mean wealth at the start of the year across the entire data set was 8.13 TLU per capita, which is above the minimum perception of 'rich'. The change in the proportion of households in each category as a result of drought (*ex post* population) is included at this point to illustrate the extent of fluctuation that Afars experience and to highlight the weakness in surveys that purport to show 'typical' livestock ownership in such regions.

A key determinant of wealth for many Afars is the accrual of debts and obligations that can be recalled during crisis. These are not bilateral obligations, but elaborate debts between multiple parties over many generations and 'repayment' does not have to be in kind. Services rendered, support provided or livestock gifted all act as routine 'payments' and 'repayments', defying quantification or measurement, and it is the regular, visible contribution according to one's means which ensures 'insurance premiums' are paid up. These social institutions are sometimes considered as a form of 'bonding' social capital (Putnam, 2000).

Participation in these social institutions is a quintessential part of being an Afar and failure to fully participate can lead to the withdrawal of goodwill over time, which presents the risk of outright destitution for the household. Afars claim to invest in these institutions for two reasons: because they believe they will receive help in return and because of social pressures. This participation is an indication of wealth in Afar and is an important aspiration for a pastoralist owing to the status and security that it confers.

Respondents considered the most important of these internal exchange mechanisms to be '*iribu*', through which households receive small numbers of stock to reconstruct their own herds after a shock. It is important to note that recipients do not get a replacement of their lost herds, but they typically receive enough stock and

Table 1. Livestock assets owned by wealth band

	Rich	Average	Poor
Mean household population	10	13	16
Ex ante livestock per household (TLU)*	127.9	65.6	29.6
Ex ante TLU per capita	13.4	5.35	1.76
Ex ante male stock (TLU)	20.43	6.22	1.83
Ex ante male TLU per capita	2.15	0.51	0.11
Ex ante population (%)	41	43	15
Ex post population (%)	7	33	60

Note: *1 TLU (tropical livestock unit) = 1 camel, 1.4 cattle, 10 goats, 10 sheep.

other support to survive as a pastoralist and to start rebuilding their herd. Although normally received from close relatives, this type of gift can also be sought from branches of the clan that normally live entirely separately (*Mela*). Regular donation of *iribu* to those in need increases a household's surety of receiving such support in return. Obtaining animals through *iribu* is seen as a right rather than as something to be begged for and participation is obligatory, enforced by community leaders who can impose harsh sanctions for refusal to cooperate.

Livestock are exchanged in many other ways in Afar society beyond *iribu*, including through bond-friendships (*'ala*) between entirely unrelated households and through less formalised actions such as providing animals for slaughter at community celebrations and ceremonies. Assistance during or after a crisis can also take different forms and, in addition to gifts of animals, a vulnerable household will be supported with shared food (cereal and milk) from neighbours, which respondents considered to be of particular importance in rebuilding livelihoods. These institutions are generally based on family and clan lineage, but they can be far-reaching and go beyond clan level in times of need.

Drought

Given the pre-eminence of livestock in their livelihoods, it is not surprising that Afars cite drought, collapse of livestock markets and livestock disease as the shocks to which they are particularly at risk. Drought takes many forms, however, and can describe a shortage (rather than complete absence) of rain, or merely the late arrival of the rains. Rainfall in the region is bi-modal and the failure of the main (*kharma*) rains between July and October is generally considered a drought; an event that may occur every four or five years. If the small (*sugum*) rains additionally fail the situation can become quite serious but a major drought, of the kind faced in 1984 and in 1977, typically come about when two consecutive *kharmas* fail.

After the 2002 drought, the majority of households shifted into the lower wealth bands and, although a few households remained relatively unscathed (Figure 3[4]), the mean loss during the drought was 59 per cent of all livestock units (standard deviation = 24). *Ex post*, 91 per cent of the population lies below the *ex ante* mean.

Using a Gini coefficient[5] (Sen, 1997) to compare the distribution of *ex ante* and *ex post* wealth, it appears that inequality rises as a result of the drought (Gini for *ex ante* wealth = 0.38, Gini for *ex post* wealth = 0.48), although the data in Figure 3 would suggest the opposite outcome. This apparent contradiction arises because the coefficient measures deviation from perfect equality and calculates the cumulative proportion of income earned by the cumulative proportion of the population. The *ex post* distribution therefore appears to be more inequitable due to the small number of 'outlying' households that remain in the highest wealth bands. The vast majority of the population is gathered into a tight cluster below 5TLU per capita, and thus, although across the population wealth is more unevenly distributed, the majority of household's could be described as having a greater homogeneity of wealth.

If redistribution mechanisms operate as reported then wealthier households should be expected to redistribute their stock amongst less fortunate households, resulting in a lower Gini coefficient after some time. Afars do not accord particular prestige to households that survive a drought with their herds intact and respondents

