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Small-Ruminant Marketing in Southwest Nigeria

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Abstract

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This paper describes the structure of the small-ruminant trade in southwest Nigeria, analyses the factors determining the price of animals, and examines the relationship of prices between markets. Animals imported from the north dominate the sheep and goat trades, and supply and prices are highly seasonal. However, multiple regression shows animal prices to be largely predictable in terms of the characteristics of the animal (breed, sex and live-weight) and the market in which it is sold (location and month of sale). Prices are relatively closely correlated between markets over time, and price relationships between markets reflect the respective structures of the trade in northern and southern animals. Price margins between markets reflect the level of traders' commission and storage costs in addition to the direct costs of transport. The study concludes that there is no evidence for market inefficiency or segregation, and that there is considerable market potential for increased local production of sheep and goats. In policy terms, the market's efficiency implies that government involvement beyond its present, limited facilitative role would not be justified.

Introduction

Sheep and goats are an important and preferred source of meat in southern Nigeria. They are also the main form of livestock raised in the area. Most rural households own a few small ruminants, which are kept both for sale and for home consumption. However, most sheep and goats consumed in the south, especially in urban areas, are imported from the northern parts of Nigeria.

While a fairly substantial literature exists on marketing systems in Nigeria (see, for example, Anthonio, 1968; Jones, 1972; Sudarkasa, 1973), few data are available on livestock marketing. Research on marketing and prices in West Africa as a whole has been predominantly concerned with the trade in staple

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food crops. The major survey of livestock marketing in West Africa undertaken by the University of Michigan's Centre for Research on Economic Development (see Ariza-Nino and Steedman, 1980) did not include Nigeria, the largest country in the zone, and is predominantly concerned with the cattle rather than the small-ruminant trade.

This paper considers the influence of breed, sex, live-weight and time and place of sale on small-ruminant prices in six southwest Nigerian markets. The relationship of prices between markets is also examined to assess the degree of integration between them. The analysis is preceded by a brief description of the structure of small-ruminant marketing in the southwest Nigeria.

Methods

Data were collected between 1981 and 1985 from six markets, two urban and four rural, which were selected purposively to reflect the structure of marketing in the region and on the basis of traders' willingness to participate in data collection. The urban markets were those at Bodija in Ibadan and Akesan in Oyo. The rural markets selected were Egbeda and Apomu, to the east of Ibadan, and Oja and Iware, in the Oyo area (see Fig. 1).

Price data were collected at the two urban markets, which are held daily, for 14 consecutive days of each month. Rural markets are held at either 4- or 8-day intervals. All market days at Egbeda and Apomu were monitored during the first half of each month, and at the other two rural markets, Iware and Oja, market days were monitored during the second half of the month.

On each observation day, species, breed, sex, weight and retail price were recorded for all animals sold in the markets (except at Bodija, where only a sample of transactions could be monitored). Animals were weighed with a spring balance. For each sale, information was also collected on the source of the animal, transport costs, period of storage and commission paid. The number of animals available for sale in each market was recorded on alternate observation days at Bodija and all observation days at the other markets.

This paper uses data collected between January 1983 and May 1985. During this period, over 13 000 transactions were monitored. Statistical analysis was undertaken using the SAS package.

Structure of the small-ruminant trade

The trypanotolerant West African Dwarf sheep and goats are the most important form of livestock kept in southern Nigeria, where trypanosomiasis has restricted the importance of cattle. Flock sizes are small (typically two to six goats and a smaller number of sheep per household), but most rural households keep some animals. In southwest Nigeria animals are usually free-roaming, and management and other inputs are minimal.

