SPATIAL AND SEASONAL PRICE DIFFERENCES:

A CASE STUDY OF SORGHUM PRODUCERS IN SUDAN

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ABSTRACT

Spatial and seasonal price differences for sorghum in the Sudan are investigated. Results indicate that the producer's share of the consumer price is low. Seasonal price spreads indicate an excess return to the storage function. Causes of these large price differences are poor marketing infrastructure and government policy.

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INTRODUCTION

The agricultural sector in Sudan, as in many developing countries, is largely organized on the basis of private ownership. The irrigated subsector, composed mainly of government schemes, constitutes about 20 percent of the total cultivated area in the country. In this subsector, the government is responsible for management and provision of certain production inputs such as land, irrigation water, fertilizers, etc. The farmers who work as tenants, provide labor for the different production operations and harvesting. The rainfed subsector, which is more important in terms of area and amount of production, constitutes about 80 percent of the total area under cultivation. Almost solely organized by private ownership, the rainfed subsector produces the bulk of the sorghum food grain, all the sesame, and a very large share of the country's groundnuts production.

The rapidly growing demand for food products produced in both subsectors and the recurrent food shortages have induced producers, consumers and policy makers to question the performance of the food marketing system. This concern is understandable because marketing activities, especially in developing countries, are frequently thought of as unnecessary, unproductive, and work against the interest of society. Where transportation and communication facilities are poor, and access to institutional financing restricted, this might very well be true. Under these circumstances, "it is important for the food policy analyst to determine how effectively marketing institutions and marketing agents are performing their dual role of transforming commodities in time, place, and form while reflecting relative abundance and scarcity through

the price signals communicated to producers and consumers. These price signals can be generated in the process of exchange in markets in which case the competitiveness and efficiency of the markets must be examined." [Timmer]. The efficiency of marketing institutions and markets determines the extent of price differences between producers and consumers over space and time and therefore influences producers incentives, farm profitability, resource allocation and production levels. The objective of this study is to estimate these price differences (price spreads) and margins between producers and consumers for sorghum produced in the rainfed subsector of Sudan. More specifically the objectives of the study include the measurement of spatial, seasonal, and regional price spreads for sorghum.

METHODOLOGY

To achieve the stated objectives, the Gadarif and El Obeid areas of production and the Khartoum area of consumption were chosen. Within these areas multistage stratified random samples were selected. First, five villages were selected randomly, and from each village 12 farmers were selected to give a total of 60 farmers in each area of production. Second, three merchants were selected from each village to give a total of 15 merchants in Gadarif and El Obeid. Third, 15 assembly traders were selected from 3 rural markets in each area, and 10 wholesalers were selected from the central market. A total of 100 respondents at different stages in the marketing chain was interviewed in each production area. In Khartoum, 60 retailers from residential areas, and 30 wholesalers/retailers in the terminal markets were selected. The primary data were collected using a structured and pretested questionnaire through a one visit interview during March/April 1987. Data were also collected for sesame, and other varieties of sorghum but are not reported in this paper due to space

limitations. The secondary data, on the other hand, was obtained from the monthly and annual bulletins of the Ministry of Agriculture and Natural Resources, Khartoum.

Sorghum is partly consumed locally and partly exported. Sorghum for export, however, has not been considered as exports are banned at present because of the shortages that took place during the last two seasons. Two areas, Gadarif and El Obeid, are the main producing areas and the main destinations are the consuming centres of El Obeid town and Khartoum, the capital city.

Estimates of marketing margins and regional and seasonal price spreads are averages using the quantities marketed in various regions and at different levels in the marketing chain as weights. Prices paid at any one time and at any level differ from place to place within the country depending on the kind of market or level in the marketing system at which transactions take place. Four such levels are distinguished for sorghum:

a) Village shopkeepers

The village shopkeepers deal in consumer goods and various crops produced by farmers. The shopkeepers buy sorghum and sesame for their own benefit or on behalf of some urban buyers. Because of the lack of or scarcity of working capital, village shopkeepers become agents to urban buyers who provide the working capital and packing material such as jute sacks. In many cases they play another important role, which is money lending.