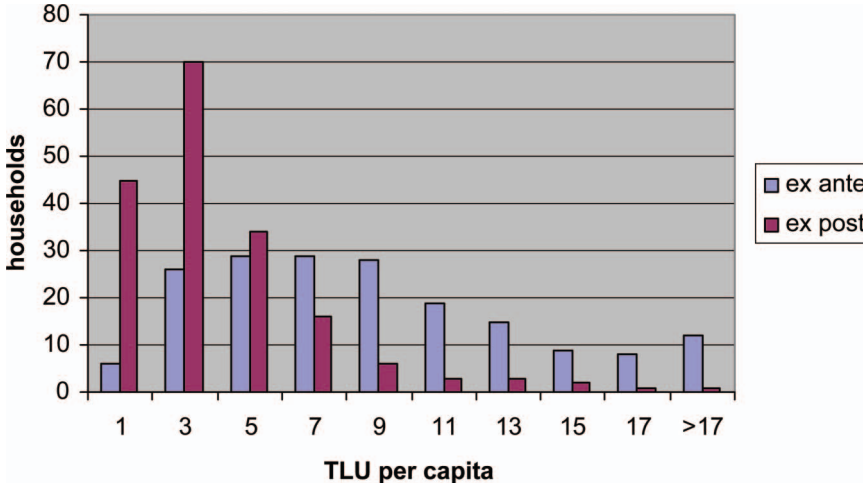

Figure 3. Distribution of household wealth before and after the 2002 drought

considered it to be a matter of luck, which encourages people to use their good fortune to insure against future hardship by supporting less fortunate households. If redistribution mechanisms were to fail it appears that stark inequity would arise in the immediate aftermath of the first drought.

Livestock Disease

The most severe catastrophes in Afar occur when drought is exacerbated by livestock epidemics which undermine traditional coping measures. Many livestock diseases are endemic to Afar and have a significant effect on food security and herd management. Management strategies are adapted to cope with parasitic diseases in particular, with migrations away from infested areas (notably dry season reserves where water reservoirs exist) during particularly bad seasons. Local research indicates 3.7 per cent losses to anthrax in an outbreak during 2000, when 73 per cent of all households were affected, and 2.8 per cent losses to contagious bovine pleuropneumonia later in the same year, when 50 per cent of all households were affected (Davies, 2001).

These figures may appear low when compared with the herd decimation that results from drought, but the combined impact of a whole gamut of diseases can be severe during drought periods when animals are already weakened and households can least sustain losses. The impact of disease is further heightened through productive losses owing to morbidity.

Markets

Markets are sparse in Afar and the study area, with a population of 117,000[6], is served by only one formal market (Ayssaita) and three informal markets (Loggia, Dubti and Dishoto). The formal market has greater availability of goods and it provides the only opportunity to sell large stock without trekking to neighbouring regions of Ethiopia, where security threats act as a major deterrent. However, for

many communities, visiting Ayssaita entails a roundtrip in excess of 300 km which limits the frequency of visits. Informal markets therefore play a key role in Afar livelihoods but they cater only for small stock, predominantly sold to restaurants that service the truck-trade along the Addis Ababa to Djibouti highway. The informality of these markets deters external traders (livestock buyers) from routinely operating there. Formal middlemen were not found in the area of study although, in a few cases, a particular community member would be entrusted by his peers to sell stock on their behalf.

A number of factors were reported to inhibit the sale of livestock and compromise Afar interests in the marketplace, and most of these are related to distance including:

- Weakening or loss of stock in transit.
- Costs of keeping transport camels.
- Labour demands of marketing.
- Lack of amenities for reconditioning the stock in the markets (water and fodder).
- High cost of subsistence whilst in the marketplace.
- The impossibility of return to the point of origin if stock is unsold.

Livestock sellers thus have considerable disadvantage in transactions, particularly during seasons of stress when the difficulties in completing transactions rapidly lead to further loss in value alongside the escalating costs of prolonged subsistence in the marketplace.

Livestock prices in Afar show substantial weekly variability but with a marked seasonal pattern. Figure 4 shows that male prices remain relatively stable during a good year (this data does not include the 2002 drought) and show no dry season slump, whereas female prices show the anticipated peak during the rainy season and slump during the dry season. This may indicate a drop in comparative female quality during the dry season or it may reflect a general preference for male stock, which is expressed more clearly during the season when supply outstrips demand.

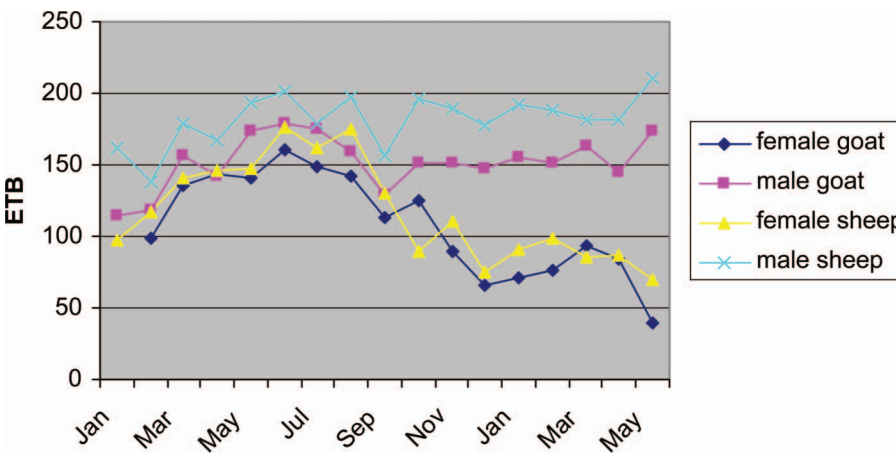

Figure 4. Small ruminant prices in Ayssaita market (2001–2002)

Maize, the cereal predominantly consumed in Afar, is produced within the region in an area south of the capital Ayssaita, but the lack of storage facilities leads to considerable export from the region after harvest and import of grain at other times when demand is high. Grain trade is controlled largely by highland merchants who speculate on demand around Ethiopia, but data was not available due to the reluctance of traders to discuss the issue and the lack of a regional Chamber of Commerce to monitor trade. Cereal prices in Afar follow the reverse pattern of female stock prices, peaking during the dry season and falling during the wet season. This applies to whole maize, which the Afar require most during the dry season, and does not apply to the maize flour consumed in the settlements, which shows marked seasonal price-constancy.