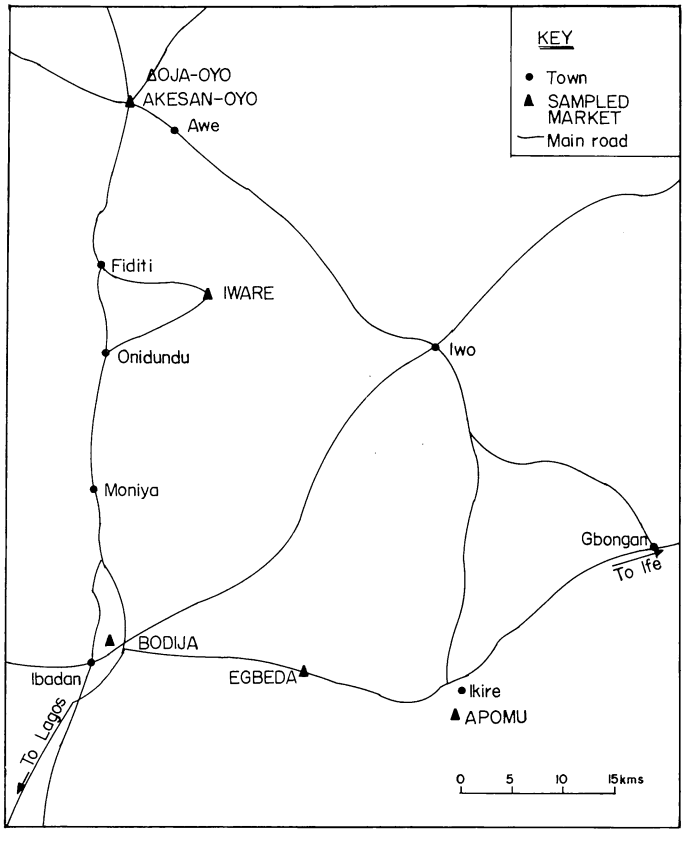

Fig. 1. Part of Southwest Nigeria showing sampled markets.

Village surveys reveal that small ruminants in southwest Nigeria are raised mainly for sale. Matthewman's (1977) data from two villages in the region showed that 93% of male and 43% of female weaned animals were sold outside the village. Nine local adult goats had been killed for home consumption in the year preceding the survey, while fifteen had been sold. Most farmers gave cash income as the main reason for keeping animals (Matthewman, 1977; cf. Okali, 1979). Seventeen percent of Okali's sample had sold at least one animal in the previous twelve months.

Farmers may take their animals to sell at rural markets, but more often they sell to specialist small-ruminant traders, who tour the villages, usually on motorcycles. These traders are known as 'baranda' (from the Hausa word for itinerant trader). Typically, the baranda resell to traders at markets in nearby towns.

Within the southwest of Nigeria, there is an overall flow of local breeds of sheep and goats from the northern, derived savanna, areas towards the coast.

They may be bought and sold a number of times on the way. Many pass through Oranmiyan market in Ibadan, which specialises in southern breeds.

Despite the widespread ownership of small ruminants in the south of Nigeria and the market orientation of producers, production is insufficient to satisfy local demand for small-ruminant meat. Most animals sold in urban markets are imported from the north of Nigeria. Northern animals are also found in rural markets. Of the purchases made over a year by the predominantly rural households in the ILCA baseline survey, 41% were northern animals. In particular, northern breeds made up almost half of the animals purchased for slaughter at ceremonies and festivals (Okali, 1979). Ninety-three percent of the sheep and goats slaughtered during Id El Kabir, equivalent to one per household, in a predominantly Muslim village surveyed by Matthewman (1977), were of northern origin.

The volume of trade from the north is large. In 1984, for example, official figures indicate that over 300 000 slaughter sheep and 1.7 million goats were transported to southern markets by road from northern Nigeria, mainly from Bauchi, Benue, Borno, Kano and Sokoto States (Federal Livestock Department, 1985). The most common breeds of northern goats are the Red Sokoto (Maradi) and Red Kano, while sheep are of the long-legged 'Fulani' type (the Y'ankassa, Balami or Ouda breeds).

The main destinations for animals from the north are Ibadan and Lagos. Smaller numbers of animals pass through Makurdi to the principal markets of the southeast, Onitsha, Enugu, Umuahia, and Port Harcourt (Obi, 1984). For northern animals coming in to the southwest, the main dropping-off point is Bodija market in Ibadan. Animals are bought here and then resold in other urban or rural markets in the region.

There are thus two patterns of movement of small ruminants in southwest Nigeria. Northern breeds of sheep and goat enter the region from the northern states and are redistributed primarily from Bodija market. Southern breeds circulate within the region, moving from rural to urban markets, and from the northern to the southern parts of the southwest.

Southwest Nigeria is well served with markets. Urban markets are generally held every day, while the smaller rural markets meet at either 4-day or 8-day intervals. The two major markets for small ruminants in Ibadan, Bodija and Oranmiyan, are to some extent specialised in the trade, but most markets of any size include an area where sheep- and goat-sellers ply their trade.

Sheep- and goat-selling, unlike many other forms of food retailing, is predominantly, though not exclusively, a male occupation. Traders are specialised, and have usually served an apprenticeship in the business, working with an established trader for a number of years. In other cases, they have graduated from buying in villages as baranda. The small-ruminant traders in each market, like traders in other commodities, are organised into an association (usually called the 'egbe eleran iso'). All small-ruminant sales in the market have

to pass through traders who are recognised members of the association – producers cannot sell their stock direct to consumers in the market.

