

Livestock Markets in West Africa: Potential Tools for Poverty Reduction?

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Abstract: *Drawing on surveys of traders and weekly sales transactions data collected from January 2000 – June 2001 in three frontier markets linking four countries, this paper evaluates how livestock markets currently function in relation to poor livestock producers and traders in the central corridor of West Africa. Empirical analysis indicates that although market preferences appear to be well transmitted through prices to small-scale livestock producers, they are still largely unable to supply in sufficient quantity top quality animals demanded by buyers. Limited own financial resources and access to external finance prevent small-scale livestock traders from expanding their business activities at the same time that high transport and handling costs and taxes hinder the performance of large-scale traders engaged in cross-border trade. This information provides insights into the challenges confronting market participants and how they can be assisted through program and policy interventions to take advantage of market opportunities.*

In West Africa, as in other parts of the developing world, livestock represent the main marketable assets held by rural people. In this setting, livestock markets act as critical institutions through which rural people recurrently convert wealth stores to food staples and cash to finance other basic needs, inputs, and services. They also act as transmission mechanisms through which growth in the wider economy is transmitted to rural areas via the linkages they offer to national and regional economies. Livestock markets in rural communities are typically embedded in cultural and social institutions and the way in which people,

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particularly the poor, participate in these markets is conditioned by economic, social, and cultural factors.

At least 100 million poor people in West Africa rely on livestock as part of their livelihood strategy (Thornton et al. 2002, Kristjanson et al. 2004). In the semi-arid areas of the region, livestock rearing provides the main source of employment for the majority of the people and is by far the most important source of revenue. For these people, access to well-functioning markets could potentially provide a way out of poverty by giving them better returns on marketed livestock products and opportunity to build and acquire other assets to reduce vulnerability. The link between improved livestock marketing and poverty reduction is recognized in the Poverty Reduction Strategy papers of countries in the study region, particularly livestock exporting countries such as Burkina Faso, Mali, and Niger (Blench et al. 2003), where it has been argued that, due to the large number of people involved, targeted programs in the livestock sector, including livestock marketing, can provide opportunity to increase incomes directly, generate capital for use in alternative income generating activities, and reduce poverty levels.

But there is clear evidence that agricultural markets, including livestock markets, may fail to function as effectively as the neoclassical model of perfect market competition will suggest. In the specific context of the poor, transaction costs and risk of participation in markets may be too high due to poor infrastructure and imperfect, asymmetric information. In other cases, social or economic barriers (e.g., restricted access to commercial finance) may exclude them from markets. In poor rural areas or in the development of new products or services, markets may be too thin. The possibility of market failure implies that market outcomes may not be pro-poor. Livestock market failure, in particular, will undermine the ability of the rural poor, as producers, to grow out of poverty through the sale of their major wealth stores—livestock. It will also impair the performance of other market actors (e.g., traders) due to the high cost and risk of carrying out transactions.

In this paper, we investigate livestock market functioning as it affects poor rural livestock producers and traders in the central corridor of West Africa. We are particularly interested in examining how livestock markets operate under the institutional, social, and infrastructural conditions that exist in rural areas and how the functioning of markets under such conditions affect the economic vulnerability of poor households. In doing this, the aim is to identify interventions which could change the structure and characteristics of markets to expand the choices available to the poor

and lead to market outcomes that benefit them. We draw on surveys of livestock traders and weekly market transactions data collected over an eighteen-month period in three markets in Burkina Faso and Mali to empirically examine the following questions:

- What factors determine cattle prices received by producers? How well do markets transmit, through prices, information that producers can use to improve their production and marketing strategies?
- What barriers exist within the marketing channel for different categories of livestock traders?
- How do the markets studied fit into supply and value chains? How do these chains operate?

By focusing on these questions, we are able to evaluate how livestock markets currently function and are also able to identify where the potential lies for pro-poor market development.

Although previous studies of livestock marketing in West Africa (Ariza-Nino et al. 1980, Delgado and Staats 1980, Francis 1990, Jabbar 1998, Turner and Williams 2002) have examined various strands of the questions posed above, they have done so either by focusing on markets at a particular level in the marketing chain or by investigating a single continuum from point of purchase in a primary market to point of sale in a terminal market, without due consideration to the various segments that exist within the marketing channel. These approaches mask important differences in the degree of market concentration and competition at different levels in the marketing chain. Furthermore, none of the past studies combined an investigation of the determinants of livestock prices with an analysis of traders' activities to obtain a comprehensive picture of the impact of livestock market functioning on two major actors (producers and traders) in the marketing chain. Given this context, the contributions of this paper are threefold. First, it offers a detailed look at livestock marketing in West Africa, a case of considerable interest to policy makers and donor agencies, given the importance of livestock to many economies in the region. Second, unlike past studies, the paper combines an analysis of livestock price formation with an exploration of traders' commercial activities at different market levels, while explicitly recognizing the main segments (domestic and cross-border) that exist within the marketing chain. Third, the comparative analysis of three different marketing channels linking four countries adds a further rich dimension to the discussion presented below and to the literature on livestock marketing in West Africa.

The remainder of the paper is organized as follows. The next section reviews the expected and actual roles of livestock markets and the likely

impacts on the poor. This is followed by a description of livestock markets in West Africa. The study area and research methods are then described followed by two sections that address the questions posed above. We then discuss our results, and a final section offers concluding remarks.

Livestock Markets in Theory and Practice

Livestock markets, when they work, can perform multiple valuable functions: serving as efficient mechanisms for the allocation of resources and transmission of information and risk, and facilitating the exchange, coordination, and distribution of livestock, livestock products, and services. There has been a long-standing research interest in the role livestock markets can play in stabilizing livestock prices and adjusting stocking rates to a temporally and spatially fluctuating resource base. A number of studies have emphasized the efficiency and flexibility of unregulated livestock markets and point to these features as characteristics that could be harnessed to stabilize local prices and facilitate adjustments of livestock stocking rates to local forage resources across time and space (Sandford 1983, Scoones 1994, Fafchamps and Gavian 1996). Given that rainfall in any one year is spatially heterogeneous, regionally-integrated markets could, except in years of widespread drought, work to stabilize local prices (Torry 1986, Kates and Millman 1990). Similarly, by regulating local livestock densities through facilitation of movement of animals from areas of forage scarcity, livestock markets are seen as institutions that could play an important ecological role, particularly in dryland areas (Fafchamps, Udry, and Czukas 1998). In this way, livestock markets could play important roles in sustaining rural livelihoods and the environment.

However, the reality of imperfect information, insecure property rights, poor road and transport infrastructure, limited rule of law, and contract enforcement suggests that markets may not function as well as stylized, abstract models of perfect market competition will imply. Livestock market failure could occur as a result of any of the above-listed factors, a combination of them, or as a consequence of failure in other markets (e.g., financial markets). Empirical analyses of price movements have shown that livestock market integration is incomplete, with evidence of market segmentation and lack of price transmission (Arnould 1985, Fafchamps and Gavian 1996). Local livestock prices may be destabilized by trade policies, shifts in urban demand for livestock products, and weather shocks (Williams 1993, Williams et al. 1995, Fafchamps and Gavian 1997).

Price formation in village livestock markets has been shown not to be determined solely by economic forces of demand and supply, but also by

sociopolitical factors (gender, wealth endowments, and village location), reflecting the differential access and powers of people and the social embeddedness of local livestock markets (Turner and Williams 2002). Political economic analyses have consistently argued that the functioning of real grain and livestock markets within drought-prone regions has often increased the vulnerability of the rural poor (Watts 1983, Clough 1986, Watts and Bohle 1993). Markets are shown as working differently for the poor and rich due to seasonal and inter-annual differences in the poor's dependence on and participation in formal markets. People near the subsistence floor sell their livestock to purchase grain in periods when local grain reserves are low and prices high. Also, dramatic livestock price volatility due to informational disparities between buyers and sellers, low market density, and imperfect spatial arbitrage tend to dampen market participation rates by poor pastoralists, as observed in Northern Kenya livestock markets by Barrett and Luseno (2004).