Livestock prices fell substantially during the 2002 drought, although male stock prices only fell by about the amount that female stock prices fell in the good year (between 50 per cent and 60 per cent), and maize prices rose in parallel by about 235 per cent. During the good year of 2001 terms of trade fluctuated between a high of 183 kg maize per goat to a low of 93 kg per goat (averaging around 133 kg per goat: see Figure 5). During the 2002 drought this dropped to approximately 14 kg maize per goat, or 10 per cent of the previous year mean.

Livelihood Strategies

Despite the importance of livestock products, most Afar households, including the wealthy, routinely consume maize, although it is common for those who migrate with stock to the furthest pastures (often the young men) to survive solely on milk during those periods. The splitting of households for the sake of livestock migration has implications for the assessment of poverty, particularly in times of crisis when women, children and the elderly may remain in one place whilst young men take the herds to seek pasture opportunistically. Milking livestock are usually left with the home unit, but in times of stress this is limited and the most vulnerable part of the household can face an increased risk of food insecurity.

Milk products are routinely consumed and contribute significantly, occasionally exclusively, to the Afar diet, but sale of livestock and butter to purchase grain is also

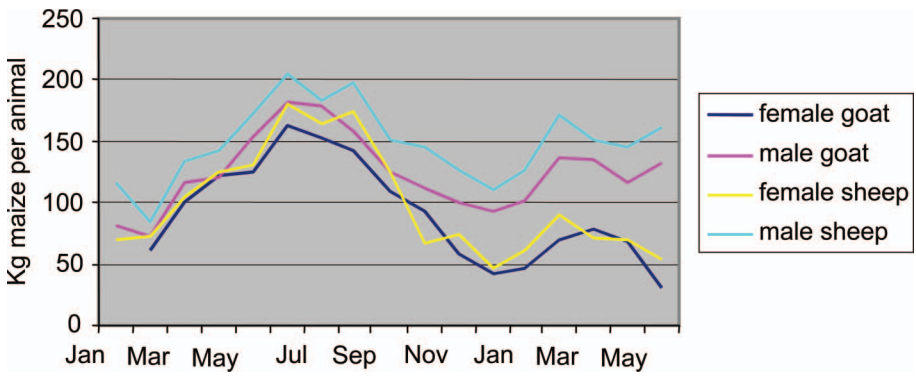

Figure 5. Terms of trade in Ayssaita market (2001–2002)

an essential part of the livelihood. Butter is produced when households have sufficient milk, particularly just after the rainy season when the household unit resides in one place and female labour is available for production. Labour plays a limiting role in both the collection of milk and the production of butter, but where both are adequate the production of butter is an important element of the Afar livelihood, providing a relatively liquid asset (compared to livestock) that is easily stored, readily saleable and is managed primarily by women.

Exchanges of livestock and livestock products are made both externally, to obtain essentials and luxuries from the marketplace, and internally, to invest in social institutions. In times of stress the short-term demands of the household, for food or medicine, may prevail regardless of the availability of surpluses, but this is not always the case and participation in social institutions continues even when the household is energy deficient. During drought, elders routinely ensure that livestock is distributed between households, with those doing comparatively better being obliged to provide stock to the worst off households.

A central feature of Afar social relations is the institution of *absuma*[7], a practice of cross-cousin marriage between affiliated clans. Through *absuma* Afars claim to have *de facto* rights in the male livestock of certain other households, in particular those of their maternal uncles, and this ease of access is central to the drought survival strategy of 'herd splitting'. The term conjures up an image of dividing stock amongst numerous parties who are migrating to different pastures, but in Afar the herds are not literally partitioned in this way. It is the rights to livestock which are divided amongst numerous herds and which effectively ensures that herds are permanently split.

Pastoral Income

Potential energy yields from milk have been estimated from data gathered through focus group exercises, involving calculation based on daily milk yields[8], lactation lengths and periodicity of births.[9] These figures are estimated for the year 2000, which was a good year following a period of strong herd growth. Household subsistence capacity is illustrated in Table 2 by comparing milk yields with

Table 2. Household potential milk energy income

	Rich	Average	Poor
Household size	10	13	16
Milking camels	20	8	4
Milking cattle	41	21	6
Milking Sheep/goats	86	66	55
Total potential milk income (l)	34,143	17,132	8,351
Total milk energy available (Mcal)	24.5	12.7	6.5
Annual energy available *per capita* (kcal)	2,458	978	407
Annual energy demand *per capita* (kcal)*	839.5	839.5	839.5
Energy available (%)	293	117	48

Note: *Latham (1979).

household energy demand. Rich and average households appear to have access to more milk (on average) during the course of the year than their immediate demands, although the average household lies close to 100 per cent sufficiency which, given the vagaries of seasonal production, means they would encounter insufficient milk during some months. For poor households average energy available from milk is less than 50 per cent of annual energy demand. Like all estimates of pastoral milk output, these figures are very broad means across a range of production scenarios.

Livestock asset growth (Table 3) is estimated from reproductive data gathered from focus groups, including birth intervals, reproductive life cycles and mortality rates. Assuming that half of the surviving young are female, these figures support a potential doubling of the reproductive camel unit in about eight years, the reproductive cattle unit in less than six years and the reproductive sheep/goat unit in less than three years, although such rates of growth assume zero sale of female stock.

The survey of marketing behaviour provided data on livestock sales, which is combined with seasonal means from the price survey to estimate cash generation in the study area (Table 4). Median figures are presented to avoid distortion by a small number of extreme outlying cases. Nevertheless, it is clear that significant livestock sales were made during the year and substantial cash income was generated.