At daily urban markets, there are usually sheds where unsold animals may be kept overnight. These are hired by the traders' association from the local Government. The traders' association also employs hunters to guard the stock at night. The income of the traders' association consists of a commission paid on each sale by the buyer. Commissions during the survey period were usually N1.00 per animal at Bodija and 50 kobo (N0.50) at the other markets.[1] However, commissions on more expensive animals, especially northern sheep, were sometimes N2.00 or N1.00 respectively. These commissions represent some 1 to 5% of resale price.

Supply and source of animals

Table 1 shows, by species and breed, the mean number of animals available for sale in the various markets. Several thousand animals were available at Bodija on most days, a few hundred at Akesan, while smaller numbers were available in the rural markets. Goats were more numerous than sheep in all markets. Northern breeds predominated in Bodija market, accounting for 99% of animals available. Two-thirds of these northern animals were goats, and one-third sheep. Northern goats were also the most numerous breed at Akesan market, accounting for three-quarters of animals available, but here southern goats were considerably more numerous than northern sheep. Southern goats were the predominant breed in rural markets, followed by northern goats. Northern sheep were rarely found in rural markets.

In Bodija market, where all but five of the transactions recorded were in northern breeds, all sheep and almost all goats sold had come directly from outside Oyo State. Most northern animals (95% of goats and 63% of sheep)

TABLE 1

Daily mean number of animals available for sale by breed and market

	Bodija		Akesan		Rural markets	
	(No.)	(%)	(No.)	(%)	(No.)	(%)
Northern sheep	1079	32.9	11	3.9	1	2.8
Southern sheep	16	0.5	10	3.5	6	17.0
Northern goats	2163	66.0	213	75.3	9	26.0
Southern goats	22	0.6	49	17.3	19	54.2
ALL ANIMALS	3280	100	283	100	35	100

[1]The average exchange rate during the survey period (January 1983 to May 1985) was 1 Nigerian Niara = US$1.33.

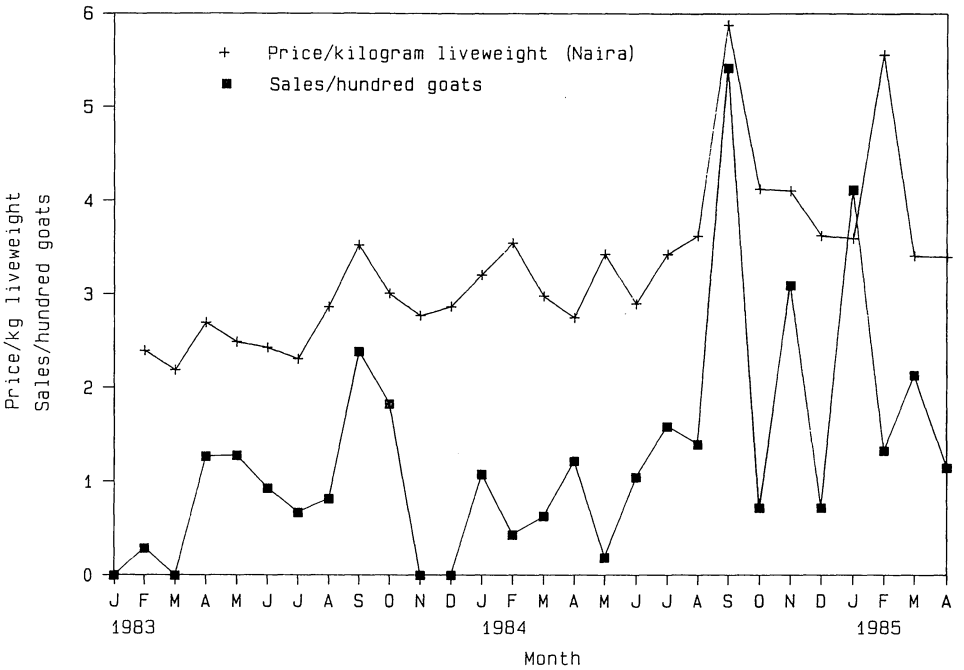

Fig. 2. Price per kilogram live-weight of southern goats at Akesan and level of sales of goats at seven nearby villages, January 1983–April 1985.

sold at Akesan, on the other hand, had already been sold once within the state, generally at Bodija. The remainder were mostly animals sold in September 1983 and 1984, when Akesan traders had purchased in the north for sale before the Id El Kabir festival. All northern animals sold in rural markets had been purchased at Bodija.

All southern animals sold at Akesan came from within Oyo state, but only one-half of these from the same local-Government area. In the rural markets this proportion was much higher, with 74% of southern sheep and 81% of goats coming from within the local-Government area, and 58% of both sheep and goats from the immediate locality of the market.

