AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
http://ageconsearch.umn.edu
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

WP 2005-11
November 2004

Working Paper

Department of Applied Economics and Management
Cornell University, Ithaca, New York 14853-7801 USA

Household-Level Livestock Marketing Behavior Among Northern Kenyan and Southern Ethiopian Pastoralists

Christopher B. Barrett, Marc F. Bellemare, and Sharon M. Osterloh

It is the Policy of Cornell University actively to support equality of educational and employment opportunity. No person shall be denied admission to any educational program or activity or be denied employment on the basis of any legally prohibited discrimination involving, but not limited to, such factors as race, color, creed, religion, national or ethnic origin, sex, age or handicap. The University is committed to the maintenance of affirmative action programs which will assure the continuation of such equality of opportunity.

Household-Level Livestock Marketing Behavior Among Northern Kenyan and Southern Ethiopian Pastoralists

Christopher B. Barrett, Marc F. Bellemare and Sharon M. Osterloh

Cornell University

November 2004

Authors listed in alphabetical order, with no assignment of seniority of authorship. Correspondence should be directed to Barrett at 315 Warren Hall, Cornell University, Ithaca, NY 14853-7801 USA, tel: 607-255-4489, email: cbb2@cornell.edu. We thank Abdillahi Aboud, Francis Chabari, Layne Coppock, Solomon Desta, Michael Fleisher, Getachew Gebru, Garth Holloway, Robert Kaitho, Peter Little, Winnie Luseno, Hussein Mahmoud, John McPeak, Kevin Smith, Jerry Stuth and Amare Teklu Yirbecho for helpful discussions and comments, our field enumerators and, especially, the survey households for their generous sharing of time and information, and the International Livestock Research Institute for hospitality. This research was funded by support to the Global Livestock Collaborative Research Support Program (GL CRSP) from the Office of Agriculture and Food Security, Global Bureau, USAID, under grant number DAN-1328-G-00-0046-00. The views expressed here are those of the authors and do not represent any official agency.

© Copyright 2004 by the authors. All rights reserved. Readers may make verbatim copies of this document for non-commercial purposes by any means, provided that this copyright notice appears on all such copies.

I. Introduction

Pastoralists in East Africa's arid and semi-arid lands (ASAL) regularly confront climatic shocks triggering massive herd die-offs and loss of scarce wealth. On the surface, it appears puzzling that pastoralists do not make extensive use of livestock markets to offload animals when climatic shocks temporarily reduce the carrying capacity of local rangelands, and then use markets to restock their herds when local conditions recover. In recent years, donors and policy makers have begun to hypothesize that investments in livestock marketing systems might quickly pay for themselves through reduced demand for relief aid,by increasing pastoralist marketing responsiveness to temporal variation in range conditions.

Such investments include information (*ex post* or forecasts) on climate or prices, reduced transactions costs and/or increased prices through transport subsidies, the improvement of roads, the creation of pastoralist marketing cooperatives, revision of cultural institutions that create complex property rights in animals, and the opening of financial institutions that might serve as safe repositories for livestock sales proceeds, etc. This chapter examines whether these hypotheses are valid and whether they would be effective should policies based on them be implemented.

This emphasis on livestock marketing as a means for managing risk may reflect, however, an insufficient understanding of the incentives pastoralists face and their long-term incentives to hold livestock. In a local economy offering negligible alternative livelihoods, livestock are the most attractive asset available (Desta 1999, McPeak forthcoming) and one of the best means to ensure future household food security. The highly nonlinear herd dynamics characteristic of poverty traps (Barrett et al. 2004, Lybbert et al. 2004, Barrett and McPeak forthcoming) , coupled with the observation that although livestock sales today increase current cash income and thus consumption, sales come at the cost of decreased future income and consumption (McPeak 2004), pastoralists might rationally maximize herd size and limit marketed off-take to animals needed to raise cash to meet immediate expenditure requirements.

This chapter aims to improve our understanding of the factors that affect pastoralists' marketed off-take response with a view to informing this ongoing policy debate. The next section briefly describes the data we use in the paper. Section III then explores particular hypotheses of interest regarding household livestock marketing behavior. Section IV concludes with some of the policy implications of these findings.

II. Data

We use data collected from pastoralist households in northern Kenya and southern Ethiopia by the USAID Global Livestock Collaborative Research Support Program (GL CRSP) Pastoralist Risk Management (PARIMA) project on a quarterly basis over a two-year period beginning in June 2000 and ending in June 2002. In June 2002, we supplemented the usual household-level survey instrument – which included detailed information on marketed off-take behavior and a wide range of other data on herd status – with a detailed module to gather more precise information on recent livestock marketing transactions. A total of 330 households were

randomly sampled from the 11 different sites depicted in Figure 1: six in northern Kenya (Dirib Gumbo, Kargi, Logologo, Ng'ambo, North Horr and Suguta Marmar and five in southern Ethiopia (Dida Hara, Dillo, Finchawa, Qorate and Wachille). The sites were chosen to capture variation in agricultural potential, market access, livestock mobility and ethnic diversity. As shown in Table 1, the study area encompassed approximately 124,000 km^2 and spanned several ethnic groups, including the Ariaal, Boran, Chamus, Gabra, Gurji, Rendille, and Samburu.