Other studies have addressed the microeconomic behavior of market actors, such as livestock traders. These studies have highlighted the high transaction costs faced by these economic agents, and their reliance on social networks to enforce contracts and reduce risk (Ariza-Nino et al. 1980, Delgado and Staatz 1980, Holtzman and Kulibaba 1994, Fafchamps 2004). Furthermore, the persistence of firm size heterogeneity reported in some studies of food marketing in Africa focuses attention on barriers to enterprise expansion and mobility of firms from one category to the next within the marketing chain. Prominent among these barriers are substantial start-up costs, inadequate access to working capital, market information, bulk storage and transport, and a reliable network of buyers and suppliers (Bauer 1965, Caves and Porter 1977, Fafchamps 1994, Barrett 1997).

The picture that emerges from this brief review is that the institutional, infrastructural, and social conditions under which livestock markets operate lead to market outcomes that are decidedly non-neutral in their impact on different categories of livestock producers and traders. A deeper understanding of how livestock markets function for the poor will contribute to contemporary policy debates on how to design more effective policies and programs to make markets work better for the poor.

Background on Livestock Markets and Marketing Channels in the Central Corridor of West Africa

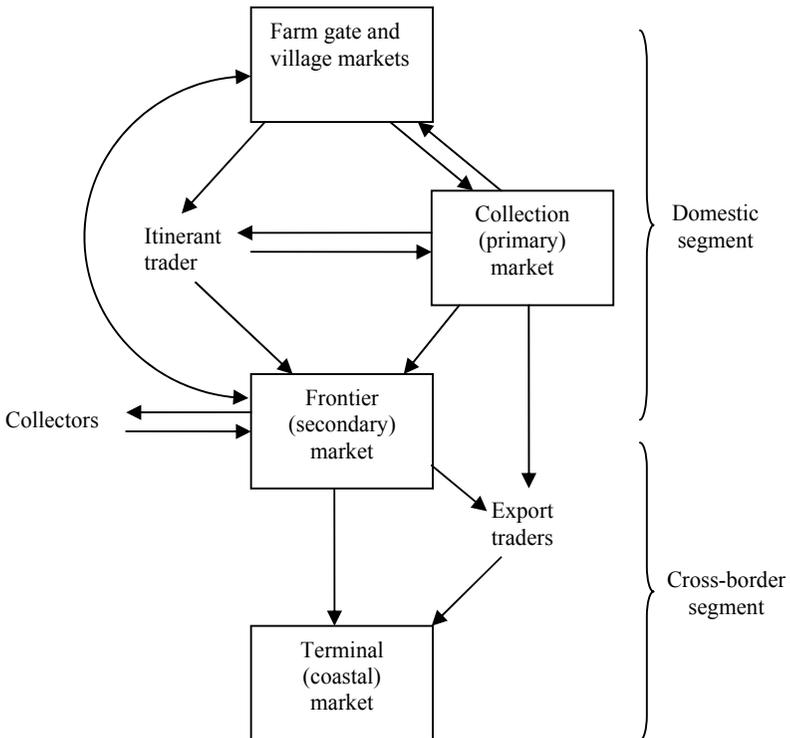
In the central corridor of West Africa, livestock markets and trade have historically linked the Sahelian countries in the semi-arid zone—Burkina Faso, Mali and Niger—with coastal countries in the humid zone—Côte

d'Ivoire, Ghana and Nigeria. The biophysical environment in the Sahel which favors livestock production enables countries in this zone to produce surplus animals which are exported to the coastal countries. The trade is dominated by live animals, particularly cattle, with trade in processed livestock products quite negligible.

Although livestock markets predate the colonial period, livestock marketing fundamentally changed during the colonial era. Commercial circulation of livestock deepened with the imposition of taxes in currency (Dupire 1962, Okediji 1972), and the orientation of marketing channels changed to supply not only domestic markets in the Sahel, but also large urban centers in coastal countries.

The marketing channel consists of three segments (figure 1). Trade in live animals generally starts at the farm gate and centrally located rural markets that serve groups of villages, i.e., primary or collection markets. Frontier markets—markets that are strategically located along the border of neighboring countries to facilitate cross-border trade—provide a location for regrouping animals purchased upstream destined for export, but non-export transactions also take place in these secondary markets. Animals bought at collection markets are usually transported on-the-hoof to the frontier markets. Domestic livestock marketing ends at this point. Livestock keepers¹ and smallholder crop-livestock farmers have three options in selling their animals within this marketing channel: (1) sell to itinerant livestock traders at the farm gate, (2) sell at a collection market, and (3) directly at a frontier market. In reality, they make use of all the three options, albeit to varying degrees, depending on household characteristics (urgency of need, availability of a person to trek animals to the market) and proximity to markets. Also, the flow of animals to collection and frontier markets is not strictly unidirectional as pastoralists and farmers also buy animals for breeding, fattening, and draft power from these markets. The cross-border segment of the marketing channel extends to terminal markets in Côte d'Ivoire, Ghana, and Nigeria. This segment is largely operated by export traders. Transportation of animals from frontier to terminal markets at the coast is now mainly by truck following the collapse of the rail system that was previously used in the 1970s and 1980s.

Livestock markets are regulated by the state with government livestock agents checking animal vaccination records and traders' licenses, and collecting market fees on behalf of local governments and municipal authorities. The degree of state oversight generally increases with the size of the market and value of livestock species with cattle sales, for instance, attracting more attention than small ruminants' sales.

Figure 1: Livestock marketing channels in the central corridor of West Africa

In the absence of complete information or formal risk management instruments (credit, insurance, and contract enforcement mechanisms), the transactions entailed in the flow of animals through the marketing chain are facilitated through social networks involving livestock owners, traders, and intermediaries. At the farm gate, traders sometimes advance credit to livestock owners to lock them into contracts to ensure a steady supply. Traders use intermediaries to obtain information on prices, types, grades, and number of animals available in surrounding villages, and generally to shorten the time spent in search of sellers and animals to buy. In the market, brokers link buyers to sellers, moderate price negotiations, enforce terms of exchange, and witness the transfer of animals from buyer to seller. By acting *ex ante* to provide market information and *ex post* to participate in market transactions and enforce contractual obligations, intermediaries perform key functions to reduce transaction costs.

Study Area

The livestock marketing study reported in this paper was a component of a larger project funded by the Common Fund for Commodities and jointly implemented by Comité Permanent Inter-États de Lutte contre la Sécheresse dans le Sahel (CILSS), an intergovernmental organization, and the International Livestock Research Institute (ILRI). The main objective of the project was to improve livestock marketing and intra-regional trade in West Africa by addressing infrastructural, institutional, and policy constraints confronting livestock producers and traders. CILSS handled the market infrastructure development work, while ILRI focused on livestock marketing research. Three frontier markets located at Sikasso in southern Mali, Niangoloko in southern Burkina Faso, and Bittou in eastern Burkina Faso, where trading used to take place in open unsecured areas, were selected for upgrading. In each of these locations, CILSS fenced the market area, constructed animal holding pens, watering troughs, feeding stalls, sick bays, meeting and store rooms, and installed weighing scales. The three frontier markets were, therefore, purposively selected as the main sites of investigation for the analysis reported in this paper, although the entire marketing channel extending over the three levels described above was studied.

The Sikasso market is located about 100 km from the Malian border with Côte d'Ivoire and handles cattle destined for export, local slaughter, and other uses on a daily basis. This market had feeding stalls, water troughs, a feed storage room, and a truck loading ramp, but no facility for weighing animals at the time of the market surveys. To estimate the weight of animals, heart-girth measurements were taken by trained enumerators and then converted to liveweight using conversion factors derived from a regression model (details available from the authors on request). About 10 percent of the animals traded during the survey period were brought directly to this market by producers from surrounding villages. Along this marketing channel, the bulk of the cattle destined for export are purchased by traders at farm gates and upstream primary markets and are only trekked to the Sikasso frontier market for loading into trucks to be transported to Côte d'Ivoire. Most of the animals that actually changed hands in the Sikasso market were purchased for local slaughter.