b) Primary or Rural Markets

Primary markets are markets in rural areas where most of the crops are sold by producers to other producers or to traders. The producer

price considered in this study is the price in the primary or rural market which represents the first point of sale.

c) Intermediate or Central Markets

These markets may be in rural areas or towns. The commodities under consideration are being sold by traders who have previously purchased them at "primary markets" to other traders who sell the commodities at the "terminal" markets. Organized auction markets are important intermediate markets especially for sesame and other export crops.

d) Terminal Markets

Most of the commodities are sold to processors, wholesalers and retailers at the terminal markets. Retail prices for domestic consumers were collected at these markets. Administered prices at the retail level, such as ration prices, are not considered in estimates of price spreads.

SPATIAL SPREADS IN PRICES

Price spreads between producer and consumer have been estimated for sorghum in Gadarif and El Obeid areas. Farmers in Gadarif area received about 33.5 percent of the urban retail price for sorghum sold in Khartoum, Table 1. Net returns to assemblers, wholesalers and retailers each were 4.9, 18.0, and 13.6 percent, respectively, of the urban retail price for variety (deber), and gross returns were 17.2, 27.9, and 21.4 percent of the urban retail price. The relatively low producer's share of the urban retail price is due to high transportation costs, local taxes and losses that result from transporting and cleaning the product. These costs will be discussed further in another part of this paper.

The spatial price spreads of sorghum produced in El Obeid area and sold in El Obeid town are shown in Table 2. No sorghum is transported from El Obeid to

Khartoum because the area is too far from the capital city, and because El Obeid is a deficit area most of the time. The producer's share of the local urban retail price is 55.2 percent, and the net returns of village merchants, assemblers and retailers are 7.7, 4.7, and 3.4 percent of the urban retail price respectively.

Regional price differences for sorghum between Gadarif, Khartoum, and El Obeid reflect the effect of the presence or absence of trading between pairs of towns or markets. The retail price in the Gadarif market relative to the retail price in the Khartoum market is 67.4 percent, while the retail price in the Gadarif market relative to the El Obeid retail price is 54.4 percent. These prices were average market prices in March, 1987. The price in Gadarif is only about half the price in El Obeid while the Gadarif price is more than two thirds that of Khartoum. This indicates that Gadarif and El Obeid are not linked with each other because of high transportation costs due to poor infrastructure and high petrol prices while the Gadarif-Khartoum markets are linked because of the presence of an asphalt road. "Although it is quite unconventional to derive a conclusion on market integration from a set of data as is done here, the conventional practice of using correlation among prices as a measure of integration is often unreliable" [Ahmed].

SEASONAL SPREADS IN PRICES

Seasonal price analysis tests the effectiveness of arbitrage over time. Prices of sorghum and food crops in general, follow a common seasonal pattern. The prices decrease to low levels immediately after harvest in December and January and rise thereafter until the next harvest as village merchants and assemblers store some supplies to meet the continuous demand. In a competitive market the seasonal price rise should just cover the costs of storage

(interest charges on capital invested in the stored commodity, costs of the storage facility, physical losses and normal profits). This is analyzed by comparing the monthly prices with the monthly costs of storage. The monthly price changes are derived from an index of wholesale prices, which has been calculated as the average monthly percentage of a twelve-month moving average (Table 3).

In Gadarif, the seasonal price of sorghum (deber) increases from a harvest low of 93.8 in December to a high of 116.4 in October just before the next harvest. This represents an increase of 22.6 percent in the eleven month December-October period. The storage costs of sorghum for 11 months in Gadarif, for instance, are 14.3 percent of the Gadarif wholesale price. This indicates that those who perform the long term storage function are gaining excess profits. In most cases, however, the storage period for sorghum is five to six months.

CAUSES OF SORGHUM PRICE SPREADS

From the analysis in Table 1, it appears that local taxes, transportation costs, storage costs, and losses resulting from cleaning (at the retail level) and profit (as a residual of prices after meeting costs), are the main factors that explain the intercountry differences in price spreads between producers and the ultimate consumers. These factors are now discussed to evaluate the contribution of each one of them to the total price spread.