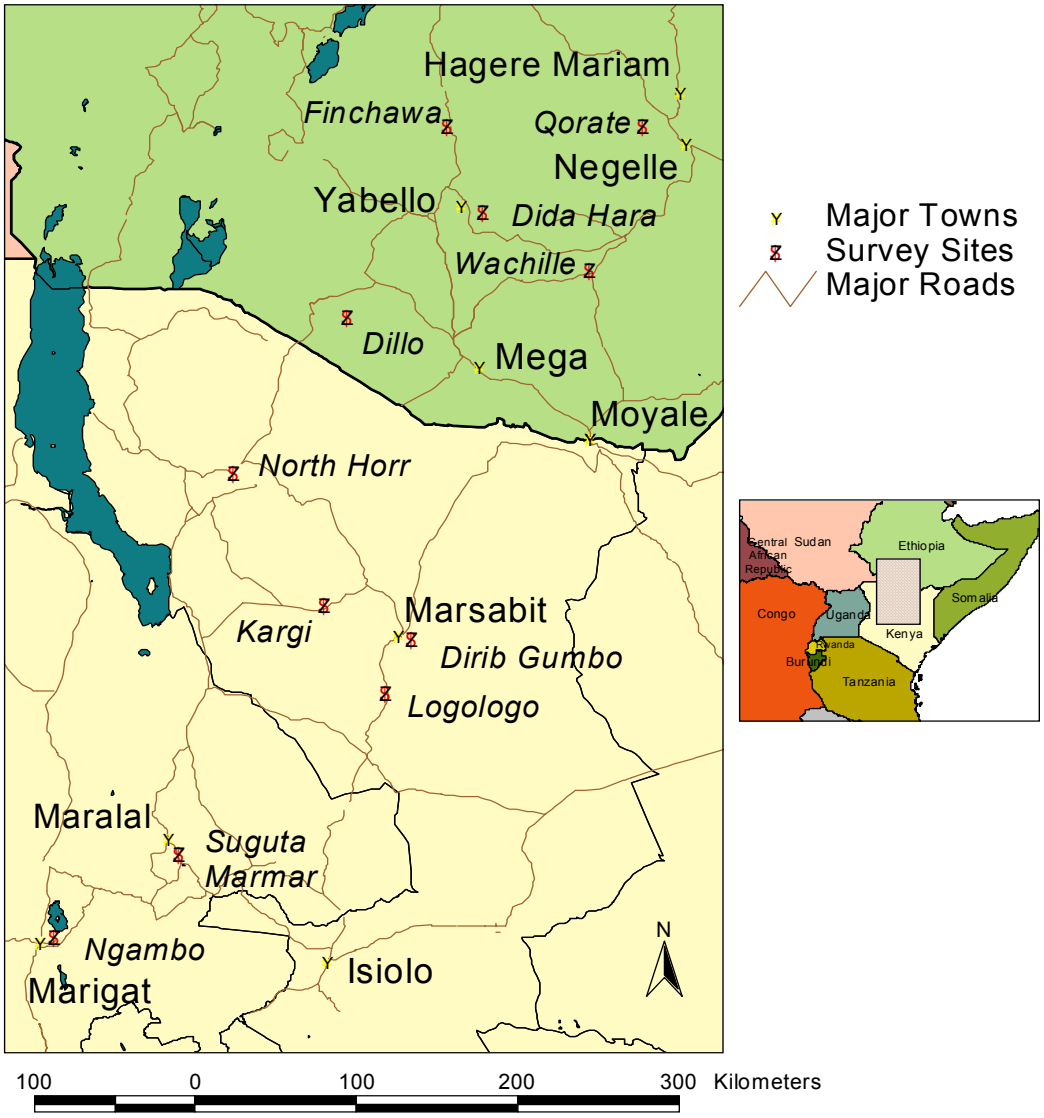


Figure 1: Survey Sites in Southern Ethiopia and Northern Kenya

Table 1: Site Descriptions

Country	Site Name	Market Access	Ethnic Majority	Agricultural Potential	Annual Rainfall
Kenya	Dirib Gombo	Medium	Boran	High	650
	Kargi	Low	Rendille	Low	200
	Logologo	Medium	Ariaal	Medium-Low	250
	Ng'ambo	High	Il Chamus	High	650
	North Horr	Low	Gabra	Low	150
	Sugata Marmar	High	Samburu	Medium	500
Ethiopia	Dida Hara	Medium	Boran	Medium	500
	Dillo	Low	Boran	Low	400
	Finchawa	High	Guji	High	650
	Qorate	Low	Boran	Low	450
	Wachille	Medium	Boran	Medium	550

III. Household Marketing Behavior: Some Hypotheses

These data permit us to explore several prospective explanations for household-level livestock marketing behavior. Each of these explanations carries implications for policymakers, donors and operational agencies concerned about the performance of livestock marketing systems and the welfare of pastoralist peoples in the region. Some of the implications conflict with those assumed by outside observers, highlighting the critical importance of looking carefully at the empirical evidence before proceeding with the design and implementation of policy.

A. Herd Size and Dependence on Livestock

Perhaps the first important results we find are that pastoralist households are far from autarkic and they do adjust their livestock market participation in response to drought shocks. Greater than nine out of ten pastoralist households in our sample used livestock markets at some point during the survey period, either to sell or buy animals. As seen in Table 2, market participation – defined as either purchasing or selling livestock on the market – varies over time, with fewer households participating in livestock trading during the June 2002 quarter[1] as opposed to June 2000, with the exception of Qorate. In response to one of the worst droughts in years, household demand for livestock marketing was especially high during our initial survey period. We find that most households participate in the livestock market and that they participate most actively when prompted by environmental stress, albeit almost entirely as sellers rather than buyers.

[1] Note that each survey captures a three-month interval, therefore participating in the market in June 2000 reflects either selling or buying livestock via the market at least once between April and June 2000.

Table 2: Percentage of HHs Participating in the Livestock Market, by Quarter and Site

	Jun-00	Sep-00	Dec-00	Mar-01	Jun-01	Sep-01	Dec-01	Mar-02	Jun-02	HHs Marketing Livestock during Survey Period
Dirib Gumbo	68%	42%	21%	19%	10%	26%	29%	19%	0%	97%
Kargi	70%	37%	40%	20%	47%	60%	28%	40%	33%	97%
Logo Logo	43%	47%	25%	37%	30%	13%	37%	7%	7%	87%
Ng'ambo	43%	40%	41%	43%	30%	13%	6%	6%	3%	87%
North Horr	53%	50%	54%	27%	67%	41%	45%	24%	17%	94%
Suguta Marmar	60%	40%	30%	40%	13%	33%	23%	47%	7%	90%
Kenya Weighted Avg	**56%**	**43%**	**35%**	**31%**	**33%**	**31%**	**28%**	**24%**	**11%**	**92%**
Dida Hara	57%	37%	23%	20%	23%	27%	39%	30%	37%	90%
Dillo	43%	33%	20%	23%	17%	17%	33%	33%	30%	87%
Finchawa	58%	48%	73%	45%	48%	32%	45%	10%	7%	100%
Qorate	13%	23%	0%	20%	20%	0%	23%	3%	33%	63%
Wachille	30%	37%	20%	43%	20%	20%	32%	33%	23%	93%
Ethiopia Weighted Avg	**40%**	**36%**	**27%**	**30%**	**26%**	**19%**	**34%**	**22%**	**26%**	**87%**

Kargi, Dirib Gumbo and North Horr have the highest rates of market participation amongst the six Kenyan sites, while Ng'ambo, Logologo and Suguta Marmar have the lowest rates of market participation. This likely reflects several key facts. First, the low market participation sites have the best access to alternative livelihoods. Logologo lies along the main Marsabit-Nairobi road and has the largest proportion of household participants in the wage/salary workforce amongst the 11 survey sites. Ng'ambo is near the town of Marigat in Baringo District and abuts the Perkerra irrigation scheme, which allows for sedentarized cultivation – especially maize and papaya – on a scale and with expected returns unavailable elsewhere in our study area. In their analysis of livestock income and non-livestock income, McPeak and Little (forthcoming) show that non-livestock income sources provide the majority of income for these three sites (Figure 2). These sites not only exhibit higher income than the sites where households depend more on livestock for income generation, households there also enjoy better access to markets and infrastructure and earn more diversified incomes. These also tend to be more sedentarized, although there are important exceptions to this tendency. As a result, herd sizes in Logologo, Ng'ambo and Suguta Marmar are somewhat smaller and livestock market participation rates are likewise lower (Table 3).

The Kargi and North Horr sites, by contrast, are the most pastoralist of the Kenya sample, as reflected in a general absence of alternative livelihood options and larger average household herd sizes, measured in tropical livestock units (TLU)[2]. Pastoralist households with larger herds participate more actively in livestock markets. Table 4 reinforces this rather intuitive result by showing that the more active participants in livestock markets have higher average livestock

[2] 1 TLU = 1 cattle = 0.7 camels = 10 goats = 11 sheep. We also classify cattle and camels as "large stock" and goats and sheep as "small stock".

holdings. Autarkic households own an average of 10.8 TLUs, as opposed to the households most active in markets, which average holdings of over 40 TLUs.

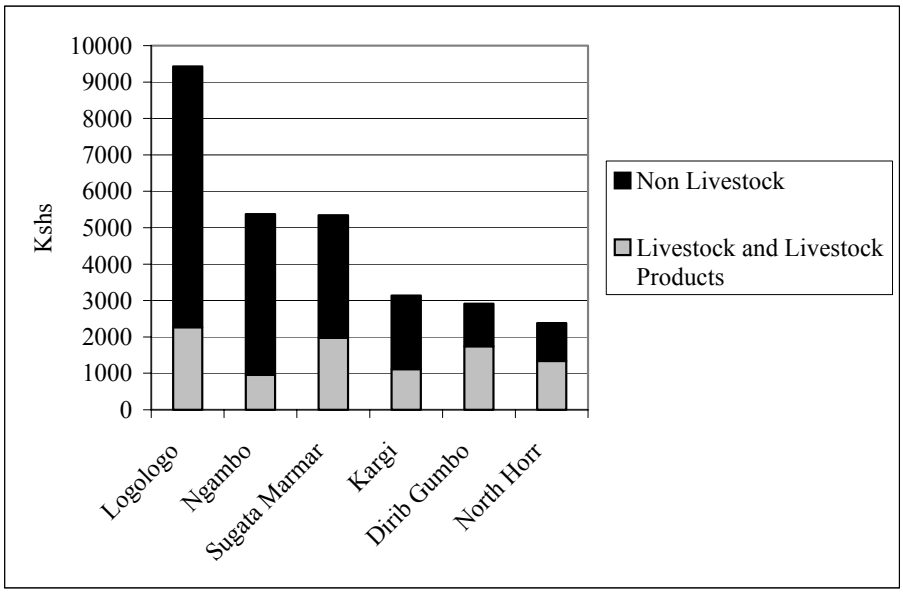


Figure 2: Average Income Reported Over a Three-Month Period
(Source: McPeak and Little, forthcoming. Note: $1≈Kshs 75**)**