Assuming that 1 kg maize provides 3600 kcal (Young, 1992) and per capita annual energy demand is 839,500 kcal *per annum* (Latham, 1979), the entire energy demand can be met with 233 kg maize per person. The maize price during the study period (again, prior to price collapse during the 2002 drought) ranged between 0.8 Ethiopian Birr ETB/kg and 2.0ETB/kg, averaging 1.3 ETB/kg. At the mean maize

Table 3. Household reproductive potential

	Rich	Average	Poor
Reproductive camels	20	8	4
Reproductive cattle	41	21	6
Reproductive sheep/goats	86	66	55
Surviving camel calves per year	5	2	1
Surviving cattle calves per year	15	8	2
Surviving lambs/kids per year	62	47	39

Table 4. Livestock sold

	Rich	Average	Poor
Household size	10	13	16
Female sheep/goats	8	13	14
Male sheep/goats	14	13	18
Female bovine	0	0	0
Male bovine	2	1	0
Female camel	0	0	0
Male camel	1	0	0
Per capita income (ETB*)	877	547	374

Note: *At time of survey the exchange rate was approx. 8.5 ETB per US$.

price the mean poor household produced a cash income in excess of its entire basic demand for energy and even at the maximum price for the year the income considerably exceeds that required to make up for the shortfall in milk, estimated previously.

Alternative Livelihood Activities

The Afar are highly specialised pastoralists who have access to very few alternative economic activities, although rangeland resources contribute to the livelihood in numerous ways and some activities, such as the weaving of grass mats and pots, have been expanded in the past to support the household during crises. For much of the time, and for the majority of households, pastoralism appears to provide an adequate income and even poor households on average have sufficient stock to meet their food energy requirements, generate surplus income and record herd growth. Nevertheless, this income is subject to great uncertainty, considering the vagaries of production, reproduction, disease and market conditions, even in a good year.

Agriculture is practiced in only a few pockets to the south of the study area, predominantly by highland settlers, and the majority of Afar is too arid to support cultivation. Linkages between pastoral and farming communities appear to be weak, tainted by perceptions of farmers as the descendants of non-Afar slaves. To the southwest of the study area a state cotton plantation irrigates large swathes of cultivable land and some Afar have found opportunities to grow maize (or in some cases, to demand rent) alongside this project, including some communities who were settled under the former communist government. Other than this, few opportunities exist for agriculture in the area and those Afars who have adopted agriculture lack support for creating or maintaining irrigation infrastructure and do not have access to training or agricultural equipment.

The other important livelihood options include salt production to the north of the study area and contraband trafficking and honey production to the east, but in all cases the opportunities are tightly controlled by certain clans and access is limited. However, despite the exclusivity of these activities, in most areas Afars can cite some source of income in previous times of crisis.

Few opportunities can be found for wage labour in Afar, although incidences of Afars seeking employment on construction projects suggest that attitudes to paid work may be changing, and wherever construction projects exist, Afar can be found to earn money in return for guaranteeing security. The fluidity of inter-household relationships has made it difficult to ascertain the true extent of internal labour exchange, but the temporary adoption of labour by rich households is commonplace in Afar. This has important implications for shifting labour to where the livestock resources are and it is typically Afar boys and young men who are supported in this way.

IV. Implications of Livelihood Adaptation to Risk

The livelihood of Afars in the region of study is highly influenced by and adapted towards the exploitation of their inhospitable rangeland environment. This primary natural resource is used communally, but is not always commonly owned, and

elaborate rules of private ownership and use rights exist, particularly regarding the resources that provide a dry season buffer in the form of permanent water sources and associated grazing areas. This rangeland resource is harvested through the use of livestock, which yield a range of benefits including fresh food, access to income, access to social safety nets and transportation, and the Afar livelihood strategy is typified by trade-offs that are made between these different options, bolstered by a small number of secondary options adopted in times of extreme stress. Livestock are therefore fundamental to Afar livelihoods and to understand Afar poverty and vulnerability requires an appreciation of how livestock are distributed and what their roles are.

Although this research uses livestock ownership as the indicator of wealth, it is the use of that stock, as much as the sheer number of stock owned, which Afars consider to confer wealth: in particular the use of livestock to support the poor. As a result, livestock continue to be given away even when a household does not have sufficient to meet its own immediate food needs. This also has implications for settled Afars, detached from the pastoral livelihood, who cite their inability to support visiting clan members as their greatest impoverishment. The focus on livestock in this research is not intended to deny the existence of other productive activities but to relegate their comparative prominence: in most cases, alternatives to livestock production are engaged in during times of extreme stress and are perceived as the means of survival whilst herds are rebuilt.

Many Afars have sufficient stock to be largely self-sufficient from their herds during non-crisis years and the regular sale of livestock at this time indicates that Afars consume maize even when milk is in abundance, despite the obvious impracticalities of transport and storage. Subsistence goals remain important but the exact contribution of milk to the Afar diet is unclear and may be inconsistent across the household as a result of seasonal labour divisions. Milk production is highly seasonal and even comparatively wealthy households anticipate shortages during the driest periods. The ability to produce butter enables Afar households to benefit from periodic gluts, although this is limited by human capital constraints (labour and also knowledge of new or improved processing techniques). Development agents should explore the opportunities for introducing labour-saving technologies for milk-processing to further capitalise on seasonal milk gluts.