Supplies are of a seasonal nature. The major peaks in the numbers of both species available occurred in September and December in all markets (Okali and Upton, 1984). These coincided with the major Moslem and Christian festivals, Id El Kabir and Christmas.[2] The supply of both sheep and goats in-

[2]The three major festivals in the Moslem calendar are Id El Fitri, Id El Kabir and El Moulud. The dates of these festivals are based on the lunar calendar, and thus occur at an earlier date each year. Id El Fitri marks the end of Ramadan, and El Moulud the prophet's birthday. Id El Kabir, locally known as Ileya, is particularly associated with small-ruminant consumption as Muslims are enjoined to sacrifice a ram on the occasion to commemorate the sacrifice of Abraham.

creased during both periods, though the September peak was more marked in the case of sheep and the Christmas/New Year peak in the case of goats. In all markets, the number of goats available for sale exceeded the number of sheep, except in some cases during the September peak.

Figure 2 compares the mean price per kg live-weight of southern goats at Akesan with data on the level of sales from seven nearby villages. The close relationship between levels of sales and seasonal movements in prices is clearly evident, implying price responsiveness amongst southern producers.

Price and live-weight

Table 2 shows the number of observations, live-weights, prices per head and per kg, and price/live-weight correlations for all sex/breed/species categories. Sixty-seven percent of sheep sold were male and 33% female. Sixty-one percent of goat sales were of males, 33% females and 13% castrates. Southern breeds of both species included a higher proportion of females than did northern breeds, but very few castrates appeared in the markets (small ruminants are not normally castrated in the south).

Sheep were heavier than goats, and northern breeds heavier than southern.

TABLE 2

Mean prices, weights and price-weight correlation coefficients for small ruminants (all markets)

Class	*n*	Mean live-weight	Mean price per head	Mean price per kg	*r*
ALL ANIMALS	13 727	15.7(5.3)	41.1(20.9)	2.6(0.8)	0.67
All sheep	867	22.4(8.1)	78.5(47.1)	3.5(1.4)	0.63
All northern sheep	376	26.0(8.1)	88.2(55.1)	3.4(1.6)	0.51
male northern sheep	271	25.7(8.7)	98.9(59.8)	3.8(1.6)	0.60
female northern sheep	105	26.8(6.3)	60.6(24.6)	2.3(1.1)	0.24
All southern sheep	491	19.6(6.9)	71.0(38.3)	3.6(1.1)	0.77
male southern sheep	310	20.2(7.3)	79.1(43.3)	3.8(1.2)	0.79
female southern sheep	181	18.6(6.0)	57.2(21.8)	3.1(0.7)	0.80
All goats	12 860	15.2(4.8)	38.6(14.7)	2.6(0.7)	0.53
All northern goats	11 348	15.6(4.5)	38.9(13.7)	2.5(0.7)	0.60
male northern goats	7 089	14.1(3.3)	36.7(13.2)	2.6(0.8)	0.61
female northern goats	2 583	19.5(4.7)	43.6(12.2)	2.3(0.6)	0.54
castrate northern goats	1 676	16.0(4.5)	41.1(16.1)	2.6(0.7)	0.66
All southern goats	1 512	12.4(5.9)	36.1(20.1)	2.9(0.8)	0.86
male southern goats	760	9.2(3.4)	25.8(13.7)	2.8(0.9)	0.72
female southern goats	752	15.7(6.1)	46.5(20.1)	3.0(0.7)	0.83

Arithmetic means with standard deviations in parenthesis.

Male goats of both breeds were marketed at much lower weight than were females, indicating that they were marketed at a much younger age, the females being kept for breeding. However, the live-weights of male and female northern sheep were similar, and male southern sheep were heavier than female. This suggests differing marketing strategies for the two species. Rams are fattened for sale at Id El Kabir, while male goats are sold soon after weaning. There were no significant differences in live-weights between markets for any of the breeds.

Prices per kg live-weight were higher for sheep than for goats and for southern, as compared to northern, breeds of the same species. Male animals fetched higher prices than female, except in the case of female southern goats, which cost more per kg than the males. The higher price of southern females suggests that some local breeding stock was passing through the markets.

The high price/weight correlations obtained indicate that prices offered for animals were proportional to live-weights. As this suggests, animals were purchased mainly for slaughter. The low correlation coefficient for female northern sheep is due to the importation of animals at the end of their reproductive life, some in poor condition, from the north.