Table 3: Average Site TLU and Herd Composition

	AVERAGE SITE TLU/HH	LARGESTOCK %TLU	SMALLSTOCK %TLU
Dirib Gombo	13.3	92%	8%
Kargi	30.6	71%	29%
Logo Logo	21.3	85%	15%
Ngambo	6.6	47%	53%
North Horr	25.6	68%	32%
Suguta Marmar	13.3	78%	22%
Dida Hara	15.5	95%	5%
Dillo	45.1	84%	16%
Finchawa	14.7	96%	4%
Qorate	13.2	99%	1%
Wachille	15.3	98%	2%

The patterns in southern Ethiopia are, on their surface, opposite to those in northern Kenya. The sites with the best market access (Finchawa, Wachille and Dida Hara) are also those with the highest rates of household livestock market participation, far higher than those for the site with

the largest average herd sizes (Dillo).[3] However, in southern Ethiopia, market access does not present the same non-pastoral livelihood diversification options that it does in northern Kenya (Little et al. 2001), so in greater Ethiopia, market access means reduced costs to market participation, which necessarily stimulates livestock marketing at the margin.

Pooling the data from Ethiopia and Kenya and across all survey periods, advanced econometric analysis[4] corroborates the Kenya patterns with respect to herd size. There exists a strong, statistically significant, positive causal association between a household's herd size and its livestock sales volume, controlling for other household-level covariates as well as location- and period-specific effects (Bellemare and Barrett 2004).

Table 4: Frequency of Market Participation and Average TLU

QUARTERS REPORTING LIVESTOCK MARKETING ACTIVITY	% OF RESPONDENTS, KENYA	% OF RESPONDENTS, ETHIOPIA	MEAN TLU OF MARKET PARTICIPANTS
0	9%	13%	10.78
1	19%	19%	15.59
2	23%	21%	14.47
3	16%	19%	19.58
4	12%	16%	19.70
5	6%	5%	35.72
6	9%	4%	30.28
7	4%	3%	45.86
8	1%	1%	48.30

The key practical implication of these descriptive statistics and richer multivariate regression analysis is that active livestock markets depend on pastoralists attaining and maintaining sufficiently large herd sizes, allowing a comfortable margin for liquidating animals through the market. However, the development of physical infrastructure such as roads and modern communications supports not only livestock marketing but also the emergence of alternative livelihoods. It seems likely that the directly stimulative effects on livestock marketing would be trumped, in time if not immediately, by the negative effects on livestock marketing that result naturally from reducing household dependence on herding.

B. Cash Needs and Bank Access

[3] Severe insecurity in Qorate significantly disrupted livestock marketing there during the survey period, confounding comparisons between this survey site and others.

[4] The technique used here estimated a two-stage model of household behavior. In the first stage, the model studied what determines whether a household will be a net buyer, autarkic, or a net seller on the livestock market. The second stage then studied what determines how much a household will buy or sell respectively for net buyer and net seller households. This estimation technique and the results can be found in Bellemare and Barrett (2004).

Northern Kenya and southern Ethiopia are net exporter regions of animals, as one would expect given the comparative advantage in livestock production enjoyed by arid and semi-arid lands. The micro-level data reflect this. Households tend to sell livestock with greater frequency and in larger quantities than they buy animals. Over the course of the study period, 89% of the 918 quarterly observations of household market participation were net sales. Considering net market transactions across the two-year survey period, 80% of households participated as net sellers, while only 8% of households purchased more TLUs than they sold. 11% of households exhibited zero net sales, almost entirely due to non-participation in livestock markets during those two years.[5]

Nonetheless, gross and net sales volumes are low. In no quarter was the average household transaction more than 1 TLU for non-autarkic households (Table 5). The limited transactions volumes temper the immediate gains pastoralist households can reap from generalized stimulus to regional and international livestock markets. Any hypothesized price gains from, for example, trade promotion, will have only a small positive welfare effect on the region given the very modest household-level net sales volumes.

Table 5: Average Quarterly Net TLU of Livestock Market Participants

		Jun-00	Sep-00	Dec-00	Mar-02	Jun-02	Sep-02	Dec-02	Mar-03	Jun-03
KENYA	average net tlu	-0.7	-0.6	-0.5	-0.8	-0.4	-0.5	-0.6	-0.2	-0.3
	% of HHs participating in livestock market	56.35%	42.54%	35.29%	30.94%	32.60%	30.94%	28.11%	23.76%	11.05%
ETHIOPIA	average net tlu	-0.9	-1.1	-0.9	-0.9	-0.9	-1.8	-0.9	-0.1	-0.9
	% of HHs participating in livestock market	40.40%	35.76%	27.33%	30.46%	25.83%	19.21%	34.46%	21.85%	26.00%
TOTAL	average net tlu	-0.8	-0.8	-0.7	-0.9	-0.6	-1.0	-0.7	-0.1	-0.7
	% of HHs participating in livestock market	49.10%	39.46%	31.56%	30.72%	29.52%	25.60%	30.93%	22.89%	17.82%

While pastoralists actively use the markets to offload animals, albeit in small quantities, restocking is typically relegated to births rather than purchases. We compare purchases as a percentage of gross herd recruitment (purchases plus births) by species across periods in Table 6. Purchases comprise a relatively small share of herd growth. Note in particular the correlation coefficient between births and purchases as calculated in the final row in Table 6. There exists a strong negative correlation between births and purchases for the dryland species, camels and smallstock, as opposed to a very slight positive relationship between cattle births and purchases. In the drier areas, pastoralists appear to use the markets to restock their animals in times when

[5] Most of the non-participating households were stockless pastoralists, i.e., households that belong culturally and geographically to pastoralist communities but who no longer hold any livestock. These are typically among the poorest members of the community.

the birth rate is not high enough to restock herds to a viable level. Partly this reflects species differences. As cattle are more fragile, both reproduction and purchases increase as cattle mortality falls and the carrying capacity of the natural resource base recovers. Since camels and smallstock are much more resilient than cattle, pastoralists can use purchases and births as substitute methods of herd restocking.

Table 6: Births and Purchases in TLUs Across Species, by Quarter

	Camel Births, TLU	Camel Purchases, TLU	Purchases as a % of gross herd recruitment	Cattle Births, TLU	Cattle Purchases, TLU	Purchases as a % of gross herd recruitment	Smallstock Births, TLU	Smallstock Purchases, TLU	Purchases as a % of gross herd recruitment
Jun-00	117.3	0.0	0.00%	168.0	49.0	22.58%	67.8	5.0	6.87%
Sep-00	24.3	1.4	5.56%	99.0	11.0	10.00%	31.0	2.9	8.55%
Dec-00	80.1	7.2	8.20%	113.0	7.0	5.83%	51.7	2.3	4.26%
Mar-01	70.1	2.9	3.92%	105.0	12.0	10.26%	122.0	2.2	1.77%
Jun-01	62.9	1.4	2.22%	211.0	2.0	0.94%	153.4	1.6	1.03%
Sep-01	38.6	4.3	10.00%	212.0	4.0	1.85%	94.9	2.0	2.06%
Dec-01	123.0	2.9	2.27%	321.0	11.0	3.31%	119.7	4.1	3.31%
Mar-02	113.0	1.4	1.25%	343.0	24.0	6.54%	117.9	2.8	2.32%
Jun-02	127.3	0.0	0.00%	213.0	1.0	0.47%	91.7	0.9	0.97%
Coefficient of Correlation between Births and Purchases			**-0.3284**			**0.0579**			**-0.2395**

One can likewise look at the relative importance of markets as regulators of pastoralist herd sizes by studying the ratio of purchases to births for restocking and by looking at the ratio of sales to deaths. A higher ratio indicates greater reliance on markets. We computed these ratios as well (not reported) and found that the ratio increases as market access improves, but in no case did that ratio approach one. Even in the most market-oriented sites in northern Kenya and southern Ethiopia, biological factors remain the dominant regulator of pastoralist herd size.