There is significant market activity in Afar, which increases with wealth and is thus inconsistent with a society that aims for subsistence production, indicating a degree of commoditisation in Afar. Expenditure on least essential items, including Chat (a narcotic) and commercial sex, is considerable, which dispels the myth of a culture that exists outside the cash economy. Measurement of such expenditures is complex, but it is clear that substantial cash is generated beyond immediate food needs and in most cases it greatly exceeds that required to purchase grain. Market uncertainty and the difficulties of returning unsold animals may create a tendency to oversupply the market, generating short-term surpluses of cash, but there is little tendency to save cash in Afar.

The standard assumption that pastoralists sell animals during the dry season and conserve them during the wet (Perrier, 1995) is not generally borne out by this research, although total seasonal sales were marginally lower during the good rainy season of 2001. The high proportion of female stock sold during the year, when it was expected to find these stock being conserved for reproduction (Sandford, 1983),

further highlights the extent of commoditisation in Afar and reflects a tendency to reserve some higher-valued male stock during emergency in anticipation of increased demands for grain. Analysis of variance indicates that the total percentage of females sold varies significantly by season (f-statistic = 4.278) and during drought the proportion of females sold increased from 40 to 45 per cent.

Assuming that some Afars have periodic milk deficiency, the seasonality in terms of trade could be highly compromising to their livelihoods. At the average terms of trade even the poorest household has sufficient livestock to cover all food demands, through milk and cash income, but at the worst terms of trade this is not the case. There are many constraints to marketing in Afar, most of which relate to the distance of residence from the marketplace. These can be differentiated from the 'pure transaction costs' associated with information and uncertainty (Dorward, 1999). These factors have a significant influence on the income generated from livestock sales and are particularly serious during drought periods when buyers have greatest leverage, when competition to sell is high and when quality of stock is lowest.

Slow dissemination of market information and generally weak relations between Afar sellers and highland buyers generates high transaction costs, which are exacerbated by distance from the marketplace. There is evidence of Afars with Amharic language or numeracy skills being more frequently entrusted with selling livestock, which is consistent with Strasberg et al. (1999) observation that education and literacy can reduce transaction costs. Many Afars live at great distance from the market, entailing roundtrips measured in weeks rather than days. At such distances the imperative to generate adequate cash with each visit is great and uncertainty over prices thus leads to the tendency to greatly oversupply the market, which is compounded by the impossibility of returning home with unsold stock.

In addition to milk and monetary income, livestock ownership enables Afars to invest in the social institutions that are a prerequisite for exploiting their hostile environment. Although there are strong societal demands to participate in these institutions, Afars also invest explicitly and willingly to ensure their right to protection in the face of crisis. Such 'insurance' is for protection against outright destitution rather than loss of individual assets and it does not protect the household against poverty *per se*. The individual is not guaranteed replacement of lost stock, but instead it is assured of survival in the case of destruction of the livelihood.

Participation in social exchange mechanisms is obligatory in Afar and is described as a defining feature of the Afar way of life: to be an Afar *is* to participate in the exchange economy. Such a feature has ramifications for objective research in Afar where researchers risk being denied access to those who are not considered Afars because of a failure to participate in such intrinsically 'Afar' social networks. If there is a relationship between poverty and the failure to participate in these networks then there is a risk of inappropriate sampling and neglect of marginal parts of the community.

Following Putnam (2000) this paper maintains the distinction between 'bridging' and 'bonding' social capital, which is essential to understand the impact of social capital on transaction costs. Social capital is reported to facilitate integration into a market economy by facilitating business networks and reducing transaction costs (Dorward et al., 2003), but this refers to 'bridging' social capital, which is weak in

Afar. The 'bonding' social capital that Afars generate may be too internalised to benefit external trade and if anything it is more likely to compromise trade, through limitation of opportunism (Grootaert, 1998) or through exclusivity and downward levelling norms (Portes, 1998).

In case of failure of the pastoral livelihood, there are very few options for diversification in Afar and significant entry barriers exist, including the perception that such risk-reduction strategies come at too high a cost (Dercon, 2002). To engage in any activity that compromises mobility, such as agriculture, the household must entrust its stock to a related household, the price of which is the loss of all male offspring and milk to the custodian. Table 5 provides an estimation of the opportunity cost associated with crop cultivation.

Average maize yield in sub-Saharan Africa is around 1316 kg per hectare (International Institute of Tropical Agriculture, online). It is unlikely that yields in Afar come close to this mean, but even using this optimistic figure the cost of engaging in agriculture at the expense of pastoralism is equivalent to the maize yield from 0.25 hectares per cow owned and 0.1 hectare per ewe. Indeed, the value of a single bull calf, if kept till maturity, plus a single lactation's milk exceeds the value of maize produced from one hectare of cultivated land and, although this is the potential, rather than the mean, opportunity cost, as long as a poor household can expect support on a day to day basis from other community members, the incentive to keep herding stock is likely to massively outweigh the incentive to adopt agriculture.

Adoption of agriculture is further discouraged by the loss of opportunities for participating in social exchange mechanisms, which remains a livelihood priority even during periods of extreme hardship and at the cost of short-term poverty. Diversification could threaten Afar livelihoods by diverting labour away from activities that yield 'social capital' and directing resources towards more individually owned assets, raising the risk of destitution amongst the Afar. Poverty reduction strategies that promote livelihood diversity may therefore be incompatible with Afar livelihood goals and could feasibly raise the level of destitution in Afar.