Factors determining price

An analysis-of-covariance model was used to determine the influence on price of breed, sex, live-weight, and market and month of sale. The following equation was estimated for each of the four breed/species groups:

$$P = a_0 + a_1 W + a_2 T + \sum_i b_i S_i + \sum_i c_i L_i + \sum_i d_i M_i + e \qquad (1)$$

where P is price in Naira; W live-weight (kg); T time trend (months); S dummy variable equal to 1 if animal was of sex i, and 0, otherwise; L dummy variable equal to 1 if sale was in market i, and 0 otherwise; M dummy variable equal to 1 if sale was in month i, and 0 otherwise; and a_0, a_1, a_2, b_i, c_i, d_i are structural parameters of the equation.

In addition to this linear model, a log-linear model with the following specification was tested:

$$\ln P = a_0 + a_1 \ln W + a_2 T + \sum_i b_i S_i + \sum_i c_i L_i + \sum_i d_i M_i + e \qquad (2)$$

Coefficients, standard errors, and regression coefficients for the linear equations are given in Table 3, and for the log-linear equations in Table 4 (species/breed/market groups including less than ten observations, and castrates, were excluded). The values of the 'dummy' variable coefficients have been adjusted so that, for any variable, the mean of the coefficients is set equal to 0. The coefficient on any class thus represents the difference of the least-squares mean

TABLE 3

Estimated parameters of linear demand equations for northern and southern sheep and goats

	Sheep				Goats			
	Northern		Southern		Northern		Southern	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
Intercept	75.83	(2.37)	66.90	(1.04)	40.73	(0.41)	35.65	(0.24)
Live-weight (kg)	4.14	(0.25)	3.63	(0.15)	2.00	(0.02)	2.81	(0.05)
Time (months)	−0.18	(0.25)	0.78	(0.12)	0.32	(0.01)	0.61	(0.03)
Sex								
Male	11.65	(2.40)	4.58	(1.03)	0.36	(0.13)	−1.45	(0.27)
Female	−11.65	(2.40)	−4.58	(1.03)	−0.36	(0.13)	1.45	(0.27)
Market								
Bodija	−9.36	(2.11)	-	-	−6.68	(0.42)	-	-
Akesan	9.36	(2.11)	2.45	(1.87)	2.33	(0.43)	3.04	(0.38)
Egbeda	-	-	−4.10	(1.85)	1.48	(0.62)	−0.98	(0.51)
Apomu	-	-	−0.79	(2.34)	3.65	(0.58)	−1.19	(0.46)
Iware	-	-	0.45	(1.70)	−2.99	(1.70)	−1.61	(0.47)
Oja	-	-	1.99	(1.99)	2.20	(0.95)	0.74	(0.55)
Month								
January	−9.68	(6.36)	−4.02	(3.54)	−0.71	(0.28)	0.30	(0.73)
February	−15.58	(6.17)	5.29	(2.92)	−2.53	(0.29)	−1.16	(0.62)
March	−10.21	(6.67)	−8.49	(3.06)	−3.38	(0.29)	−2.74	(0.67)
April	−7.58	(5.70)	−6.08	(3.07)	−2.30	(0.27)	−1.73	(0.62)
May	−19.42	(5.61)	−1.98	(2.78)	−3.38	(0.28)	−0.27	(0.66)
June	−.6.83	(8.98)	−3.86	(3.57)	−2.67	(0.32)	−2.19	(0.84)
July	6.97	(6.29)	−2.80	(3.57)	1.90	(0.30)	−1.56	(0.81)
August	8.97	(11.58)	5.62	(2.89)	1.71	(0.29)	1.46	(0.82)
September	49.65	(4.10)	24.64	(2.41)	7.33	(0.25)	8.42	(0.74)
October	−9.56	(6.96)	−5.35	(4.25)	−0.68	(0.31)	−0.26	(0.92)
November	10.05	(7.67)	−8.00	(3.78)	0.36	(0.36)	−0.82	(0.93)
December	3.21	(5.28)	5.04	(3.46)	4.34	(0.27)	0.55	(0.73)
R^2	0.651		0.736		0.587		0.824	
Adjusted R^2	0.636		0.726		0.586		0.822	
N	362		486		9672		1512	

price (or log price) per animal for that class from the mean for the sample as a whole. The number of coefficients given for each class variable is therefore equal to the number of classes, rather than to one less than the number of

TABLE 4

Estimated parameters of log-linear demand equations for northern and southern sheep and goats