All of this raises a fundamental question: if pastoralists enjoy comparative advantage in livestock production and are net exporters of animals, why do they not sell more animals? One possible explanation is that pastoralists sell their animals largely to meet their immediate needs for cash (e.g., for purchasing food or medicine, for paying school fees, etc.). Under this hypothesis, livestock serve as a "bank on hooves" as well as a productive asset. In this region of northern Kenya, a household of average size needs approximately 500 Kshs (roughly US$7) per month to provide a regular supply of consumption goods, such as maize, tea, and sugar, in addition to lumpy, seasonal needs such as school fees. Relatively wealthy pastoralists, with greater herd size, have considerably higher expenditure rates (Barrett and McPeak, forthcoming). Thus one hypothesis consistent with the data is that wealthier households use livestock markets more frequently to cash out animals because they have greater cash needs. When livestock prices are rising in the post-drought period, the wealthier households are able to sell surplus animals and take advantage of favorable prices, while poorer households tend to hold on to their few animals remaining after the drought, unless forced to sell by consumption needs. However, econometric

analysis shows that controlling for period- and location-specific effects, household livestock sales volumes fall as prices increase, consistent with the notion that cash-limited households sell animals to meet immediate expenditure needs, rather than to capture capital gains on an appreciated asset. This hypothesis of cash-constrained livestock marketing behavior is also consistent with the econometric evidence that, by contrast, households are highly price responsive in purchasing animals. If the price falls sharply, they begin buying, and if prices rise they stop.[6]

Why would households hold livestock in the face of rising livestock prices? The simple answer is that livestock offer the best rate of return of assets available to pastoralists in this region (McPeak forthcoming). Livestock prices increase with improvement in underlying forage and water availability, reflecting greater animal productivity (Barrett et al. 2003). Because livestock are a productive asset that generates future income, not just a storable commodity like grain, the incentives to sell or buy animals in response to shocks (e.g., drought) and to price fluctuations are more complex and tend to militate against sales (McPeak 2004). Indeed, because livestock offer the highest returns, households rationally accumulate herds over time (Bellemare and Barrett 2004, Lybbert et al. 2004, McPeak forthcoming). If herd accumulation is rational, then livestock marketing will respond mainly to demands for cash needs rather than to short-term profit-taking opportunities.

Table 7: Bank Account Holders and Average TLUs across Sites

	RESPONDENTS	BANK ACCOUNT HOLDERS	AVERAGE SITE TLU	AVG BANK HOLDERS TLU
Dirib Gombo	31	2	13.3	22.2
Kargi	32	2	30.6	14.8
Logo Logo	30	5	21.3	22.6
Ngambo	31	2	6.6	9.2
North Horr	31	15	25.6	25.6
Suguta Marmar	30	1	13.3	36.0
Dida Hara	31	1	15.5	124.9
Dillo	30	0	45.1	n/o
Finchawa	31	1	14.7	4.0
Qorate	30	0	13.2	n/o
Wachille	30	0	15.3	n/o
Total	337	29	19.5	26.0

The idea that pastoralists will cash out animals in response to higher prices depends fundamentally on the assumption that there exists an alternative means by which to store wealth. This has induced some observers to posit that the introduction of financial institutions (e.g., banks or micro-finance institutions) might allow pastoralists to diversify their risk, holding assets in a different and perhaps safer form (Coppock 1994, Desta 1999). As shown in Table 7, few

[6] Bellemare and Barrett (2004) estimate the price elasticities of demand and supply at the means in these data as -2.73 and -0.10, respectively.

pastoralists (8.6%) in our sample held a bank account between March 2000 and June 2002. This makes it difficult to formally test the hypothesis that increased bank-mediated savings could affect livestock marketing patterns, as there is relatively little variation in our data.[7] By trying to understand why so few pastoralists hold bank accounts we can perhaps uncover useful information revealing the role financial institutions might play with respect to pastoralist livestock marketing behavior.

Among the study sites, bank accounts were observed most frequently in North Horr, where a Nairobi-based NGO, KREP Development Agency (KDA), opened a Financial Service Association (FSA) which makes accessible bank accounts to locals purchasing shares in the financial cooperative. Though nearly half of the respondents in the North Horr site had bank accounts at some point between June 2000 and June 2002, membership in the FSA declined among the sample population between these periods. Only one household in our sample maintained an FSA account over the entire two-year survey period.

If banks indeed assist pastoralists in risk management, it is natural to ask why FSA membership among North Horr respondents declines over time and why so few pastoralists hold bank accounts elsewhere. Osterloh (2004) found that the value of North Horr FSA shares declined in value by 50% from 1997 to 2000, due to an extraordinarily high rate of loan default. Far from providing a secure repository of cash investments in shares, investments in FSA shares proved a money-losing proposition. McPeak (forthcoming) similarly finds that livestock raising offers a higher average rate of return than savings in the commercial bank. Comparing the rates of return in TLUs of herds from two Gabra study areas in northern Kenya, he finds herds returned an average annual rate of 6% and 15% from early 1993 to early 1997. By contrast, once one accounts for the fees charged on bank savings, a cash deposit the equivalent of roughly 25 goats' value or more returns approximately 2% per-year over a four-year period, while a deposit of between 18 and 25 goats renders a rate of return of -44 %, and accounts worth less than 18 goats were completely dissipated by service charges in four years' time. The positive rate of return threshold herd of 25 goats is roughly 10% of average household herd size, or the equivalent of greater than half of the average household's total livestock sales over the four year study period. Even including the losses of late 1996, and excluding the benefits of income generation as well as the costs associated with accessing savings in the district capital, livestock offer a higher average rate of return than savings. While it could be argued that formal banking may still be attractive in terms of reduced variance in return (Desta 1999), discussions with herders suggest that herders do not consider bank savings a low risk asset. They express doubts about the safety of money placed in banks. This could reflect the weakness of institutions in Kenya, e.g., the lack of checks and balances on the banking system or the lack of deposit insurance, or simply a bias towards what herders already know in the face of what they have no experience with, i.e., a status quo bias in favor of livestock and against a banking system that is perceived as complex.

Empirical evidence does not support the claim that lack of banking options significantly limits livestock marketing. Few pastoralists wish to cash in livestock to hold financial assets they consider risky and that generate significantly lower real rates of return than livestock. This may

[7] Background econometric estimates generated in the preparation of Bellemare and Barrett (2004) consistently found no statistically or economically significant relationship between holding a bank account and either participating in market or the sales or purchase volume conditional on market participation.

change as non-pastoral livelihood options become viable and remunerative in the region. But that change will signal a decline in the importance of livestock and, as discussed in the previous sub-section, would seem to be associated with less, not more, livestock marketing.

C. Marketing Costs and Risks

Due to the poor state of transport and marketing infrastructure in the study region, many observers cite the perceived high costs of moving animals to market and of traders evacuating animals from up-country source markets to terminal markets (e.g., Addis Ababa, Nairobi) as pervasive problems crippling the livestock marketing chain (Bailey et al. 2000, Mahmoud 2003). Yet there has been little-to-no empirical evidence on the actual marketing costs faced by pastoralists. Our surveys included a module fielded in May-June 2002 that collected data on the cash expenses incurred while buying or selling animals during the respondent's most recent trip to market. We emphasize that we can only discuss cash expenditures, which clearly underestimate total economic costs that include the pastoralists' time, risk, etc. But given the low opportunity costs of time for people earning less than $0.25/person per day, on average, the monetary value of time spent marketing is low. Furthermore, since pastoralists often combine livestock sales or purchases at market with other transactions they need to execute in town, -- e.g., purchase of animal or human medicines, picking up food aid rations, visiting government offices -- full attribution of the cash costs of going to town to market livestock overstates the true marginal costs of buying or selling animals. On balance, cash expenditures are not only the best available data on household-level marketing costs, they are likely not far off the true economic cost since the downward bias associated with the omission of modest non-monetary marketing costs is likely offset by the sharing of the observed cash costs across multiple household activities at market.