The Niangoloko market is located right on the border between Burkina Faso and Côte d'Ivoire and operates mainly on Saturdays, although animals may be brought to the market for sale and resale any day of the week. Over 70 percent of the animals traded in this market during the survey period were supplied by producers. The market had holding pens, water troughs,

feed storage and meeting rooms, truck loading facilities, and weighing scales that worked throughout the survey period except for a three-week period in August 2000. Veterinary officials regularly visited the market to vaccinate and check the health of animals during the survey period.

The Bittou livestock market is at the border between Burkina Faso, Ghana, and Togo and is open every third day for livestock transactions, with animals exported from this market going mostly to Ghana. Approximately 40 percent of cattle traded over the survey period were brought directly to this market by producers and sold to buyers through brokers. The market had facilities similar to those in Niangoloko, but the weighing scale was at a short distance from the central part of the market, which necessitated moving animals through a poorly maintained corridor which becomes impassable during the rainy season. As a result, it was not possible to weigh all the cattle traded in this market. Information on activities in other markets in the supply chain was captured through weekly market transactions and traders' surveys described in more detail below.

Research Methods

Data Collection

Preliminary investigation to establish sampling frames, profiles of market participants, and major features of each market started in June 1999, but regular market surveys on a weekly basis commenced in December 1999 and ended in June 2001. Data collected through weekly market transactions surveys by trained enumerators included information on the geographic origin of the sale animal, price at the point of origin, mode and cost of transportation to the market, weight, sex, age, condition, breed, color, purpose of purchase, type of seller, type of buyer, arbitrage functions performed by different marketing agents, sale price at the frontier market, total number of animals presented for sale on a market day, and number actually sold.² In all, 19,001 transactions involving 11,419 cattle, 3,612 sheep and 3,970 goats were recorded in the three frontier markets with the following specific breakdown: Sikasso (7,404 cattle), Niangoloko (2,230 cattle) and Bittou (1,785 cattle, 3,612 sheep and 3,970 goats). Only a subset of the cattle data was utilized in the analysis presented below due to incomplete information on some of the transactions (e.g., no recorded or estimated weight, missing farm gate price, or indeterminate animal age). As a result, only 3,738 observations involving cattle with actual or estimated weights and other relevant transactional details were utilized in our analysis.³

In addition to weekly market transactions data collected in each of the three frontier markets, traders in these markets were also surveyed

using structured questionnaires. Two sets of interviews were conducted at different periods during the study to capture seasonal variations in trading activities. The first occurred from July to November 2000 during the rainy season, while the second was conducted in the dry season from March to June 2001. The questionnaire used consisted of three parts. Part one focused on traders' profiles, including level of education, equipment, assets and financial resources, trading history, trading practices, and economic activities other than livestock trading. Part two dealt with the purchase of animals and transport to the frontier market, while the third part addressed issues related to export trade. Information was collected on volume of trade, costs, taxes, levies, credit, interest rates, transport regulations, and enterprise development initiatives by local and central governments and their effects on domestic and cross-border livestock trade.

Analytical Methods

To identify factors influencing cattle prices and address the question of how well information on buyer preferences is transmitted through prices to producers, a hedonic price model was fitted to the cattle transactions data. The underlying hypothesis is that traded cattle have utility bearing attributes and the values of those attributes contribute to the price of the animal. In the marketplace, utility maximizing buyers and sellers interact to establish the market value for a given attribute. The observed price of an animal is therefore a composite of the implicit values of the animal's attributes. If buyers show systematic preferences for specific cattle attributes and are willing to pay prices consistent with their preferences, farmers can use such price signals to alter their production and marketing strategies to increase the benefits obtainable from marketing animals.

In this paper, an animal's price is hypothesized to be affected by its biological and physical characteristics, seller and buyer characteristics, purpose and season of purchase, and market location. Characteristics that are likely to influence the price of an animal include its age, sex, breed, weight, and body condition. The price of an animal may also be affected by the purpose of buying (slaughter, fattening, breeding, draft power, domestic resale, export) and the type of seller or buyer (trader, farmer, livestock keeper, or butcher). The marketing factors considered as affecting prices were season and location of market. Sales occurring in a given year were divided into four seasons: cool dry (January 1–March 31), hot dry (April 1–June 30), rainy (July 1–September 30) and harvest (October 1–December 31).

After some specification testing, we settled on the log livestock price as the dependent variable of the hedonic price function. A separate model

was estimated for each of the three frontier markets, and for all markets combined. The models were estimated using the AnCov procedures of SAS.

To address the question of what barriers exist within the market channel for different categories of livestock traders (or firms) and to gain an understanding of the marketing chain operations, we utilized data collected through the traders' surveys. First, we used traders' assets and trading practices to categorize them into three mutually exclusive groups. We then analyzed each group's start-up capital requirements, sunk costs, access to working capital, and network of suppliers and buyers to investigate what mobility or enterprise expansion barriers, if any, exist within the marketing chain. Second, we linked traders' assets and business practices to evidence on traders' net margins using data on marketing, operating, and transaction costs. By investigating the relationship between costs faced by individual traders and their margins, we are able to evaluate how efficient traders' marketing activities are.

A livestock trader's assets in the study area will include human capital (level of education, years of experience in livestock marketing), physical capital (equipment, transport vehicles), financial resources (working capital, loans), and social capital. Business practices include a trader's search behavior, inspection of animals before purchase, reliance on networks, use of intermediaries such as agents and brokers, methods of payments, and investment behavior. Traders' assets and trading practices, together with infrastructure (roads, communication and market facilities) and government policy on taxation, business registration, and incentive measures, directly influence the extent of traders' commercial activities viewed in terms of purchases, sales, transport, and arbitrage functions. The framework utilized in this investigation therefore allows the analysis of barriers to mobility from one trader's category to the next within the marketing chain, as well as the impact of trading practices on the efficiency of market activities performed by traders.

Results and Discussion

Livestock Producers

Our study did not find any regulation compelling livestock producers to sell or buy animals from any particular market or through particular traders. The sale of animals through specific outlets reflected efforts by producers to sell their animals at market levels and channels that provided them the best deal subject to information, transport, and other constraints they might have to grapple with.

The livestock producers were uniformly small-scale, poor livestock breeders (pastoralists) and crop-livestock farmers offering individually one to four animals for sale at a time, usually at the farm gate but also at collection and frontier markets, where prices are often higher than the farm gate. Traders perform the function of assembling these animals, sorting and grouping them for sale at all three market levels shown in figure 1.

Table 1 shows the distribution of weighed cattle traded in the three frontier markets. Livestock keepers alone supplied about 91 percent of the cattle traded in Niangoloko market, while livestock keepers together with farmers supplied almost 40 percent of the cattle sold in Bittou market. The situation was different in Sikasso where traders constituted the single most important group of sellers. More male than female cattle were traded in Niangoloko and Bittou, but the reverse was the case in Sikasso, where more than half (54 percent) of the animals sold were females. The latter market also recorded the largest proportion of traded castrates. Cattle breeds found in the markets include the humped zebu, humpless taurines—N'Dama and shorthorns (e.g., Méré)—and various crosses of zebu and shorthorns and zebu and N'dama collectively called Métisse. The taurines generally display trypanotolerance, i.e., varied levels of adaptation to the tsetse fly transmitted disease, trypanosomiasis, while zebras possess little or no trypanotolerance but have a bigger body frame compared to the taurines. Zebu breed accounted for 96 percent and 52 percent of the animals traded in Bittou and Sikasso markets, respectively. This breed was not recorded in Niangoloko, where Métisse accounted for 56 percent of the total number of cattle traded, followed by another crossbred called Dgogan (34 percent). The majority of cattle sold in the three markets were in good body condition (i.e., median in the body condition classification utilized), but the highest proportion (22 percent) of traded cattle in excellent body condition was recorded in Niangoloko. More than half of the cattle were sold in the dry season from January-June in all of the markets. In Niangoloko and Bittou markets most cattle were bought for export, but in Sikasso (as explained earlier) most of the cattle actually traded in that market (75 percent) were destined for local slaughter.