	Sheep				Goats			
	Northern		Southern		Northern		Southern	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
Intercept	4.205	(0.021)	4.095	(0.012)	3.652	(0.009)	3.429	(0.006)
Live-weight (kg)	1.104	(0.055)	1.007	(0.032)	0.753	(0.008)	0.949	(0.015)
Time (months)	0.004	(0.025)	0.135	(0.016	0.107	(0.003)	0.195	(0.007)
Sex								
Male	0.124	(0.021)	0.052	(0.012)	−0.019	(0.003)	−0.057	(0.007)
Female	0.124	(0.021)	−0.052	(0.012)	0.019	(0.003)	0.057	(0.007)
Market								
Bodija	−0.133	(0.019)	-	-	−0.154	(0.009)	-	-
Akesan	0.133	(0.019)	0.048	(0.022)	0.085	(0.009)	0.057	(0.009)
Egbeda	-	-	−0.078	(0.022)	0.052	(0.135)	−0.016	(0.013)
Apomu	-	-	0.010	(0.028)	0.071	(0.127)	−0.012	(0.012)
Iware	-	-	−0.002	(0.020)	−0.137	(0.037)	−0.049	(0.012)
Oja	-	-	0.021	(0.024)	0.084	(0.021)	0.019	(0.014)
Month								
January	−0.023	(0.056)	−0.035	(0.042)	0.016	(0.006)	0.048	(0.019)
February	−0.167	(0.055)	0.111	(0.035)	−0.042	(0.006)	0.005	(0.017)
March	−0.141	(0.058)	−0.071	(0.036)	−0.066	(0.006)	−0.055	(0.017)
April	−0.108	(0.049)	−0.046	(0.036)	−0.055	(0.006)	−0.033	(0.016)
May	−0.288	(0.049)	−0.048	(0.033)	−0.088	(0.006)	−0.016	(0.017)
June	−0.091	(0.079)	−0.100	(0.042)	−0.085	(0.007)	−0.080	(0.022)
July	0.143	(0.055)	−0.021	(0.042)	0.046	(0.007)	−0.057	(0.021)
August	−0.019	(0.102)	0.063	(0.034)	0.042	(0.006)	0.018	(0.022)
September	0.450	(0.036)	0.239	(0.028)	0.141	(0.006)	0.163	(0.019)
October	−0.023	(0.061)	−0.043	(0.050)	−0.018	(0.007)	0.018	(0.024)
November	0.184	(0.067)	−0.118	(0.045)	0.008	(0.008)	−0.023	(0.024)
December	0.082	(0.047)	0.069	(0.041)	0.102	(0.006)	0.012	(0.019)
R^2	0.728		0.792		0.659		0.840	
Adjusted R^2	0.716		0.784		0.658		0.838	
N	362		486		9672		1512	

classes, as would be the case if the usual practice of arbitrarily assigning the value 0 to one of the coefficients was followed.

As Tables 3 and 4 show, the models fitted the data well, with coefficients of multiple determination (R^2) being high. The models do not, of course, include

all of the characteristics of the marketed animal which have a bearing on its price. Factors such as the age, health, general condition and appearance, and the colour of the animal have an important influence on the price obtained for it. Further, since animals are not weighed before purchase, the price agreed depends on the buyer's and seller's skill in assessing live-weight. In addition, the models do not include terms for interactions between variables, which are discussed in the next section. Nevertheless, coefficients of determination for the log-linear models for the four breeds ranged from 0.66 to 0.84, indicating that, for all breeds, most of the variation in price is explained by the characteristics of the animal and market included in the regression equations (i.e. sex and live-weight of animal, location of market and time of sale).

Examination of the parameters confirms that the price of male animals was higher that that of female, except in the case of southern goats. Northern animals of both species were cheapest at Bodija, while southern breeds were cheaper in the rural markets of Egbeda, Apomu and Iware (although a minor and 'rural' market, Oja is situated close to Oyo, a major urban centre of demand). This is the effect of the differing structures of marketing for the two breeds described earlier. The monthly parameters indicate price peaks in September, and, to a lesser extent, December, the peak festival periods of demand.

Homogeneity of models and interaction of variables

The dummy variables included in the above models allowed the intercept to vary between classes of any variable, but assumed a common set of slope coefficients (b_i, c_i and d_i in equations 1 and 2) over all the classes within any breed/species group. To test whether slope as well as intercept coefficients varied between classes, the homogeneity of models was tested using the analysis of covariance procedure given by Johnston (1972). This method compares three models:

(a) a restricted model in which neither slope nor intercept are allowed to vary between classes;
(b) an intercept dummy model which allowed intercepts but not slopes to vary between classes (as in equations 1 and 2 above); and
(c) an 'unrestricted' model, which allowed both intercepts and slopes to vary from class to class.