Marketing costs can be divided between variable and fixed costs. Variable costs increase with each animal marketed, while fixed costs are incurred regardless of the quantity of animals sold and affect only the discrete decision to participate or not in the market. High fixed costs create increasing returns to scale in livestock marketing, discouraging small volume sales. High variable costs, by contrast, are scale invariant in their effects, serving just to reduce net proceeds from sales. Variable costs such as animal transport, council fees, and animal health certification, are generally species- and market-specific. In principle, these fees constitute an unavoidable cost of selling livestock at market. However, some markets in our sample, such as Kargi, Suguta Marmar, Finchawa, and Wachille, are clearly more systematic than others in collecting these fees. Estimated fixed costs include transporting the participant, food, lodging, bribes, and fixed brokerage fees (not commissions), and vary from pastoralist to pastoralist. As Table 8 illustrates, 67% of sampled Kenyan market participants and 79% of those in Ethiopia incurred some sort of cash costs in their last livestock transaction, though the percentage of those incurring fees varies greatly by site. In sites close to large markets, such as Ng'ambo and Dillo, few respondents reported incurring fixed marketing costs, as both sites are close to major markets rendering transportation, food, and lodging costs avoidable through a brief trek to market and walk home the same day. The need for veterinary medicines can also be met easily in these sites as the need arises. In more remote and pastoral sites, such as Kargi, trekking to town constitutes a non-

negligible investment of time, and needs such as medicines might be deferred until a trip to town to market livestock.

Table 8: Percentage of Participants Incurring Marketing Fees

	Respondents Marketing Livestock	Total Respondents	% of Market Participants Incurring Marketing Fees
Dirib Gombo	18	22	77%
Kargi	20	20	100%
Logo Logo	21	18	83%
Ngambo	12	16	6%
North Horr	20	20	40%
Suguta Marmar	11	11	100%
Total Kenya	102	107	67%
Dida Hara	16	17	94%
Dillo	14	16	25%
Finchawa	18	9	100%
Wachille	20	20	100%
Total Ethiopia	68	62	79%

As evinced in Table 9, few of our sample pastoralist households paid to transport animals. In Ethiopia, only one pastoralist in Wachille paid to trek a herd of cattle to market. No other Ethiopian households incurred any cash transport costs in marketing, although they certainly spend time taking animals to and from market. In Kenya, more pastoralists paid to trek or truck their animals to market, though frequency varies with site. In Dirib Gumbo and Ng'ambo, sites close to market, no pastoralists paid to transport their animals to market. In more remote locations such as Kargi and North Horr, 26% and 34% of smallstock sold or bought incurred transportation expenses. Kargi was the only Kenyan site where pastoralists hired labor to trek their animals.

The trekking or trucking of animals is not the sole transportation cost borne by pastoralists marketing their livestock. The average costs of human transportation actually exceed those of transporting the marketed animals. The sum of animal and human transport costs comprises the largest component of marketing costs in both Ethiopia and Kenya, 44% and 60%, respectively. Improving upon the notoriously poor infrastructure would reduce the high costs of transportation in the region by increasing security, traffic, market access, and speed of travel.

Perhaps more striking, and counter to the conventional wisdom among donors and policymakers, is the fact that pastoralist households' cash expenses in livestock marketing appear relatively low. As reflected in the two rightmost columns of Table 9, variable costs average less than six

Table 9: Marketing Costs Incurred, by Cost Category and Site

	LIVESTOCK TYPE	LIVESTOCK MARKETED PER TRANSACTION	% PAID TO TRANSPORT ANIMALS	AVG COST TO TRANSPORT ANIMAL/HEAD (Kshs)	% INCURRING COUNCIL FEES	AVG COUNCIL FEE/HEAD (Kshs)	TOTAL AVG VARIABLE COSTS PER ANIMAL (Kshs)	TOTAL AVG FIXED COSTS PER MARKET VISIT (Kshs)	VARIABLE COSTS AS AN AVG % OF TOTAL REVENUE	FIXED COSTS AS AN AVG % OF TOTAL REVENUE
Dirib Gumbo	Smallstock	1.79	0.0%	n/o	72.0%	26	26			
	Largestock	1.38	0.0%	n/o	72.7%	50	50	0	1.0%	0.0%
Kargi	Smallstock	3.41	75.0%	43.2	100.0%	44	87			
	Largestock	1.33	15.0%	300	25.0%	100	400	54	2.9%	11.1%
Logo Logo	Smallstock	1.25	14.3%	50	86.7%	39	89			
	Largestock	1.83	14.3%	150	90.9%	100	250	41	3.4%	17.6%
Ng'ambo	Smallstock	3.27	0.0%	n/o	5.6%	50	50			
	Largestock	1.80	0.0%	n/o	0.0%	n/o	0	50	0.2%	0.5%
North Horr	Smallstock	2.16	70.0%	61.7	43.9%	20	82			
	Largestock	1.00	0.0%	n/o	0.0%	n/o	0	440	5.4%	0.7%
Suguta Marmar	Smallstock	1.20	36.4%	42.5	100.0%	36	78			
	Largestock	1.00	9.1%	250	100.0%	50	300	24	5.9%	5.1%
Dida Hara	Smallstock	1.75	0.0%	n/o	85.7%	30	30			
	Largestock	1.67	0.0%	n/o	100.0%	120	120	16	1.6%	7.4%
Dillo	Smallstock	1.09	0.0%	n/o	0.0%	n/o	0			
	Largestock	1.40	0.0%	n/o	0.0%	n/o	0	96	0.0%	1.8%
Finchawa	Smallstock	2.13	0.0%	n/o	64.7%	40	40			
	Largestock	1.91	0.0%	n/o	100.0%	139	139	19	0.6%	8.9%
Wachille	Smallstock	1.50	0.0%	n/o	100.0%	40	40			
	Largestock	1.22	5.0%	100	100.0%	137	237	16	0.5%	7.5%

percent of total livestock sales revenues in each site, and less than two percent in each of the Ethiopia sites. Fixed costs are uniformly larger than variable costs in Ethiopia, but still reasonably modest, at less than nine percent of total livestock sales revenues. In Kenya, there exists considerable spatial variation in fixed costs, with Kargi and Logologo – the only two sites in our sample not within just a few kilometers of a regular livestock market – exhibiting the highest fixed costs of market participation. The relatively modest levels of fixed costs are likewise reflected in the small average transaction size – less than two large stock or four small stock per transaction in each site – and the absence of any strong correlation between average fixed costs and mean livestock marketed per transaction. Just greater than half (50.5%) of marketed transactions are for one animal only. Figure 3 shows the distribution of transactions volumes, underscoring the small lots traded, no matter the species involved.