Table 2 shows that cattle were generally marketed at about seven years of age, weighing approximately 250kg. Cattle from Burkina Faso (i.e., Bittou and Niangoloko) were marketed at five to six years of age (i.e., two to three years earlier than in Sikasso, Mali). Since it is normal for cattle in this region to attain a liveweight of 250kg from about four years of age, the lower age at marketing in Bittou and Niangoloko suggests that the offtake rate may be higher in Burkina Faso than in Mali. As would be

Table 1: Percentage distribution of cattle traded by market, animal characteristics, season, type of seller, and purpose of purchase

	Niangoloko n = 1940	Bittou n = 839	Sikasso n = 959	All n = 3738
<i>Frontier Market</i>				
Niangoloko				51.9
Bittou				22.4
Sikasso				25.7
<i>Type of Seller</i>				
Livestock keeper	91.4	29.7	5.8	55.6
Farmer	4.6	9.3	3.4	5.3
Trader	3.7	61.0	89.8	38.7
Others	0.3	0	1.0	0.4
<i>Animal Characteristics</i>				
<i>Sex</i>				
Female	36.8	30.2	54.3	39.8
Male	48.9	66.7	16.7	44.7
Castrates	14.3	3.0	29.0	15.5
<i>Breed</i>				
Métisse	56.4	0	45.2	40.9
Local Crossbred	0	3.9	0	0.9
Dgogan	33.8	0	0	17.5
Zebu	0	96.1	52.0	34.9
Méré	9.8	0	0	5.1
N'dama	0	0	2.8	0.7
<i>Body Condition</i>				
Very lean	0.3	2.9	1.0	1.0
Lean	5.3	17.8	18.8	11.5
Good	46.9	42.1	50.8	46.6
Very good	25.6	32.2	23.7	26.8
Excellent	21.9	5.0	5.7	14.1
<i>Season of Sale</i>				
Cool dry (January 1 – March 31)	24.0	44.7	32.7	30.9
Hot dry (April 1 – June 30)	35.3	23.6	36.0	32.8
Rainy (July 1 – September 30)	19.6	12.0	31.3	20.9
Harvest (October 1 – December 31)	21.1	19.7	0	15.4
<i>Purpose of Purchase</i>				
Slaughter	2.9	1.7	74.6	21.0
Fattening	0.7	3.5	0	1.2
Draft power	3.9	3.3	0.2	2.8
Breeding	2.0	1.1	0.5	1.4
Domestic resale	32.0	41.0	0.5	25.9
Export	58.5	49.4	24.2	47.7

Table 2: Mean age, weight, and price of cattle traded by market

Parameter	Market							
	Niangoloko (<i>n</i> = 1940)		Bittou (<i>n</i> = 839)		Sikasso (<i>n</i> = 959)		All markets (<i>n</i> = 3738)	
	Mean	s.d.	Mean	s.d.	Mean	s.d.	Mean	s.d.
Age of cattle (years)	5.6	2.6	5.0	1.7	7.7	1.9	6.9	2.3
Weight (kg)	253.2	61.2	250.3	83.5	256.4	56.3	253.3	65.7
Price at initial market of purchase (US\$/kg liveweight)	0.57	0.13	0.68	0.14	0.63	0.17	0.59	0.14
Price at frontier market (US\$/kg liveweight)	0.63	0.13	0.71	0.15	0.69	0.25	0.66	0.18

expected, mean price per kg liveweight at each frontier market was higher than comparable prices at upstream primary markets and farm gates.

Table 3 summarizes the results of the hedonic price model for cattle in each frontier market and for all markets combined. The models had adjusted R^2 values ranging from 0.208 for Bittou market to 0.508 for Niangoloko market. The F-statistics were highly significant for all the models.

The results show that animal attributes clearly affect cattle prices, as previous studies in the region (Jabbar 1998, Turner and Williams 2002) and elsewhere (Barrett et al. 2003) have shown. The coefficients for age variables were statistically significant. The coefficients for *age* and *age*² had positive and negative signs, respectively, indicating as expected that after a certain age, the price offered for cattle will decline. The price maximizing age was estimated to be approximately 9 years in Niangoloko, 10.5 years in Bittou, and 12 years in Sikasso, implying that the turning point is reached 1.5 to 3 years earlier in Burkina Faso compared to Mali. However, considering the range of services that cattle provide for farm households in the region (traction power, milk, and manure) and the cost (e.g., of feed) and risk (of theft or animal death) of holding on to an animal, the price maximizing age may not necessarily be the best time to sell an animal. The opportunity cost of selling an animal will have to be considered before a final decision is made.

Female cattle were sold for significantly less than castrated male cattle in Niangoloko and in all markets combined, but no differences in prices were found in Bittou and Sikasso. Only in Sikasso did male cattle attract a significantly higher price per kg liveweight than castrates. Animal body condition plainly influences sales prices as animals rated less than excellent were sold for significantly lower prices in each market and in all

Table 3: Estimated coefficients (x 100) for natural log of animal sale price per kilogram liveweight by market

Parameter	ALL n = 3738		NIANGOLOKO n = 1940		BITTOU n = 839		SIKASSO n = 959	
	B	t	B	t	B	t	B	t
Intercept	618.70***	90.69	609.30***	89.67	589.50***	38.81	604.40***	77.71
Age	1.27**	2.29	1.32**	2.09	4.12***	3.20	3.07**	2.22
Age-squared	-0.16***	-4.22	-0.146***	-3.44	-0.39***	-3.97	-0.253***	-2.83
<i>SEX (default is Castrates)</i>								
Female	-6.02***	-5.54	-10.50***	-7.79	-3.96	-0.85	-2.78	-1.42
Male	-0.81	-0.76	-1.74	-1.41	-2.65	-0.61	4.33*	1.86
<i>CONDITION SCORE (default is Excellent)</i>								
Very lean	-39.80***	-12.11	-13.70*	-1.76	-22.90***	-4.22	-80.90***	-10.26
Lean	-28.00***	-18.54	-24.10***	-12.19	-17.50***	-4.56	-40.00***	-10.06
Good	-17.20***	-14.37	-16.00***	-12.86	-10.20***	-2.95	-22.80***	-6.27
Very good	-8.02***	-7.21	-7.84***	-7.10	-3.46	-1.02	-7.05**	-2.07
<i>BREED (default is Zebu)^{1/}</i>								
Dgogan	2.59	1.62	6.9***	7.79	-	-	-	-
Local Crossbred	4.89	1.59	-	-	-1.13	-0.30	-	-
Méré	-7.24***	-3.66	-1.6	-1.27	-	-	-	-
Métisse	-4.65***	-3.68	-	-	-	-	-2.08	-1.35
Ndama	-4.18	-1.11	-	-	-	-	-2.57	-0.58
<i>PURPOSE OF PURCHASE (default is Export)</i>								
Slaughtering	-10.20	-1.59	-16.10**	-2.43	-10.10	-0.59	0.72	0.07
Fattening	-3.45	-0.83	-4.104	-0.83	-1.01	-0.14	-	-
Traction	-11.9*	-1.89	-17.8***	-2.98	2.83	0.20	-28.7*	-1.79
Breeding	7.47*	1.82	9.43**	2.37	-1.76	-0.20	64.2***	5.88
Domestic resale	4.53	0.53	3.07***	3.36	0.96	0.53	-32.80***	-3.21
<i>TYPE OF SELLER (default is Farmer)</i>								
Trader	0.59	0.37	-4.72*	-1.70	-0.60	-0.22	1.92	0.44
Livestock keeper	0.59	0.39	1.36	0.76	-4.11	-1.48	5.85	1.18
Others	3.85	0.77	19.80***	3.08	-	-	-3.69	-0.44
<i>TYPE OF BUYER (default is Farmer)^{2/}</i>								
Trader	-11.20*	-1.83	-24.10***	-3.96	4.64	0.33	-	-
Livestock keeper	0.92	0.16	-19.6***	-3.06	14.70	1.15	-	-
Butcher	-8.21	-1.42	-20.8***	-3.64	16.30	0.87	-2.37	-0.23
Others	-5.88	-1.04	-17.40***	-3.32	-	-	-	-
<i>SEASON (default is Harvest)^{3/}</i>								
Cool dry	3.09***	2.92	-2.15**	-1.97	4.75**	2.14	0.76	0.40
Hot dry	11.10***	10.88	12.90***	13.19	11.30**	4.81	-2.24	-1.20
Rainy	10.20***	9.40	12.30***	11.17	9.01***	3.48	(0)a	(0)a
<i>FRONTIER MARKET (default is Sikasso)</i>								
Niangoloko	-16.50***	-9.64	-	-	-	-	-	-
Bittou	-6.51**	-2.01	-	-	-	-	-	-
R-squared	0.364		0.508		0.208		0.357	
F-Statistic	46.439***		65.938***		9.708***		42.456***	

*** p < 0.01, ** p < 0.05, * p < 0.1; - variable not included in the model

^{1/} Except Niangoloko where default is Métisse. ^{2/} Except Sikasso where default is traders.