Taxes on foodgrains range between 3 percent to 5.2 percent in Gadarif. These taxes are mainly (Zakat) tax, which is a religious tax on the crop levied by the central government and collected by the local authorities. The tax is equal to 10 percent of the total production, but after delivery of the crop the producer is given back 2.5 percent of the quantity delivered to distribute in

his own way to the needy. Only the 7.5 percent is considered in the calculation as nobody could be sure that producers do distribute the amounts of product they are entrusted with distributing. In addition to the (Zakat) tax, there are also local taxes levied by the local authorities for developing certain self-help projects. These vary from one area to another and they are generally small in amount. In fact one of the main reasons for organizing auction markets is to facilitate the collection of this particular type of crop tax.

Crop losses during storage and transportation are difficult to estimate and there are no previous studies to indicate their magnitude. For sorghum, however, a rough estimate of these losses is obtained by estimating the loss in weight at the retailer's level. Retailers clean the quantities they sell to consumers. In addition to the impurities there is presumably loss in weight during both transportation and storage. These losses range between 4.5 and 5.7 percent of the product value.

Profit margins and storage costs for the different trading agents also contribute to the price spreads. As discussed above, the magnitude of these margins is not a major element in the price differential over space. This leaves transportation as the main element in explaining the spreads in prices between producers and consumers. From the marketing margin tables, the transportation cost is about 13.7 percent of the consumer price for Gadarif area and 11.4 for El Obeid area.

Sudan is a large country that is very sparsely populated. The population density is only about 10 persons per square kilometer. The production of food crops, because of favorable environmental conditions, is concentrated in certain parts of the country that are distant from the urban centers where the consumers are concentrated. The average truck transport costs, according to the

Ministry of Agriculture and Natural Resources estimates are about LS 0.11/ton/km on asphalt roads, and about LS 0.70/ton/km on dirt roads. In addition to the poor roads and the long hauling distances, these costs also reflect the high cost of fuel and spare parts, both of which are imported. The lack of development of rail and river transport also adds to the transportation costs and difficulties. The most common mode of road transport is the 5 to 6 ton lorries used for the inter-regional and inter-market transport. Bigger trucks have been recently introduced, but these operate only on asphalt roads which are limited in number and lengths. This lack of diversity in modes of transportation has led to the increase in marketing costs and in their import content.

POLICY IMPLICATIONS

The analysis indicates that an obvious policy implication is infrastructural reform. Although the Gadarif area is relatively well-served by asphalt roads to Port Sudan and Khartoum, there is a need for feeder roads to connect the rural markets and inland areas of production with the main highways leading to consuming centres and export. Moreover, the dispersion of areas of production and the long hauling distances have led to high per unit costs of transport. This has been accentuated by the high cost of petrol and spare parts.

A second major area of improvement would be public policies in agricultural marketing. There is a need to invest in securing and disseminating market information. Time and again one would find producers or even assembly traders (lorry traders) moving products from a village or a rural market to an intermediate market and finding prices lower than where they purchased the product. This adds to the marketing costs and inefficiency. In addition, market

information would be more meaningful if there were standards and grades introduced and implemented by the local authorities.

There is also a need to make some tax reform measures. The Zakat tax, introduced in 1983, has many shortcomings and has added to the costs of marketing. The Zakat tax is another tax in addition to the existing taxes levied by the local authorities. One would have expected the old crop tax to be abolished after the introduction of the Zakat tax.

CONCLUSIONS

The analysis of spatial price spreads shows that producers receive low shares of the prices paid by consumers. The average producer price, expressed as a percentage of the urban consumer price is 33.5 percent for dura (sorghum) produced in Gadarif area and retailed in Khartoum, the capital city and abuot 55.2 perent for dura produced in the El Obeid area and consumed locally. Regional price differences, on the other hand, reflect the extent of trading between the two regions. The price spread is about 67.4 percent between Gadarif and Khartoum and about 54 percent between Gadarif and El Obeid. That is, the price at Gadarif is only about 50 per cent of that in El Obeid and about two thirds of that in Khartoum. The price spread in the former is significantly larger than the marketing margin which indicates that the two markets, Gadarif and El Obeid, are poorly integrated.