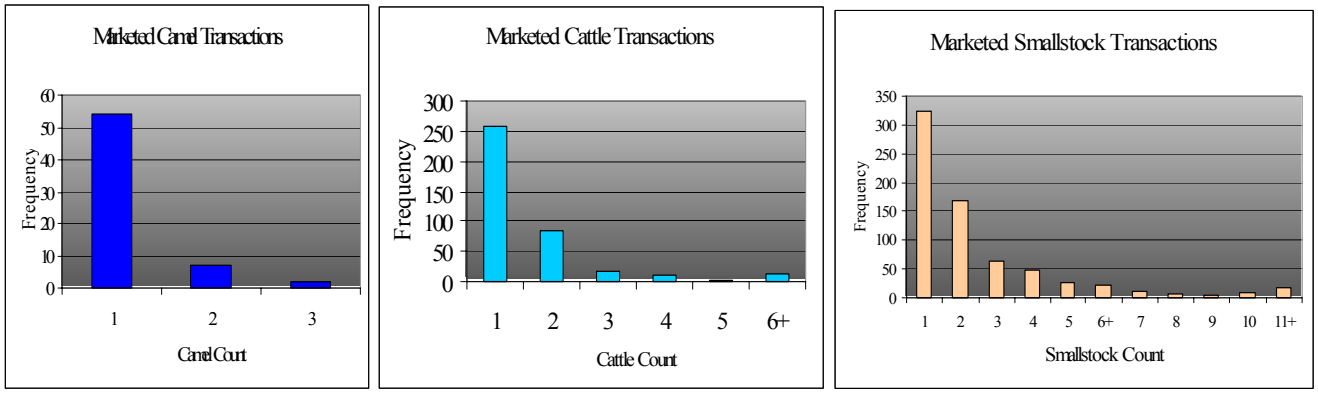


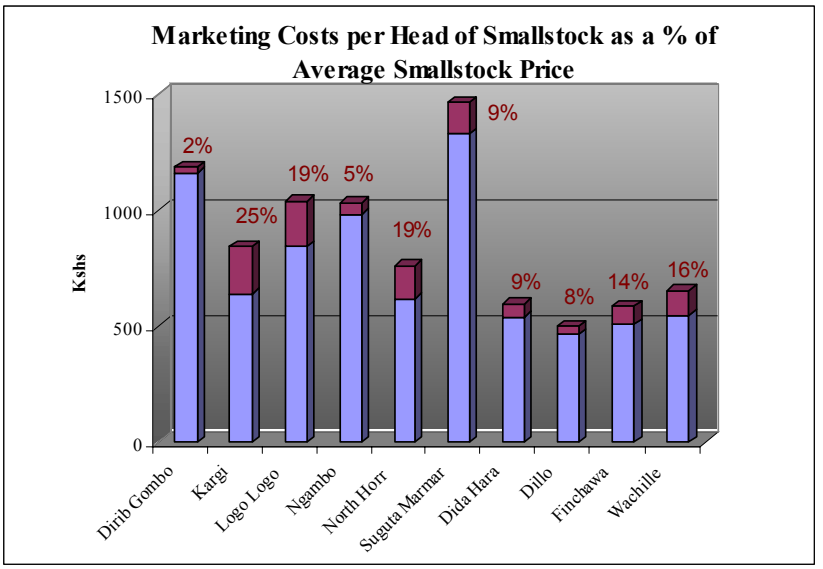
Figure 3: Frequency of Marketing Quantities of Camel, Cattle, and Small Stock

As a percentage of gross sales revenues, marketing costs are relatively greater for small stock than large stock, as illustrated by figures 4a and 4b. Nonetheless, small stock marketed outnumber large stock marketed by a factor of three to one. Of the 3,041 animals purchased or sold in these data, 2,280 were either goats or sheep. In more remote, drier sites, this factor increases for the simple reason that cattle fare less well in drier agroecologies, so goats become more plentiful in more arid zones. In North Horr, for example, only 5 large stock were marketed, as opposed to 297 small stock. The low volume of individual transactions and the relative dependence on smallstock sales rather than cattle or camels is consistent with the hypothesis that pastoralist livestock sales are driven largely by immediate cash needs, rather than by profit-seeking liquidation of animals.

The cost of marketing animals relative to the price the animals received on the market varies from site to site. For small stock, marketing costs ranged from two percent in areas close to town like Dirib Gumbo, to 25% in more remote areas like Kargi. Less variation was observed with in the costs of marketing large stock. No cash expenses were incurred in either North Horr or Ng'ambo, (recall that only five largestock were marketed in North Horr, and Ng'ambo has a major livestock market in the nearby town of Marigat), with a maximum of 10% of large stock price in Wachille.

Although livestock marketing costs are relatively modest, econometric estimates reported in Bellemare and Barrett (2004) indicate that they do statistically significantly affect household

marketing behavior, discouraging market participation in general and, conditional on participating in the market, dampening sales volumes (in the case of variable costs) and purchase volumes (in the case of fixed costs). Pastoralists largely behave in economically rational ways, but the magnitude of the marketing costs involved means that these really are not a significant impediment to household-level livestock sales or purchases.[8]



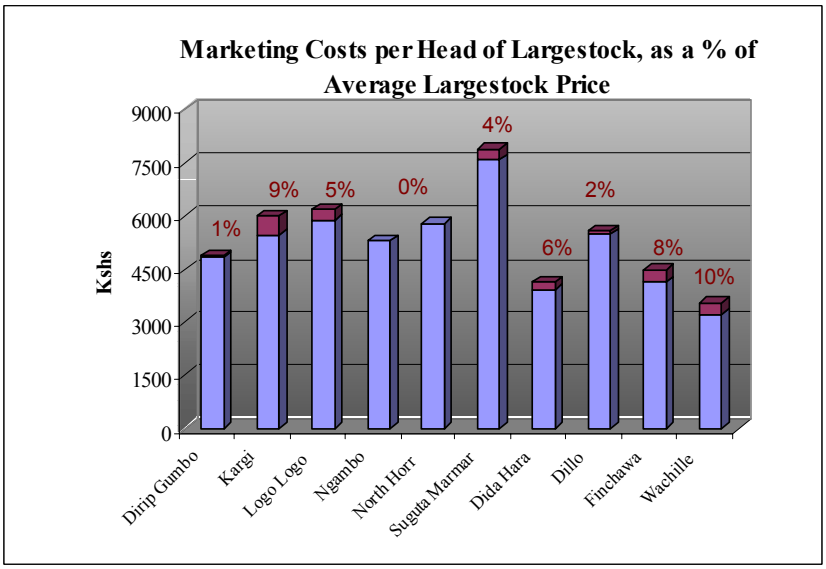


FIGURE 4 a,b: Marketing Costs as a Percentage of Average Price

One prospectively important cost we cannot quantify is the risk associated with taking one's livestock to market. Livestock raiding, both between ethnic groups and between clans within an ethnic group, has a rich and long history in the study area. Oral histories refer to years of

[8] Marketing costs – especially for transportation – do seem to figure prominently however in trader behavior and in the spatial correlation of livestock prices (Barrett et al. 2003, Mahmoud 2003, Barrett and Luseno 2004).

particularly devastating (or alternately, rewarding) raids in reference to the raids themselves. The influx of automatic weapons has altered the scope of the danger associated with raids and potentially the commercialization of raided animals (Fleisher, 2000). When we include in our econometric models simple dummy variables for periods in which survey communities reported raids, we find no statistically significant effect on livestock marketing patterns. This only tells us that the experience of raids has no impact on livestock marketing behavior, and does not signal that the nearly ever-present risk of raiding has no effect. Given that insecurity typically prompt pastoralists to relocate from relatively remote and dangerous areas to more populous areas closer to market, insecurity may actually increase livestock market participation rather than discourage it at household level, ignoring the prospective effects of insecurity on livestock prices. Insecurity is also more likely to force pastoralists into the market to purchase animals to replace those lost to raiding.

On balance, the empirical evidence suggests that while marketing costs and risks are real, they do not pose a major obstacle to livestock marketing among pastoralists in the sites we study. There are good reasons to work hard to reduce insecurity and violence in the region and to improve infrastructure. But policymakers and operational agencies in the field should not undertake such efforts in order to stimulate livestock marketing.

D. Informational Constraints

One sometimes hears conjectures that if pastoralists had better forecast information about upcoming rainfall and forage conditions, then they could better use livestock markets to offload animals in anticipation of temporarily reduced rangeland carrying capacity or purchase animals when forage and water availability are expected to be especially good. Similarly, one frequently hears complaints about the poor state of livestock market price reporting systems and the disadvantage this creates for herders wishing to transact on the market. These related claims imply that information gaps limit livestock marketing by pastoralists. This hypothesis is testable.