^{3/} Except Sikasso where default is rainy season.

markets combined. The only exception was in Bittou, where no significant price difference was observed between cattle rated to be in very good and excellent body conditions. Also in Niangoloko, the discount for lean condition was higher in magnitude than that for very lean. This could be due to the subjectivity of categorical descriptions and a failure to clearly distinguish between two proximate body conditions (e.g., very lean vs. lean or very good vs. excellent). Nonetheless, the overall results for the body condition variable suggest that cattle prices are likely to increase with improvement in body condition.

With regard to breed, the combined all market model results show that Méré and Métisse breeds attracted significantly lower prices per kg liveweight compared with zebu, though such significant differences were not found in Bittou and Sikasso markets. In Niangoloko market, where no zebu breed was traded, the Métisse breed was the default and here the Dgogan breed attracted significantly higher price per kg liveweight compared with Métisse, though both breeds are crossbred variants.

Compared to prices offered for export cattle, those purchased for traction and slaughter in Niangoloko and for domestic resale and traction in Sikasso attracted significantly lower prices. Although not statistically significant, animals purchased for fattening in each of the three frontier markets attracted lower prices. The higher price for cattle purchased for export is not surprising given the open knowledge that when these animals are sold in external urban terminal markets in coastal countries, with relatively higher income consumers, they will fetch even higher prices. With the exception of Bittou market, breeding cattle in other markets attracted significantly higher prices than export cattle, possibly reflecting the value attached to the reproductive functions they are expected to perform to ensure herd growth and continuity.⁴

Sellers' primary vocation did not appear to be especially important in price determination in the markets studied, except in Niangoloko where occasional sellers grouped in the "others" category tend to obtain higher prices than farmers. Also, in Niangoloko all other categories of buyers paid significantly lower prices for cattle compared to farmers. In the combined markets model, the results show that traders in particular paid a significantly lower price per kg liveweight for cattle purchased compared to farmers. This could be due to traders' bargaining skills or market power that they possess through the volume of their transactions.

With regard to seasonality, prices obtained during the hot dry and rainy seasons were significantly higher compared with the harvest season,

Table 4: Mean price (US\$/kg liveweight) by grade of cattle and by market

Market		Body condition score					
		Very lean	Lean	Good	Very Good	Excellent	All cattle
Niangoloko	Price/kg liveweight (US\$)	0.49	0.48	0.59	0.65	0.73	0.63
	Std. deviation	0.11	0.14	0.11	0.13	0.11	0.13
	% of cattle in category	0.3	5.3	46.9	25.6	21.9	100
Bittou	Price/kg liveweight (US\$)	0.59	0.65	0.70	0.76	0.78	0.71
	Std. deviation	0.18	0.17	0.15	0.13	0.12	0.16
	% of cattle in category	2.9	17.7	42.1	32.2	5.0	100
Sikasso	Price/kg liveweight (US\$)	0.36	0.55	0.67	0.79	0.86	0.69
	Std. deviation	0.06	0.12	0.30	0.16	0.18	0.25
	% of cattle in category	1.0	18.0	49.9	24.5	6.6	100
All markets	Price/kg liveweight (US\$)	0.52	0.57	0.63	0.72	0.75	0.66
	Std. deviation	0.18	0.16	0.20	0.15	0.12	0.18
	% of cattle in category	1.0	11.5	46.6	26.8	14.1	100

except in Sikasso where there was no clear pattern. The higher prices during the hot dry and rainy seasons could have been due to fewer animals being presented for sale due to lack of adequate forage/ pasture in the dry season or poor road infrastructure that makes access to markets difficult in the rainy season. Assuming these and other constraints could be overcome, livestock producers can take advantage of higher prices during these two seasons to bring their animals to the market at these periods.

When the three market locations are considered, Niangoloko and Bittou recorded significantly lower prices per kg liveweight compared with Sikasso market. Cattle were cheapest in Niangoloko. Possible reasons for the difference in prices include variations in the structure of the marketing channels and the degree of integration of frontier markets with primary and tertiary markets.

In sum, the model results indicate that animal age, sex, breed, body condition, purpose of purchase, season of sale, and market location are the most significant factors influencing shortrun cattle prices in the study region, even though the relative effects of these variables on prices differ from one market to another.

The results of the price formation models which indicated significantly higher prices for cattle in excellent body condition elicited further analysis to determine prices actually paid per kg liveweight for the five grades of cattle included in this study. As table 4 shows, there was a gradual increase in price paid as body condition improved from “very lean” to “excellent.” Price per kg liveweight in all markets combined increased from \$0.52 (± 0.18) for very lean cattle to \$0.75 (± 0.12) for cattle in excellent body condition, with the widest range in prices occurring in Sikasso where very lean cattle only attracted \$0.36 (± 0.06) compared to \$0.86 (± 0.18) for cattle in excellent body condition. Similar patterns were found generally

in Bittou and Niangoloko frontier markets and reinforce the existence of higher prices for well finished animals. But is this information on buyer preferences and the higher prices they are willing to pay for cattle in excellent body condition transmitted through the market to producers?

Table 5, which presents mean prices received by producers (small-scale livestock keepers and farmers) selling animals directly to buyers at frontier markets, provides evidence which indicates that producers are aware of this information and do receive prices commensurate with the grades of cattle marketed. The table also shows, as indicated earlier, that a good proportion of animals sold in frontier markets are marketed there directly by livestock producers themselves.

However, as tables 1 and 4 show, producers were not yet fully taking advantage of the market opportunity presented through higher prices for cattle in excellent body condition, as less than a fifth (14 percent) of the 3,738

Table 5: Mean price (standard deviation) received by livestock producers for different cattle grades at frontier markets^{1/}

Castrates	Sample size (n)	Price US\$/kg liveweight (std. dev.)
Lean	2	0.63 (0.02)
Good	50	0.66 (0.14)
Very Good	93	0.70 (0.12)
Excellent	186	0.73 (0.10)
Total sample size and mean price for all grades of castrates	331	0.71 (0.11)
Male		
Very Lean	5	0.52 (0.12)
Lean	40	0.67 (0.23)
Good	532	0.63 (0.13)
Very Good	355	0.72 (0.14)
Excellent	225	0.76 (0.11)
Total sample size and mean price for all grades of male cattle	1157	0.68 (0.15)
Female		
Very Lean	15	0.52 (0.14)
Lean	147	0.53 (0.10)
Good	456	0.57 (0.09)
Very Good	161	0.58 (0.09)
Excellent	38	0.61 (0.09)
Total sample size and mean price for all grades of female cattle	817	0.56 (0.11)

^{1/} All frontier markets combined. Note: Total sample size in this table is lower than the sample size used in the econometric analysis since only cattle sold directly by producers at the frontier markets are considered here.

cattle considered in our analysis possessed the characteristics preferred by buyers. A significant proportion of the cattle sold (74 percent) were in the median range of “good” (47 percent) to “very good” (27 percent).