This method was applied with respect to the three class variables (sex, market location and month of sale) in turn. For these analyses, month of sale was grouped into three classes: September; December; and other months. Log-linear models were used. Results are given in Table 5. Of the tests of homogeneity, the differential intercept test (F_1) compares models (a) and (b), the differential slope vector test (F_2) compares models (b) and (c), and the overall homogeneity test (F_3) compares models (a) and (c). Table 5 also records the significance of the interaction terms between the class variable being analysed

TABLE 5

F values for tests of homogeneity and interactions of log-linear demand models with regard to sex of animal, market location, and month of sale: northern and southern sheep and goats

	Sheep		Goats	
	Northern	Southern	Northern	Southern
(A) Sex				
Homogeneity				
Differential intercept test (F_1)	40.8***	23.9***	55.3***	60.6***
Differential slope vector test (F_2)	10.5***	6.1***	26.9***	11.1***
Overall homogeneity test (F_3)	16.4***	8.3***	29.8***	16.9***
Interactions				
Sex × log live-weight	16.8***	5.7*	48.4***	0.5
Sex × log time	18.4***	16.3***	99.9***	32.0***
Sex × market	3.9*	2.3	11.4***	4.6***
Sex × season	0.8	5.5***	7.2***	10.3***
(B) Market location				
Homogeneity				
Differential intercept test (F_1)	41.7***	3.7***	658.8***	12.7***
Differential slope vector test (F_2)	1.6	3.0***	17.2***	6.6***
Overall homogeneity test (F_3)	8.4***	3.2***	128.5***	7.7***
Interactions				
Market × log live-weight	2.2	1.9	1.5	5.2***
Market × log time	1.0	5.3***	68.7***	9.5***
Market × sex	0.1	3.6**	7.4***	3.5**
Market × season	2.5	2.5*	2.3*	4.5***
(C) Month of sale				
Homogeneity				
Differential intercept test (F_1)	81.5***	34.3***	483.5***	34.6***
Differential slope vector test (F_2)	0.9	1.9	11.7***	8.0***
Overall homogeneity test (F_3)	16.9***	6.1***	65.0***	11.6***
Interactions				
Season × log live-weight	0.6	0.4	9.6***	4.7**
Season × log time	0.6	2.1	4.7***	16.6***
Season × sex	0.2	3.0	30.1***	13.7***
Season × market	0.9	1.2	37.5***	5.6***

*Significant at the 5% level.
**Significant at the 1% level.
***Significant at the 0.5% level.

and the other variables in the model. These figures indicate which of the parameters differ between sexes, markets, or seasons.

Section A of Table 5 indicates that both slope and intercept differed significantly between male and female animals for all four breed/species groups. The

significance of the sex/live-weight interaction for northern but not southern breeds indicates that the marginal effect of increasing weight differs between sexes in the case of northern animals (the coefficients in fact indicate that male animals are favoured), but not in the case of southern animals. Market, and, more surprisingly, seasonal interactions with sex are significant for southern breeds, but not for northern.

Section B of Table 5 shows that the hypothesis of overall homogeneity between markets is rejected for all breed/species groups. However, the hypothesis of equality between the slope coefficients for the markets cannot be rejected for northern sheep. The final section of Table 5 indicates that the hypothesis of slope equality between month classes is rejected at the 5% level only in the case of goats.

Relationship of prices between markets

Earlier research on marketing and prices in West Africa, which has for the most part been on food grains, has principally been aimed at establishing the degree of integration between spatially and temporally distinct markets. The methodology adopted has been that of 'structure, conduct, performance' (Jones, 1972). In this literature, the efficiency of marketing systems has generally been assessed in terms of the correlation of prices between markets, the comparison of margins between markets with transport costs, and the comparison of seasonal fluctuations in prices with storage costs.

TABLE 6

Bivariate correlation coefficients (r) of mean monthly prices per kg live-weight between markets for northern and southern sheep and goats (number of r's with indicated values)

r value in range	Sheep		Goats		All
	Northern	Southern	Northern	Southern	
0.9-0.99		1		1	2
0.8-0.89			5	3	8
0.7-0.79			1	4	5
0.6-0.69			1	2	3
0.5-0.59		2	4		6
0.4-0.49	1	3	1		5
0.3-0.39		3	2		5
0.2-0.29		1	1		2
0.1-0.19					
0.0-0.09					
Less than 0		1			1
Number of correlations	1	11	15	10	37
Number of mean price pairs	24	250	245	259	758

TABLE 7

Price margins for northern goats relative to Bodija

Market	Price margin (Naira)	Distance from Bodija (km)	Mean transport costs (Naira)	Transport costs per km (kobo)
Iware	3.69	39.4	0.60	1.5
Oyo-Akesan	9.01	50.4	0.32	0.6
Oyo-Oja	8.88	52.9	0.39	0.7
Egbeda	8.16	20.2	0.69	3.4
Apomu	10.33	35.9	0.84	2.3

Simple bivariate correlation coefficients were calculated from the mean monthly price per kg live-weight of each breed/species group between pairs of markets for all cases where more than 6 months' data were available. The results are summarised in Table 6. While all but one of these coefficients were positive, and two-thirds were higher than 0.5, they are not strikingly high. It should be noted, however, that many of the monthly mean prices (especially for sheep and for rural markets) are based on small numbers of price observations, and that these observations were not always made at the same time of the month. In addition, the 29-month period over which the data were collected is a relatively short one.