Considerable resources have been directed toward building up climate forecasting and dissemination capacity in the region, with the Drought Monitoring Centre (DMC) in Nairobi the nexus of such efforts (Curry 2001). Highly advanced early warning systems are being developed predicated upon the assumption that climate forecasts will assist pastoralists in risk mitigation. Using innovative methods to elicit pastoralists' expectations of and response to rainfall, Luseno et al. (2003) and Lybbert et al. (2003) found that although a mere 20% of households in our survey area received modern climate forecasts issued by DMC, confidence in indigenous climate forecasts outweighed confidence in modern forecasts by a three to one factor, and despite the high degree of confidence in traditional forecasts, few respondents changed their herd management or livestock marketing behavior in response to their expectations of upcoming climate conditions. There does not seem to exist much of an information gap, certainly not one significant enough for modern climate forecast information to have any economic value for pastoralists. The empirical evidence therefore suggests that climate information is not a particularly limiting factor to pastoralists' livestock marketing behavior.

Nor does there not seem to be a scarcity of information about livestock prices among these households. Respondents to the May-June 2002 household livestock marketing survey module

were asked to cite up to four market price information sources they use and the frequency with which they update their information on livestock prices. On average, respondents received information from two sources, 1.9 sources in Kenya and 2.1 in Ethiopia. Respondents gathered information about livestock prices primarily through traders, although friends, relatives and livestock brokers are likewise used frequently (Table 10). Interestingly enough, less than 13 percent of respondents inquired after sellers of livestock about prices, perhaps reflecting the sensitive nature of livestock and money. Moreover, few households go to market themselves in order to observe transactions and collect price information first-hand. Rather, information networks suffice to generate and distribute adequately reliable and timely information about market conditions.

Table 10: Sources of Price Information

Traders	56.44%
Friends	45.45%
Relatives	38.64%
Brokers	34.47%
Others who go to market	13.64%
Sellers	12.88%
Producers	11.74%
Travelers	10.61%
Go to market	7.20%
Neighbors	5.30%
Other	9.47%

Table 11: Frequency with which Respondents Check Primary Price Information Source

	KENYA	ETHIOPIA
Daily	24.32%	6.03%
Every Few Days	20.27%	10.34%
Weekly	16.22%	37.07%
Every Few Weeks	19.59%	15.52%
Monthly	8.78%	10.34%
Every Few Months	4.05%	11.21%
Rarely	2.70%	9.48%
Never	4.05%	0.00%

People collect market price information frequently. More than half the survey households checked on market prices at least weekly (Table 11). In Kenya, 45 percent of respondents checked on market prices at least every few days. Given the range of price information sources used and the high frequency with which they are consulted, one wonders precisely what sort of price information is missing from the local market. The empirical evidence available through our surveys suggests that neither climate nor price information limit pastoralists' livestock marketing to any significant degree, certainly not enough to justify significant new expenditures in support of additional market price information generation and dissemination activities.

E. Herd Management Practices

The final set of oft-hypothesized constraints on livestock marketing relate to pastoralists' traditional herd management practices, perhaps especially their tendency to maintain herds that are heavily female and customary livestock loan and gift practices[9] that bestow incomplete

[9] While the exact arrangements of gifts and loans vary subtly across ethnic groups and clans and over time, the most common arrangements give the borrower rights to the milk and any offspring born to the borrowed animal(s), while the lender retains ownership claims over the loaned animal(s).

property rights on those who receive animals. Borrowed animals or those temporarily herded for others typically cannot be sold or slaughtered. Insofar as such practices are widespread, one would logically expect these herd management practices to limit livestock marketing.

Kerven (1992, p. 109) asserts that livestock trade historically "provided [pastoralists] a vital means of restructuring or rebuilding herds or flocks, through conversion of one livestock species for another and by exchanging male for female animals." But as we have already demonstrated, pastoralists use the markets almost exclusively for sales. If pastoralists rarely use markets for restocking or restructuring herds – most likely due to limited cash liquidity – then herd structure may impede marketing in so far as herders try to hold onto fertile females and quality bulls for breeding. Since herd growth is critical to pastoralist welfare (Lybbert et al. 2004, McPeak 2004), and because herd growth comes overwhelmingly through biological reproduction (Table 6), one might hypothesize that pastoralists are less likely to sell, for any given herd size, when a greater proportion of their livestock are female.

The data fail to support either hypothesis, that herd composition in terms of either incomplete property rights or gender mix impedes livestock marketing. The primary reason why property rights have little impact on livestock marketing is that relatively few animals are encumbered by incomplete or complex property rights. Of the 330 participants in the household survey, only 25% had any animals burdened with complex property rights at the time of the baseline survey in March 2000, and of those 86 households, encumbered animals comprised only 19% of their herd, on average. Less than five percent of the aggregate herd in our study area was affected by the complex property rights governing many livestock exchanged through traditional loan and gift arrangements.

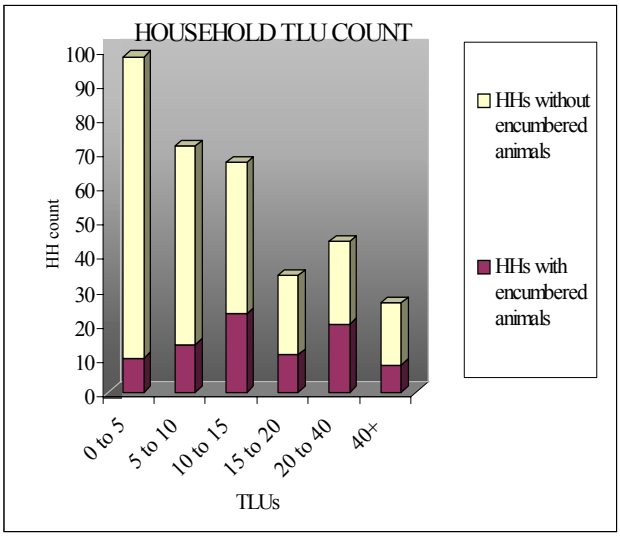


Figure 5: Households with Encumbered Animals, by Household TLU Holdings

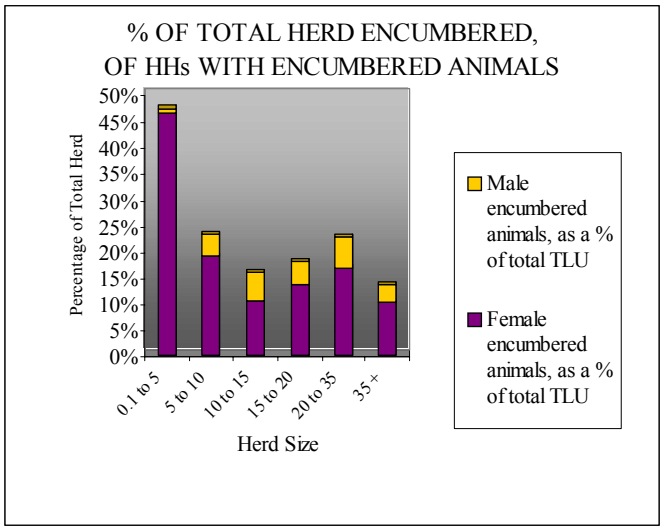


Figure 6: Percentage of Total Herd Encumbered, by Household TLU Holdings

Furthermore, Figure 5 shows that the likelihood that a household herds any animals borrowed from or herded on behalf of others is increasing in initial herd size. Yet, as Figure 6 shows, animals with encumbered property rights constitute a smaller share of these larger herds.

Moreover, nearly all such animals are females – typically lactating cows – the animals least likely to be sold under any case as households depend upon fertile cows for milk and for (re)building herds. While 68% of the TLU in our sample were female, greater than two-thirds of marketed animals in this region are male (Barrett et al., 2003).