Many reasons could be adduced for the inability of smallholders to capitalize on this favorable market condition, but we focus on only three. First, producers may be more inclined to retain animals in excellent body condition in their own herds for several reasons including breeding, provision of traction power, supply of milk and manure, and fulfillment of social obligations (e.g., dowry or slaughter during major festivals). Evidence to support or disprove this assumption can only come from household level investigation of livestock production goals of smallholders, which we did not cover in this study. However, findings from other livestock marketing studies conducted at the household level in the region (Turner and Williams 2002) indicate that the animals of choice for slaughter during festivals are small ruminants. Also, evidence presented in tables 1 and 4 point to a significant proportion (74 percent) of animals in categories next to excellent (i.e., good and very good) being sold. Taken together, these points plausibly suggest that retention of excellent animals in the herd may not be the principal reason for not selling animals in this category. A second possible reason for the inability of producers to take advantage of higher prices for cattle in excellent body condition could be due to constraints such as lack of feed, credit, and good rural road and transport infrastructure dampening supply response even in the face of favorable prices. Impassable rural roads during the rainy season, reliance on feed from rangelands, feed shortages in the dry season, and lack of credit to buy supplementary feeds are some of the constraints commonly encountered in the study area and were cited as impediments to livestock production and marketing by both producers and traders alike during our surveys. Thirdly, even when these constraints are non-binding, the cost of fattening and finishing animals to excellent body condition may outweigh the benefits. But there is evidence of financial and economic profitability of cattle fattening in the region. Metzger et al. (1997) reviewed various fattening programs in Mali and estimated benefit/cost ratios averaging 1.85 for large-scale and 4.08 for small-scale cattle fattening. This implies that efforts to finish animals properly through fattening before marketing will be well compensated. In sum, what this discussion points to is that constraints that tend to lower supply response should be tackled in order to assist producers to market animals that will fetch higher prices and ultimately increase their incomes.

Traders' Activities

With respect to livestock traders, table 6 provides information on human capital (education and experience), trading history, and sources of start-up and working capital. Thirty-three percent of all the traders had no formal education. More than half have been operating as livestock traders for more than ten years. Eleven percent of the traders worked as an agent (assisting full-fledged traders in buying and transferring animals from one market to another) or as a broker in the same market prior to initiating their current trading operation. Working as an agent or broker is viewed as a means of acquiring experience. But more importantly, and as will be seen in table 7, livestock trading involves substantial start-up capital (about \$832–\$2,653 for a small-scale trader) when compared to the average national income per capita, which in the study countries in 2002 ranged from \$220 in Burkina Faso to \$610 in Côte d'Ivoire. As a result, some traders initially act as agents or brokers to build up financial capital and social capital (reputation, trust, network) or enter into partnership with established traders before launching their own business. Start-up and working capital mostly comes from own sources. External finance is extremely limited, and loans from financial institutions are rare and heavily concentrated on a small fraction of large traders. With reliance on own funding and the meager level of income of most traders, partnership will appear to be an appropriate strategy to pool funds and operate as a large trading enterprise. However, as table 6 shows, most of the traders operate as sole proprietors. Fear of losing money and conflicts with partners were cited as the main reason for operating sole proprietorships, and partly reflect the limited applicability of formal market instruments such as commercial law and dispute settlement mechanisms in rural areas.

Table 7 shows the three categories of traders found in the study markets, together with the corresponding start-up capital and average number of animals purchased per trading trip. Small-, medium-, and large-scale traders correspond to itinerant-, collector-, and export-traders, respectively. Itinerant traders are usually small traders with similar socio-cultural backgrounds and close relationships with livestock producers. They use the social capital built up over the years to enter into special buying arrangements with producers (e.g., buying on credit). Collectors have weaker ties with livestock producers and mostly operate the livestock marketing channels between the collection and frontier markets. At the top of the ladder are export traders operating mainly between the frontier and terminal markets (i.e., in the cross-border segment of the marketing

Table 6: Profile of livestock traders in Niangoloko, Bittou and Sikasso markets

Profile	Percentage			
	Niangoloko (n=31)	Bittou (n=32)	Sikasso (n=46)	All traders
Education				
No formal education	15	38	46	33
Islamic education	59	40	45	48
Primary school	16	5	9	10
Secondary school	6	17	0	7
Experience in livestock trade (years)				
1 – 3	13	9	2	8
4 – 6	44	16	3	21
7 – 9	19	9	17	15
> 10	24	66	78	56
Past occupation				
Trader	96	81	89	89
Agent in another market	0	13	0	4
Broker in this market	4	6	11	7
Source of initial funds				
Own	97	97	96	96
Borrowed	0	0	2	1
Own + borrowed	3	3	2	3
Source of funds now				
Own	87	75	95	86
Borrowed	0	0	0	0
Own + borrowed	13	25	5	14
Partnership status initially				
Alone	84	91	80	85
In partnership	16	9	20	15
Partnership status now				
Alone	100	94	87	94
In partnership	0	6	13	6

chain). At the time of the study, small-scale traders in Sikasso required \$832 to start a livestock trading business, with large-scale traders requiring \$5,600—almost seven times the amount needed by the former. On a single trading trip, small-scale traders in Sikasso will, on the average, purchase about six cattle for resale, compared to an average of twenty-seven cattle for large-scale traders. Due to the relatively capital intensive nature of cross-border trade, only a few traders can mobilize sufficient funds to participate in the export trade—hence the limited number of large-scale traders (exporters) in all the markets. Although all three categories of traders operated in the domestic segment of the value chain, the cross-

border segment was the exclusive preserve of large-scale traders. Lack of financing appears to constitute a barrier to enterprise expansion and the mobility of small and medium-scale traders willing to venture into cross-border trade. The high degree of concentration in the export segment of the marketing chain is consistent with what Little (1992) also found in the Horn of Africa, and would suggest a relatively less competitive environment in that segment.

Costs

Both physical marketing costs (e.g., animal transportation and handling costs) and transactions costs (e.g., search and negotiating costs) are incurred by traders in the process of assembling, transporting, and selling cattle. Up to twelve types of costs were identified, but for the purposes of analysis these costs were classified into ten categories: (1) market entry fees and village/municipal taxes, (2) handling costs (loading and off-loading of animals), (3) drovers' fees, (4) commission paid to purchase and sales intermediaries, (5) transport cost, (6) animal vaccination and health certificate costs, (7) central government duties and taxes, (8) illegal

Table 7: Start-up capital requirement (US\$), number of trade animals per trip and proportion of respondents by trader category

	Location		
	Niangoloko (n=31)	Bittou (n=32)	Sikasso (n=46)
Average start-up capital[†] (US \$)			
Small scale traders	2653 (1813)	869 (830)	832 (701)
Medium scale traders	5931 (3395)	1722 (1582)	2259 (1829)
Big traders (exporters)	14028 (7062)	4759 (3307)	5600 (3910)
Average number of animals purchased on a typical trading trip[‡]			
Small scale traders	7.5 (2.2)	7.1 (10.2)	5.7 (2.5)
Medium scale traders	16.0 (3.9)	13.1 (18.1)	10.9 (7.6)
Big traders (exporters)	37.0 (4.0)	25.3 (22.4)	27.4 (13.9)
Proportion (%) of traders in each category[‡]			
Small scale traders	77	74	65
Medium scale traders	20	13	26
Big traders (exporters)	3	13	9

[†] Based on respondents' own classification which established three categories of livestock traders, start-up capital required to operate in each class, and number of animals purchased per trip by traders in each category. Standard deviation in parentheses.