The use of the coefficient of correlation between mean prices at pairs of markets over time has been criticised on a number of grounds (see especially Harriss, 1979). Most seriously, factors such as inflation or seasonal price trends affecting a number of markets may produce common price trends without there necessarily being integration between the markets. However, the coefficients do not provide any evidence for the lack of integration between small-ruminant markets.

We now turn to the question of the size of price margins between markets. As already noted, northern animals of both species were cheapest at Bodija market in Ibadan. At Akesan, northern sheep were N18.72 and northern goats N9.01 more expensive per head than at Bodija (least-squares means derived from regression model 1). Table 7 gives the mean differences in price per head of northern goats from those at Bodija at the various markets and their distances from Bodija. Mean transport costs (as given by traders) are also shown. As the table shows, price differences of northern goats relative to distance are much higher at Egbeda and Apomu, the markets on the Ife road. Transport costs per km are also highest at these markets. While transport costs from Bodija to Akesan and to Oja averaged well under 1 kobo per km (0.6 and 0.7 kobo), those to Iware were 1.5 kobo per km; the equivalent figures for Egbeda and Apomu were 3.4 and 2.3 kobo, respectively. There are several reasons for these differences in transport costs. Firstly, rates per km to the markets mon-

itored along the Oyo road are less, simply because the distances are greater. Secondly, more animals are carried at one time to Oyo, which is a larger centre of consumption, and there are thus some economies of scale on this route. Thirdly, Oyo lies on the return route to the north of vehicles which have delivered to Ibadan. There was no significant correlation between the distance of these five markets from Bodija and the transport costs of animals.

Differences in transport costs, however, account for only a small part (generally less than 10%) of the price differences between the markets. Further, not only was the correlation coefficient between distance and transport costs for the five markets insignificant, so were the correlation coefficients between both of these variables and the mean price difference between markets. The explanation for these large price spreads between markets lies in part in the costs of marketing additional to transport, and which are not related to distance. These include the market commission paid at Bodija, the costs of storage at the market of resale (such as feeding, watering, guarding), the opportunity cost of the time spent by the trader in buying, transporting and selling the animals, and the opportunity cost of his capital. Animals spent an average of $3\frac{1}{2}$ days at Akesan and the rural markets before resale. Individual traders, especially those in rural markets, generally hold few animals (typically 8–10) at any time, so that the number of sales to be expected by an individual trader on any day is relatively small. There is the additional element of risk in investing in animals whose state of health is unknown.

Prices of southern animals (both sheep and goats) were highest at Akesan and Oja, reflecting the proximity of Oyo as a centre of demand. Transactions in these markets are mainly between traders and consumers, whereas at Egbeda, Apomu, and Iware, animals which have been bought by traders from nearby farms are being sold to other traders who transport them to urban markets for resale.

Conclusions and implications

The small-ruminant trade in southwest Nigeria is dominated by imports of animals from the north of the country. The size of the trade in northern breeds, together with the price premium on southern animals, indicates the great scope for increasing local production. Prices and supply are highly seasonal, and local producers take advantage of the shifts in demand, associated in particular with festivals. However, this elasticity probably reflects decisions about the time of sales rather than the planning of production itself.

Several criteria were used to assess the efficiency and integration of the marketing system. Regression analysis showed that most (between 66% and 84% for the various breeds) of the variation in the prices of animals could be accounted for in terms of the characteristics of the animal and the time and location of the sale (even without taking the condition of the animals into

account). This indicates that traders are not able to use privileged knowledge to obtain inflated margins. At the same time, the level of price correlation between pairs of markets, while not proving that markets are integrated, at least provided no evidence for their segregation. The pattern of price margins between markets reflected the structures of the respective trades in northern and southern breeds. While the margins between markets are considerably higher than the direct costs of transporting animals between them, the difference may largely be accounted for by the other costs involved in marketing, such as traders' commission and storage costs. The evidence thus suggests that the market in small ruminants functions efficiently with minimal government involvement. The clear policy implication is that government intervention beyond its present, limited facilitative role would not be warranted.

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