Multivariate econometric analysis corroborates the impression that traditional herd management practices that place a heavy emphasis on females within the herd and on gift and loan institutions to protect herd sizes and to ensure household food security do not appear to limit pastoralists' livestock marketing. Neither the female share of a household's herd nor the share of the herd subject to complex property rights have a statistically or economically significant effect on either the likelihood of market participation nor on marketed volumes conditional on participation (Bellemare and Barrett 2004).

IV. POLICY IMPLICATIONS

Pastoralists in northern Kenya and southern Ethiopia participate actively in livestock markets. However, the small average transaction volume limits the possibility of any significant near term impact due to stimulus of broader regional and international marketing opportunities. Market transactions are almost exclusively sales, primarily of goats and sheep, despite the fact that marketing costs, although modest, are highest for these species. Overall, livestock marketing costs are surprisingly inconsequential at the household level and information about either climate or market conditions does not appear to significantly limit household livestock market participation. Nor do traditional herd management practices appear to impede livestock marketing by pastoralist households. Pastoralists do, however, respond to livestock prices, quite robustly to the prices they pay when buying animals. But the household-level livestock supply curve appears to be modestly backward-bending, i.e., sales volumes respond negatively, on average, to increased prices rather than positively.

All of this evidence supports the hypothesis that households sell livestock primarily to meet immediate expenditure needs and they otherwise accumulate livestock as the most remunerative asset to hold in the rangelands of southern Ethiopia and northern Kenya. This is consistent with the observation of strong life cycle effects, wherein households tend to buy animals when they are younger – to help build their herd – and to sell animals when they are older, and that livestock sales increase significantly with a household's herd size, reflecting greater household expenditure requirements. In sum, we find scant empirical support for many of the claims commonly made in current discussions of how best to stimulate livestock marketing off-take among pastoralists in this region. The best strategy for stimulating livestock marketing – which is unlikely to become robust any time soon regardless of policy interventions – appears to be generalized support for viable pastoralism.

REFERENCES

Barrett, C.B., F. Chabari, D. Bailey, D.L. Coppock, and P.D. Little (2003). "Livestock Pricing in the Northern Kenyan Rangelands." *Journal of African Economies* 12,2: 127-155.

Barrett, C.B. and W.K. Luseno (2004). "Decomposing Producer Price Risk: A Policy Analysis Tool With an Application to Northern Kenyan Livestock Markets." *Food Policy* 29, 4: 393-405.

Barrett, C.B., P.P. Marenya, J.G. McPeak, B. Minten, F.M. Murithi, W. Oluoch-Kosura, F. Place, J.C. Randrianarisoa, J. Rasambainarivo and J. Wangila (2004), "Welfare Dynamics in Rural Kenya and Madagascar," Cornell University working paper.

Barrett, C.B. and J.G. McPeak (forthcoming), "Poverty Traps and Safety Nets," in A. de Janvry and R. Kanbur, editors, *Poverty, Inequality and Development: Essays in Honor of Erik Thorbecke* (Amsterdam: Kluwer).

Bellemare, M.F. and C.B. Barrett (2004), "An Ordered Tobit Model of Market Participation: Evidence from Kenya and Ethiopia," Cornell University working paper.

Curry, J. (2001). *Use of Climate Information in the Greater Horn: Assessing the Needs of Institutional Users*. New York: International Research Institute for Climate Prediction, Columbia University.

Desta, S. (1999). "Diversification of Livestock Assets for Risk Management in the Borana Pastoral System of Southern Ethiopia," Ph.D. Dissertation, Utah State University.

Fleisher, M.L. (2000). *Kuria cattle raiders : violence and vigilantism on the Tanzania/Kenya frontier*. Ann Arbor: University of Michigan Press.

Kerven, C. (1992). *Customary Commerce: A Historical Reassessment of Pastoral Livestock Marketing in Africa*. London: Overseas Development Institute.

Little, P.D., K. Smith, B.A. Cellarius, D.L. Coppock, and C.B. Barrett (2001). "Avoiding Disaster: Diversification and Risk Management Among East African Herders," *Development and Change* 32, 3:401-433.

Luseno, W., J.G. McPeak, C.B. Barrett, P.D. Little, and G. Gebru (2003). "Assessing the value of climate forecast information for pastoralists: Evidence from southern Ethiopia and northern Kenya," *World Development* 31, 9:1477-1494.

Lybbert, T.J., C.B. Barrett, J.G. McPeak, and W.K. Luseno (2003). "Bayesian Herders: Updating of Rainfall Beliefs In Response to External Climate Forecasts," Cornell University working paper.

Lybbert, T.J., C.B. Barrett, S. Desta and D. L. Coppock (2004), "Stochastic Wealth Dynamics and Risk Management Among A Poor Population," *Economic Journal*, 114, 498: 750-777.

Mahmoud, Hussein (2003). The Dynamics of Cattle Trading in Northern Kenya and Southern Ethiopia: The Role of Trust and Social Relations in Market Networks, PhD Dissertation, Department of Anthropology, University of Kentucky.

McPeak, J. (2004). "Contrasting Income Shocks with Asset Shocks: Livestock Sales in Northern Kenya." *Oxford Economic Papers* 56, 2: 263-284.

McPeak, J. (forthcoming). "Individual Rationality and Collective Rationality in Pastoral Production: Evidence from Northern Kenya," *Human Ecology*.

McPeak, J. and P.D. Little (forthcoming). "Cursed If You Do, Blessed If You Do: The Contradictory Processes of Pastoral Sedentarization in Northern Kenya." E. Fratkin and E. Roth, eds. *As Nomads Settle: Social, Health, and Ecological Consequences of Pastoral Sedentarization in Northern Kenya*. New York: Plenum Publishers.

Osterloh, S. (2004). "Microfinance in Adverse Environments: The Case of KDA in Kenya," M.S. thesis, Department of Applied Economics and Management, Cornell University.

OTHER A.E.M. WORKING PAPERS

WP No	Title	Fee (if applicable)	Author(s)
2005-10	An Ordered Tobit Model of Market Participation: Evidence from Kenya and Ethiopia		Bellemare, M. and C. Barrett
2005-09	The Complex Links Between Governance and Biodiversity		Barrett, C., Gibson, C., Hoffman, B., and M. McCubbins
2005-08	Capital Market Governance: How Do Security Laws Affect Market Performance?		Daouk, H., Lee, C. and D. Ng
2005-07	Context and Volutnary Contributions: An Experimental Analysis of Communication, Voting, and Status Quo Bias*		Messer, K., Schulze, W., and H. Kaiser
2005-06	Behavior, Production and Competition		Just, D.R. and D. Zilberman
2005-05	Distributional Implications of the Internet: Can Price Discrimination Improve Farmers' Welfare?		Just, D. and R.E. Just
2005-04	Loss Aversion and Reference Points in Contracts		Just, D. and S. Wu
2005-03	Poverty, Inequality and Development: Micro-Macro Perspectives and Linkages		de Janvry, A. and R. Kanbur
2005-02	Reforming the Formula: A Modest Proposal for Introducing Development Outcomes in IDA Allocation Procedures		Kanbur, R.
2005-01	Pareto's Revenge		Kanbur, R.
2004-18	Pure Altruism and Public Risk Programs: An Experimental Examination of Voting Behavior		Messer, K., Poe, G. and W. Schulze
2004-17	Differentiating Trust-in-the-Company from Trust-in-the-Executive in Supply Chain Relations		Hagen, J. and T. Simons

Paper copies are being replaced by electronic Portable Document Files (PDFs). To request PDFs of AEM publications, write to (be sure to include your e-mail address): Publications, Department of Applied Economics and Management, Warren Hall, Cornell University, Ithaca, NY 14853-7801. If a fee is indicated, please include a check or money order made payable to Cornell University for the amount of your purchase. Visit our Web site (*http://aem.cornell.edu/research/wp.htm*) for a more complete list of recent bulletins.