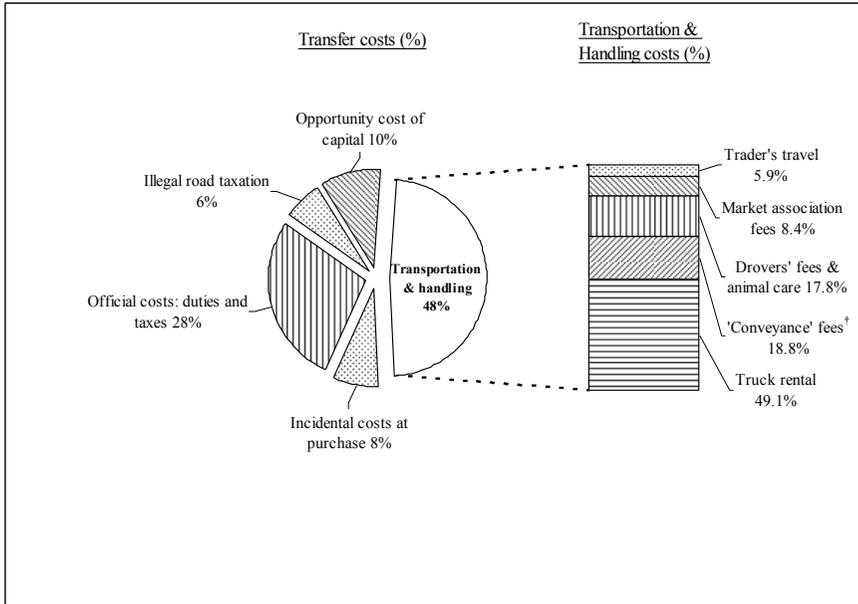
[‡] Actual number of animals purchased by respondents per trip over a period of four weeks were averaged and used to derive the real proportion of traders in each category.

payments collected at road stops, (9) trader's personal travel costs, and (10) opportunity cost of capital.

While traders that operate in the cross-border segment incur all these costs, domestic segment traders only incur a subset. As trekking is the predominant means of moving animals from the farm gate to primary (collection) and secondary (frontier) markets, costs associated with truck hire, loading and off-loading, illegal payments at checkpoints, vaccination, and central government taxes are not incurred by traders operating in the domestic segment. Measured in dollars per ton per kilometer, the average unit transport cost incurred by traders in the domestic segment was estimated to be about \$0.10 compared with \$0.23 for cross-border traders, indicating that average unit transport cost in the cross-border segment was about two-and-a-half times higher than equivalent cost in the domestic segment. Transport cost by mode of transport varied even more dramatically. Average transport cost per ton in the domestic segment was estimated at \$17 compared with \$205 in the cross border segment, reflecting the relatively shorter distance (average of 177 km) and low cost of trekking in the former segment and the longer distance (average of 875 km) and high cost of trucking in the latter segment. When the total cost of cross-border livestock marketing was decomposed, transport and handling represented by far the largest component, i.e., 48 percent of the total cost (figure 2). This confirms other empirical findings that transport and transport-related costs represent the lion's share of agricultural marketing costs in sub-Saharan Africa (Badiane et al. 1997, Fafchamps and Gabre-Madhin 2001).

Margins

Large-scale traders' net margins ranged from 11.6 percent of the final market price of cattle along the Niangoloko-Abidjan corridor to 14.3 percent in the Sikasso-Abidjan corridor. By contrast, net margins for small and medium-scale traders operating in the domestic segment of the marketing chain ranged from 2.7 percent along the Bittou axis to 5.5 percent along the Sikasso axis (figure 3). If the highest trading margin for domestic traders, 5.5 percent, is compared with the lowest trading margin for cross-border traders, 11.6 percent, it is seen that large-scale (export) traders net margins are at least twice as high as the domestic traders' margins. Part of this higher margin is due to the higher risk and costs associated with cross-border trade, as discussed above. Although not fully substantiated here, the limited number of traders in the large-scale category could have created a situation of limited competition and provided an opportunity for traders in

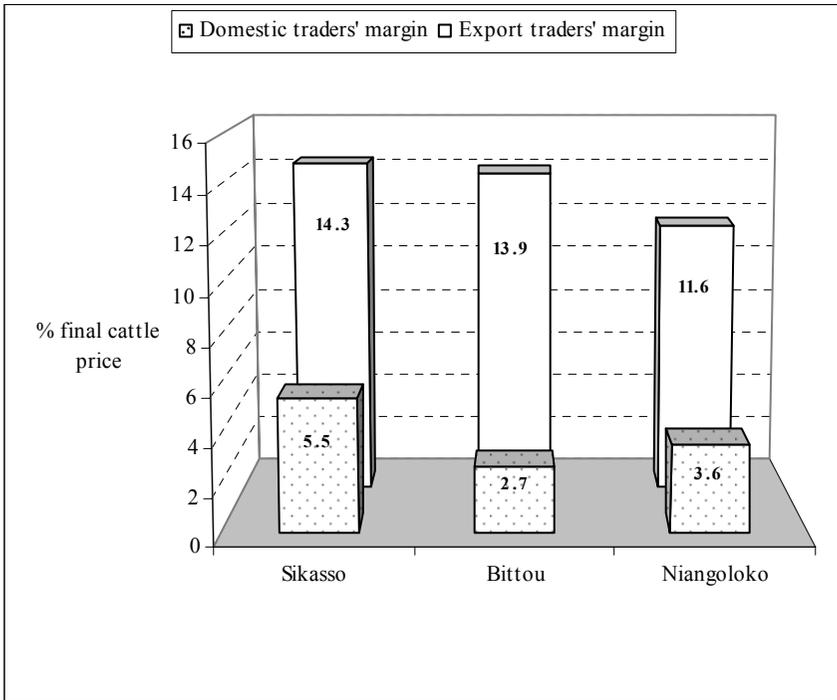
Figure 2: Decomposition of cross-border animal transfer costs

†“Conveyance fees” (*frais de convoyage* in French) refer to the fees paid to conveyance companies that assist traders in obtaining relevant trade papers and generally facilitate cross-border trade.

this category to earn economic rent. Taken together, this situation suggests that making credit available to small and medium scale traders can assist to remove mobility barriers, increase the number of enterprises in the large scale category, and improve competition in the cross-border segment of the marketing chain, with potential benefits to consumers and producers.

The binding constraint that lack of ready access to credit represents is confirmed by livestock traders when they were asked to list the constraints confronting them. The list of constraints, going from the most binding to the least restrictive, was as follows:

- Limited capital and restricted access to credit;
- Too many formalities, fees, and taxes (legal and illegal) collected along the trade route;
- Shortage of trucks at the frontier markets to transport animals to terminal markets;
- Lack of stock routes—routes specifically created to facilitate movement of animals along cultivated areas to prevent damage to crops—for trekking animals to frontier markets;

Figure 3: Net margins of domestic and cross-border traders by market

- Shortage of feed at frontier markets;
- System of selling animals on credit to buyers, which lengthens the time to recover capital outlay;
- Lack of security (risk of losing animals and money) along the trade route.

Conclusions and Policy Options

We have provided evidence to demonstrate that poor, small-scale livestock producers and traders in the central corridor of West Africa are not yet fully taking advantage of the opportunities that domestic and regional markets offer, due to a number of constraints facing them. Many of these constraints, some of which we have highlighted, are well known—a shortage of feed resources in the dry season, poor rural access roads, limited financial capital base, and restricted access to commercial finance and high transport costs. Other constraints—the huge differential in the net margins of small-scale and large-scale traders—are less well-appreciated. The persistence and continuing relevance of these constraints poses a serious challenge to policy makers.

Although information on market preferences appeared to be well transmitted through prices to small-scale livestock producers, they are still largely unable to alter production and marketing decisions to supply in sufficient quantity top quality animals demanded by buyers. The consequence is that they continue to miss out on the market opportunity to earn higher prices and increase profitability and income.

Limited personal financial capital and access to external finance, together with a trading system that relied on social networks, prevented small-scale livestock traders from broadening their business activities. At another level, high transport and handling costs and high taxes hindered the performance of large-scale traders engaged in cross-border livestock trade.

While further research will certainly be helpful to confirm the results of our analysis and better understand the marketing decisions of producers and traders, the information presented in this paper provides some insight into how livestock producers and traders can be assisted to take advantage of market opportunities. Improvements in rural physical infrastructure, and policy interventions to make credit available to small-scale producers for cattle fattening operations and to small-scale traders to expand their business activities will improve access to markets, promote competition in livestock trading, and ensure rapid response to new market opportunities. Reducing cross-border transport costs through reduction of legal and illegal taxes will improve performance in the cross-border segment of the livestock trade. These measures, apart from enhancing the competitiveness of small-scale livestock producers and traders, will also enable them to improve their income base and will ultimately contribute to poverty reduction. This will bring succor to this group of people, who constitute the most numerous but poorest economic agents in the livestock sector in West Africa.