The challenge lies in identifying livelihood diversifications that are complementary to pastoralism. Adoption of agriculture does not have to be an exclusive venture and opportunities for developing agro-pastoralism need to be examined. This requires a deeper understanding of land-access and traditional tenure systems, but agriculture is already practiced in some pockets of Afar, which provides opportunities for

Table 5. Market value of female livestock in male off take (Davies, 2004)

	Cattle	Sheep
Males per female per year[a]	0.24[b]	0.46[c]
Mean market value of surviving male offspring[d]	800 ETB[e]	170 ETB
Mean annual income per female from sale of male stock	190	79
Cost per quintal maize	65 ETB	65 ETB
Maize equivalent of male offspring per female per year	293 kg	121 kg

Note: [a]Mean number of males surviving to maturity per cow per year; [b]Figure for a healthy female, based on a calving rate of 0.9 and a mortality rate of 53%; [c]Figure for a healthy female, based on a lambing rate of 1.7 and a mortality rate of 55%; [d]Average for the years 2000–2001; [e]ETB = Ethiopian Birr. At the time of study 1US$ = 8.5 ETB.

developing a better understanding. To avoid the opportunity costs of lost livestock income, agriculture is likely to be more acceptable to households that have adequate labour for both herding and cultivation.

Access to cultivable land has not been explored in this paper but there are likely to be constraints over land access based on clan affiliation, which should be addressed. This applies equally to existing traditional labouring opportunities, most notably salt mining which is carried out only in certain areas to the north of the study area. Otherwise, labouring opportunities are scarce in Afar and non-seasonal employment presents the same opportunity costs as agriculture. Development agents in Afar should explore the seasonal opportunities for tapping pastoral labour, in particular during the dry season when cash needs are greater and household location is more defined.

Poverty in Afar is best described in terms of uncertainty, compounded by the dearth of alternative opportunities and supporting livelihood assets (such as infrastructure, human health and education) rather than through the use of finite measures of wealth. Indeed, measured during a good year, Afars do not appear to be particularly poor, but even in such times, when asset and income wealth can be high, the danger of livelihood failure is very high. This uncertainty is dictated by the environment, through drought and livestock disease, but can also be generated, and exacerbated, by the marketplace to which Afars turn during crises.

V. Conclusion

This paper challenges the prevailing assumption that pastoralists are generally poor, and illustrates how the measurement of income or assets during crises can lead to this misconception if the means by which pastoralists manage such shocks are not understood. Once the perception of pastoralists as poor-by-definition is dispelled, it becomes possible to consider the capacities that they have to manage their environment, which highlights important areas where development attention should be focused, and the needs of pastoral communities during shocks can be reconsidered so as to improve the impact and sensitivity of emergency assistance.

Of paramount importance is the acknowledgment that Afars are experienced and habitual livestock sellers who are nevertheless at the mercy of unregulated, undeveloped markets. It can no longer be argued that Afars live outside the cash economy or are unable to pay for services, and development interventions should be designed accordingly. Market interventions remain an obvious area for attention, but should focus on reducing the pure and associated costs of transaction to improve the bargaining power of the livestock sellers, through improved facilities in the marketplace, such as water and fodder supply, and better price certainty for livestock and grain. Price certainty can be improved through dissemination of price information or through increased price stability, particularly during crisis periods, although stabilising livestock prices at such times when body condition is rapidly deteriorating may be unfeasible. Stabilising grain prices, however, may be more achievable, either through legislated or subsidised price levels or through the development of grain banking and storage facilities. Such interventions will improve the terms of trade captured by Afars in times of crisis, will facilitate livestock marketing and will remove an important element of risk from the Afar livelihood.

The Afar livelihood is highly adapted to manage risk and social exchange mechanisms are integral to this adaptation. Breakdown of these institutions will compromise pastoralism through the undermining of traditional herding strategies and will reduce the effectiveness of insurance, creating an increased risk of destitution. Policy makers would be well advised to reconsider the value of these internal exchange mechanisms and recognise the damage that will be caused by their destruction. Pastoral development policies should be designed to enhance the Afar's ability to engage in these exchanges and should also examine the cost of providing viable, competitive alternative forms of insurance.

Development interventions should aim to benefit from the social exchange mechanisms and reinforce rather than undermine them, particularly through greater participation of community decision makers in the targeting of assistance in order to generate community, rather than individual, ownership of interventions and to reduce the perception of aid as an opportunity for individual profit. To achieve this will require significant efforts to develop trust and partnership between communities and development agents.

Diversification, which can strengthen rural livelihoods by spreading risk, may have the opposite impact if it undermines or substitutes the primary livelihood activity of pastoralism. Agriculture may provide a temporary alternative to pastoralism immediately after a crisis, but in the mid- to long-term the associated costs appear too great to bear and attention should be focused on activities that are more compatible with pastoralism. If agriculture is the only significant livelihood alternative in Afar then the scale of such interventions must take into account the opportunity costs that need to be offset. Gender roles in Afar are of great significance for the adoption of diverse livelihood strategies given the periodic splitting of households into migratory (male dominated) groups and sedentary (female dominated) groups. Policies must address not only the specific needs of the latter during such periods, but also the opportunities for diversification that this separation offers.

These claims of resilience and non-universality of poverty in Afar should not detract from the very serious needs that arise during periods of crisis in the region, but attention should be focused on the true extent of vulnerability and the specific needs that this generates. Reduction of poverty may be secondary to the avoidance of destitution and Afars will tolerate a degree of poverty if it means a reduction in vulnerability. Poverty reduction interventions could conceivably raise vulnerability through destruction of social exchange mechanisms and could thus be rejected by the Afar. If such interventions are not rejected then there is a risk of increasing the level of wealth heterogeneity as has been seen in other pastoral populations that are further down the road of 'development'. It is therefore imperative that pastoral development focuses on building the capacity of pastoralists to meet their livelihood goals rather than imposing alternative goals that fail to respect the true nature of pastoral vulnerability.