Seasonal price spreads from the index low to high increase about 21 percent on average for sorghum in Gadarif, and about 29 percent for sorghum in El Obeid. With an average interest rate on bank loans of about 20 percent in March, 1987 there is an indication of excess profits on the part of those who perform the storage function.

Table 1. Average Prices and Marketing Margins for Dura (Sorghum) in Gadarif Production Area and Retail Markets in Khartoum, March-April 1987 (Variety Deber)[1]

Item	LS per ton	Percentage of retail price
Assembly trader's price in Gadarif	294.8	50.7
Producer price in rural market	194.7	33.5
Assembly trader's gross margin	100.1	17.2
Zakat tax	(16.5)	(2.8)
Local tax	(1.1)	(0.2)
Transport	(33.0)	(5.7)
Handling	(5.5)	(0.9)
Storage	(15.4)	(2.6)
Assembly trader's net margin	28.6	4.9
Khartoum wholesale price	457.6	78.6
Gadarif wholesale price	294.8	50.7
Khartoum wholesaler gross margin	162.8	27.9
Transport	(46.8)	(8.0)
Handling	(11.0)	(1.9)
Khartoum wholesaler's net margin	105.0	18.0
Khartoum retail price	581.9	100.0
Khartoum wholesale price	457.6	78.6
Khartoum retailer's gross margin	124.3	21.4
Handling	(5.5)	(0.9)
Cleaning	(11.0)	(1.9)
Losses	(28.6)	(4.9)
Retailer's net margin	79	13.6
Plus value of empty sack (L.S. 21)	102.3	17.6

Source: Calculated from field survey data, 1987

Note:

1. Two dura varieties have been dealt with in the survey. These are the most commonly grown varieties. This particular one (deber) is preferred for human consumption especially in urban areas. The other variety (feterita), is a lower quality product.

Table 2. Average Prices and Marketing Margins for Dura (Sorghum) in El Obeid Production Area and Retail Markets in El Obeid Town, March-April 1987.

Item	LS per ton	Percentage of retail price
Village merchant price in local market	386.1	79.7
Producer price	267.3	55.2
Village merchant's gross margin	118.8	24.5
Zakat tax	(20.9)	(4.3)
Transport	(55.0)	(11.4)
Handling	(5.5)	(1.1)
Village merchant's net margin	37.4	7.7
Assembly trader's price in El Obeid	412.5	85.2
Village merchant's price	386.1	79.8
Assembler's gross margin	26.4	5.4
Handling	(3.3)	(0.7)
Assembler's net margin	23.1	4.7
Retailer's price in El Obeid	484.0	100.0
Wholesale price in El Obeid	412.5	85.2
Retailer's gross margin	71.5	14.8
Handling and Transport	(22.0)	(4.5)
Cleaning	(11.0)	(2.3)
Losses	(22.0)	(4.5)
Retailer's net margin	16.5	3.4
plus value of empty sack (at LS 2.5)	44.0	9.1

Source: Field Survey, 1987

Table 3. Index of Monthly Wholesale Prices of Sorghum in Gadarif and El Obeid Markets. 1981-1986

District Crops		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Range
Gadarif Sorghum (Feterita)	Mean	98.9	94.8	97.8	96.5	92.3	95.4	94.7	99.5	108.1	109.3	109.1	103.5	16.0
	S.D.	25.1	24.0	24.2	19.6	17.8	22.5	15.8	15.3	30.9	43.1	42.4	40.9	
Sorghum (Deber)	Mean	92.4	93.3	95.5	95.7	90.8	93.3	103.3	104.6	110.7	116.4	110.3	93.8	25.6
	S.D.	10.1	8.1	8.7	7.5	11.3	18.3	22.3	13.7	10.3	12.4	20.1	15.5	
El Obeid Sorghum (Feterita)	Mean	90.0	95.3	95.9	97.5	100.2	100.1	103.0	105.6	115.8	113.6	95.6	87.1	28.8
	S.D.	14.7	18.0	9.6	10.3	18.1	17.1	20.2	13.8	14.9	18.5	22.4	19.3	

Note: Index is average monthly percentage of twelve-month moving average.

Source: Calculated from Agricultural Prices in Sudan, Department of Agricultural Economics, Ministry of Agriculture and Natural Resources, Khartoum

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