Endnotes

- 1 Livestock keepers refer to sedentary pastoralists with livestock rearing backgrounds but who keep relatively smaller herds (compared to full-fledged pastoralists) and no longer practice transhumance. They often engage in part-time farming.
- 2 Although some of the information collected (e.g., price of animal at point of origin) was based on traders' recall, the short interval between the actual transaction and the reporting, which was less than a week in all cases, reduces but does not entirely eliminate concern about the reliability of recall data.

- 3 We have no reason to believe that the utilized observations are not representative of the entire dataset, but the possibility of selection bias due to the utilization of only a subset of the data should be borne in mind when the results and conclusions are considered.
- 4 There is a likelihood that the type of buyer and purpose of purchase may correlate with unmeasured features of livestock, i.e., animals purchased for a specific purpose may be systematically different from other animals in a way not captured in the data. Thus, significant differences by type of buyer or by purpose of purchase may reflect unaccounted differences in animals bought.

References

- Ariza-Nino, E.J., L. Herman, M. Makinen, and C. Steedman.** 1980. *Livestock and Meat Marketing in West Africa, Volume I. Synthesis, Upper Volta.* Ann Arbor, MI: Center for Research on Economic Development, University of Michigan.
- Arnould, E.J.** 1985. "Evaluating Regional Economic Development: Results of a Marketing Systems Analysis in Zinder Province, Niger Republic." *Journal of Developing Areas* 19: 209–244.
- Badiane, O., F. Goletti, M. Kherallah, P. Berry, K. Govindan, P. Gruhn, and M. Mendoza.** 1997. *Agricultural Input and Output Marketing Reforms in African Countries. Final Donor Report.* Washington, DC: International Food Policy Research Institute (IFPRI).
- Barrett, C.B.** 1997. "Food Marketing Liberalization and Trader Entry: Evidence from Madagascar." *World Development* 25: 763–777.
- Barrett, C.B., F. Chabari, D. Bailey, P. Little, and L. Coppock.** 2003. "Livestock Pricing in the Northern Kenyan Rangelands." *Journal of African Economies* 12: 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: 393–405.
- Bauer, P.T.** 1965. *West African Trade: A Study of Competition, Oligopoly, and Monopoly in a Changing Economy.* London: Routledge and K. Paul.
- Blench, R., R. Chapman, and T. Slaymaker.** 2003. "A Study of the Role of Livestock in Poverty Reduction Strategy Papers." Pro-Poor Livestock Policy Initiative Working Paper, FAO. Rome.

- Caves, R.E. and M.E. Porter.** 1977. "From Entry Barriers to Mobility Barriers: Conjectural Decisions and Contrived Deterrence to New Competition." *Quarterly Journal of Economics* 91: 241–261.
- Clough, P.** 1986. "The Social Relations of Grain Marketing in Northern Nigeria." *Review of African Political Economy* 34: 16–34.
- Delgado, C. and J. Staatz.** 1980. *Livestock and Meat Marketing in West Africa, Volume III. Ivory Coast and Mali*. Ann Arbor, MI: Center for Research on Economic Development, University of Michigan.
- Dupire, M.** 1962. "Trade and Markets in the Economy of the Nomadic Fulani of Niger (Bororo)." In *Markets in Africa*, eds. P. Bohannan G. and Dalton, 335–362. Evanston, IL: Northwestern University Press.
- Fafchamps, M.** 1994. "Industrial Structure and Microenterprises in Africa." *Journal of Developing Areas* 29: 1–30.
- _____. 2004. *Market Institutions in Sub-Saharan Africa: Theory and Evidence*. Cambridge, MA: MIT Press.
- Fafchamps, M. and S. Gavian.** 1996. "The Spatial Integration of Livestock Markets in Niger." *Journal of African Economies* 5: 366–405.
- _____. 1997. "The Determinants of Livestock Prices in Niger." *Journal of African Economies* 6: 255–295.
- Fafchamps, M., C. Udry, and K. Czukas.** 1998. "Drought and Saving in West Africa: Are Livestock a Buffer Stock?" *Journal of Development Economics* 55: 273–305.
- Fafchamps, M. and E. Gabre-Madhin.** 2001. "Agricultural Markets in Benin and Malawi: The Operation and Performance of Traders." Policy Research Working Paper 2734, World Bank. Washington, DC.
- Francis, P.** 1990. "Small Ruminant Marketing in Southwest Nigeria." *Agricultural Economics* 4: 193–208.
- Holtzman, J.S. and N.P. Kulibaba.** 1994. "Livestock Marketing in Pastoral Africa: Policies to Increase Competitiveness, Efficiency and Flexibility." In *New Directions in Pastoral Development in Africa: Living with Uncertainty*, ed. I. Scoones, 79–94. London: Intermediate Technology Publications Ltd.
- Jabbar, M.** 1998. "Buyer Preferences for Sheep and Goats in Southern Nigeria: A Hedonic Price Analysis." *Agricultural Economics* 18: 21–30.
- Kristjanson, P., P.K. Thornton, R.L. Kruska, R.S. Reid, N. Henninger, T.O. Williams, S.A. Tarawali, J. Niezen, and P. Hiernaux.** 2004. "Mapping Livestock Systems and Changes to 2050: Implications for

- West Africa.” In *Sustainable Crop-Livestock Production for Improved Livelihoods and Natural Resource Management in West Africa*, eds. T.O. Williams, S.A. Tarawali, P. Hiernaux, and S. Fernández-Riveria, 19–22. Nairobi, Kenya: International Institute of Tropical Agriculture.
- Kates, R. and S. Millman.** 1990. “Toward Understanding Hunger.” In *Hunger in History*, ed. L. Newman, 3–24. Oxford: Basil Blackwell.
- Little, P. D.** 1992. “Traders, Brokers and Market ‘Crisis’ in Southern Somalia.” *Africa* 62: 94–124.
- Metzel, J., A. Doumbia, L. Diakite, and A.N. Diarra.** 1997. *Can Mali Increase Red Meat Exports? Prospects for Developing Malian Livestock Exports*. Cambridge, MA: Associates for International Resources and Development.
- Okediji, F.** 1972. *An Economic History of Hausa-Fulani Emirates of Northern Nigeria : 1900–1939*. Unpublished PhD dissertation. University of Indiana, Bloomington.
- Sandford, S.** 1983. *Management of Pastoral Development in the Third World*. Chichester: Wiley.
- Scoones, I., ed.** 1994. *Living With Uncertainty: New Directions in Pastoral Development in Africa*. London: Intermediate Technology Publications Ltd.
- Thornton, P.K., R.L. Kruska, N. Henninger, P.M. Kristjanson, R.S. Reid, F. Atieno, A. Odero, and T. Ndegwa.** 2002. *Mapping Poverty and Livestock in the Developing World*. Nairobi: International Livestock Research Institute.
- Torry, W.** 1986. “Economic Development, Drought and Famines.” *GeoJournal* 12: 5–18.
- Turner, M.D. and T.O. Williams.** 2002. “Livestock Market Dynamics and Local Vulnerabilities in the Sahel.” *World Development* 30: 683–705.
- Watts, M.J.** 1983. *Silent Violence: Food, Famine and Peasantry in Northern Nigeria*. Berkeley: University of California Press.
- Watts, M.J. and H.G. Bohle.** 1993. “The Space of Vulnerability: The Causal Structure of Hunger and Famine.” *Progress in Human Geography* 17: 43–67.
- Williams, T.O.** 1993. “Livestock Pricing Policy in Sub-Saharan Africa: Objectives, Instruments, and Impact in Five Countries.” *Agricultural Economics* 8: 139–159.

Williams, T.O., D.A. DeRosa, and O. Badiane. 1995. "Macroeconomic, International Trade and Sectoral Policies in Livestock Development: An Analysis with Particular Reference to Low Income Countries." In *Livestock Development Strategies for Low Income Countries*, eds. R.T. Wilson, S. Ehui, and S. Mack, 47–69. Nairobi, Kenya: FAO/ILRI. ■