Notes

1. Federal Democratic Republic of Ethiopia Office of Population and Housing Census Commission (1996).
2. This study makes no comment on the magnitude of the 2002 drought as no meteorological records for that period were obtained.

3. TLU = Tropical Livestock Unit. 1 camel = 1 TLU, 1 cow = 0.7 TLU, 1 sheep/goat = 0.1 TLU (Jahnke, 1982).
4. These data refer to the net reduction in livestock including mortality, sale and other losses.
5. Gini coefficient = $1 - \Sigma(Xi - Xj)\,(Yi + Yj)$
   where X = cumulative proportion of households
   Y = cumulative proportion of income
   i = particular income category
   j = preceding income category or i − 1
   The Gini coefficient is used to compare the distribution of *per capita* livestock wealth rather than income. The coefficient must lie between zero (indicating perfect equality) and one (perfect inequality).
6. Federal Democratic Republic of Ethiopia, Office of Population and Housing Census Commission (1996).
7. The exact nature of cross-cousin marriage in Afar is not entirely agreed upon by different sources. Barkat Daoud (1998) writes that a man marries his mother's brother's daughter, Cossins (1974) records that a man marries his mother's sister's daughter and Getachew (2001) considers marriage to be with a man's father's sister's daughter. The disagreement could reflect different practices from area to area in Afar.
8. Data was gathered on peak daily yields, decrease in yield over the course of the lactation and seasonal impact on milk outputs.
9. The estimates make no allowance for either labor constraints (manpower required to milk animals) or seasonality of production.

References

Abdulkarim, A. G. and Kibre, J. K. (2004) Improving pastoral welfare in ethiopia and the role of the Pastoral Affairs Standing Committee (PASC). Global Livestock Collaborative Research Support Programme, University of California, Davis.

Ashley, C. and Carney, D. (1999) *Sustainable Livelihoods: Lessons from Early Experience* (London: Department for International Development).

Barkat, D. S. (1998) *Etude du Marriage Absuma Afar; les enjeux pratiques de l'institution* (Lyon: Universite Lyon II).

Barrett, C. B. (2001) Livestock pricing and markets performance. Global Livestock Collaborative Research Support Programme, University of California, Davis.

Barrett, C. B., Blume, L. E., McPeak, J. G., Minten, B., Murithi, F., Okumu, B.N., Pell, A., Place, F., Randrianarisoa, J.C. and Rasambainarivo, J. (2002) Poverty traps and resource degradation. BASIS Policy Research Brief no. 6. USAID BASIS CRSP Project.

Behnke, R. H. and Kerven, C. (1994) Redesigning for risk: tracking and buffering environmental variability in Africa's rangelands. ODI Natural Resource Perspectives Number 1, November 1994. Overseas Development Institute, London.

Boyd, C., Blench, R., Bourn, D., Drake, L. and Stevenson, P. (1999) Reconciling interests among wildlife, livestock and people in eastern Africa: a sustainable livelihoods approach. ODI Natural Resource Perspectives Number 45, June 1999. Overseas Development Institute, London.

Chambers, R. (1997) *Whose Reality Counts? Putting the First Last* (London: Intermediate Technology Publications).

Chambers, R. and Conway, G. (1992) Sustainable rural livelihoods: practical concepts for the twenty-first century. IDS Discussion Paper 296, Institute of Development Studies, Brighton.

Cossins, N. J. (1983) *No Way to Live; A Study of the Afar Clans of North-east Rangelands*. Report to the Imperial Ethiopian Government Livestock and Meat Board, Addis Ababa, Ethiopia.

Cossins, N. J. (1983) Production strategies and pastoral man. Pastoral Systems Research in Sub-Saharan Africa. Proceedings of the IDRC/ILCA Workshop held at ILCA, Addis Ababa, Ethiopia, 21–24 March, 1983.

Davies, J. (2001) *Report on CBPP Vaccination Programme in Dubti Woreda* (Addis Ababa: Afar National Regional State. Action Contre la Faim).

Davies, J. (2004) The role of livestock in Afar pastoral livelihoods: capitalisation, commoditisation and obligation. PhD Thesis. Reading University, UK.

Dercon, S. (2002) Income risk, coping strategies, and safety nets, *The World Bank Research Observer* 17(2), pp. 141–66.

Dorward, A. (1999) A risk programming approach for analysing contractual choice in the presence of transaction costs, *European Review of Agricultural Economics*, 26(4), pp. 479–92.
Dorward, A., Poole, N., Morrison, J., Kydd, J. and Urey, I. (2003) Markets, institutions and technology: missing links in livelihoods analysis, *Development Policy Review*, 21(3), pp. 319–32.
Ellis, F. (1993) *Peasant Economics: Farm Households and Agrarian Development* (Cambridge: Cambridge University Press).
Ellis, F. (2000) *Rural Livelihoods and Diversity in Developing Countries* (Oxford: Oxford University Press).
Federal Democratic Republic of Ethiopia (2000) Meterological records for Dubti weather station. Central Statistical Authority, Addis Ababa.
Federal Democratic Republic of Ethiopia (2002) Ethiopia: Sustainable Development and Poverty Reduction Program (SDPRP). Annual Progress Report (2001/2002). Ministry of Finance and Economic Development, Addis Ababa, Ethiopia.
Federal Democratic Republic of Ethiopia Office of Population and Housing Census Commission (1996) Population and housing census of Ethiopia, Central Statistical Authority, Addis Ababa, Ethiopia.
Getachew, K. N. (2001) *Among the Pastoral Afar in Ethiopia: Tradition, Continuity and Socio-economic Change* (Utrecht: International Books).
Grootaert, C. (1998) Social capital: the missing link? *Social Capital Initiative*, Working Paper No. 3 (World Bank, Washington, D.C.).
Helland, J. (1997) Development interventions and pastoral dynamics in southern Ethiopia, in R. Hogg (ed.) *Pastoralists, Ethnicity and the State in Ethiopia*, pp. 55–81 (London, Haan Publishing).
Hodgson, D. L. (1999) Images and interventions: the problems of pastoralist development, in D. M. Anderson and V. Broch-Due (eds) *The Poor are Not Us*, pp. 221–39 (Oxford: James Currey).
Hogg, R. (1997) *Pastoralists, Ethnicity and the State in Ethiopia* (London: Haan Publishing).
International Institute of Tropical Agriculture (online) www.iita.org/crop/maize.htm
Jahnke, H. E. (1982) *Livestock Production Systems and Livestock Development in Tropical Africa* (Kiel: Kieler Wissenschaftsverlag Vauk).
Konczacki, Z. A. (1978) *The Economics of Pastoralism: A Case Study of Sub-Saharan Africa* (London: Frank Cass).
Kratli, S. (2001) Educating nomadic herders out of poverty? Culture, education and pastoral livelihood in Turkana and Karamoja. Institute of Development Studies, Sussex for the World Bank.
Latham, M. C. (1979) *Human Nutrition in Tropical Africa: A Textbook for Health Workers with Special Reference to Community Health Problems in East Africa* (Rome: Food and Agriculture Organisation).
Livingstone, I. (1986) The common property problem and pastoralist economic behaviour, *Journal of Development Studies*, 23, pp. 5–19.
Majok, A. A. and Schwabe, C. W. (1996) *Development Among Africa's Migratory Pastoralists* (Westport: Bergin and Garvey).
McPeak, J. G. and Barrett, C. B. (2001) Differential risk exposure and stochastic poverty traps among east African pastoralists, *American Journal of Agricultural Economics*, 83(3), pp. 674–9.
Moser, C. O. N. (1998) The asset vulnerability framework: reassessing urban poverty reduction strategies, *World Development*, 26(1), pp. 1–19.
Payne, W. J. A. (1990) *An Introduction to Animal Husbandry in the Tropics* (London: Longman Scientific and Technical).
Perrier, G. (1995) New directions in range management planning in Africa, in I. Scoones (ed.) *Living With Uncertainty*, pp. 47–57 (London: International Institute for Environment and Development).
Portes, A. (1998) Social capital: its origins and applications in modern sociology, *Annual Review of Sociology*, 24, pp. 1–24.
Posner, R. A. (1980) Anthropology and economics, *Journal of Political Economy*, 88(3), pp. 608–17.
Putnam, R. D. (2000) *Bowling Alone: The Collapse and Revival of American Community* (New York: Simon Schuster).
Roe, E., Huntsinger, L. and Labnow, K. (1998) High reliability pastoralism, *Journal of Arid Environments*, 39, pp. 39–55.
Sandford, S. (1983) *Management of Pastoral Development in the Third World* (Chichester: John Wiley).
Sandford, S. (1995) Improving the efficiency of opportunism: new directions for pastoral development, in I. Scoones (ed.) *Living With Uncertainty*, pp. 174–82 (London: International Institute for Environment and Development).

Scoones, I. (1993) Why are there so many animals? Cattle population dynamics in the communal areas of Zimbabwe, in R. H. Behnke, I. Scoones and C. Kerven (eds) *Range Ecology at Disequilibrium*, pp. 62–76 (London: Overseas Development Institute).

Sen, A. (1981) *Poverty and Famines: An Essay on Entitlements and Deprivation* (Oxford: Clarendon Press).

Sen, A. (1997) *On Economic Inequality* (Oxford: Clarendon Press).

Strasberg, P.J., Jayne, T.S., Yamano, T., Nyoro, J., Karanja, D. and Strauss, J. (1999) Effects of agricultural commercialization on food crop input use and productivity in Kenya. Food Security II Policy Synthesis Number 41 for Global Bureau, Office of Agriculture and Food Security, USAID, Washington.

Taffesse, S., Aboye, C., Goitom, L., Tsegaye, T., Endeshaw, T. and Mohammed, H. (2000) *Report on Health and Nutrition Assessment in three Woredas of the Afar Region* (Addis Ababa: Ethiopian Health and Nutrition Research Institute andDutch Interchurch Aid).

Toulmin, C. (1983) Economic behaviour among livestock-keeping peoples: a review of the literature on the economics of pastoral production in the semi-arid zones of Africa. Development studies occasional paper, No. 25. School of Development Studies, UEA, Norwich.

Toulmin, C. (1995) Tracking through drought: options for destocking and restocking, in I. Scoones (ed.) *Living With Uncertainty*, pp. 95–115 (London: International Institute for Environment and Development).

Warren, A. (1995) Changing understandings of African pastoralism and the nature of environmental paradigms, *Transcripts of the Institute of British Geographers*, 20, pp. 193–203.

Widstrand, C. G. (1975) The rationale of nomad economy, *Ambio*, IV(4), pp. 146–53.

Young, H. (1992) *Food Scarcity and Famine: Assessment and Response* (Oxford: Oxfam).

Zaal, A. F. M. (1998) Pastoralism in a global age. Livestock marketing and pastoral commercial activities in Kenya and Burkina Faso. PhD Thesis (Cum Laude). Thela Thesis, Amsterdam.