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Abstract

Cereal grains are the most important calorie source in the Sudanese diet. An understanding of cereals in Sudan is important for maintaining efficient and sustainable agricultural and food production. This study analyzes Sudanese cereals by examining trends in cereal production, consumption, and trade during the past four decades and identifies the elements that might affect future production and import demand. The focus is sorghum, wheat, and millet. Data for various years were collected from the production and trade yearbooks of the Food and Agriculture Organization of the United Nations.

Disciplines

Agricultural and Resource Economics | Agricultural Economics | Economics

Trends in Sudanese Cereal Production, Consumption, and Trade

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ABSTRACT

Cereal grains are the most important calorie source in the Sudanese diet. An understanding of cereals in the Sudan is important for maintaining efficient and sustainable agricultural and food production. This paper analyzes Sudanese cereals by examining trends in cereal production, consumption, and trade during the past four decades, and identifies the elements that might affect future production and import demand. The focus is sorghum, wheat, and millet. Data were collected from the production and trade yearbooks of the Food and Agriculture Organization of the United Nations (FAO) for various years.

The findings have shown that the expansion of arable land did not bring about the expected increase in productivity. Also, total cereal consumption in the Sudan rose at an average annual rate higher than the production rate. To meet the shortfall between cereal consumption and production, cereal imports, especially wheat, increased.

Wheat imports have exerted a heavy burden on the Sudan's meager and deteriorating foreign exchange resources and have worsened its negative trade balance. Therefore, the domestic resources for wheat production should be fully utilized. The gap between potential yield and farmers' yields needs to be closed. In addition, to reduce wheat consumption and increase demand for sorghum, which is the traditional staple, the government should remove the high subsidy on bread prices.

TRENDS IN SUDANESE CEREAL PRODUCTION, CONSUMPTION, AND TRADE

Introduction

Cereals are crucial to human survival and are the main components of human diets (Henry and Kettlewell, 1996). Cereal grains provide a major source of energy, protein, and dietary fiber in human nutrition. For example, wheat can provide more than half of the calorie requirements in a healthy daily diet. Wheat is also a major source of protein compared with other foods and contributes more than 25 percent of the protein consumed in the human diet (Dukes et al., 1995). The protein contents in sorghum and millet are nearly equal and are comparable to that of wheat and maize (FAO/ICRISAT, 1996). New mineral-enriched varieties could reinforce nutritional benefits in grain, particularly in developing countries (Gooding and Davies, 1997).

Cereal grains are the most important calorie source in the Sudanese diet (Abdelrahman, 1990). The majority of grain in the Sudan is grown in the rainfed subsector. More than 80 percent of sorghum and millet are grown in the rainfed subsector (Faki et al., 1995). On the other hand, the irrigated subsector monopolizes wheat production in addition to producing a sizeable amount of sorghum. Sorghum is the major stable food crop consumed in the rural areas in most regions of the country. Wheat constitutes the second food grain in the Sudan and traditionally has been the staple food in the northern province and it recently became a staple in urban areas. Millet has been the major food staple in western Sudan (Abdelrahman, 1990).

In most years, the Sudan has a surplus of sorghum and a balance of millet, but has a great wheat deficit (Osman, 1989). During the period 1961-95 mean annual wheat consumption increased by 14 percent annually. Most of the increase was met by imports. In the Sudan, wheat imports increased by 15 percent annually during the same period. Wheat

imports have exerted a heavy burden on the Sudan's meager and deteriorating foreign exchange resources and involved a worsening of its negative trade balance (Hassan and Faki, 1993). Therefore, there is a great incentive to expand the utilization of domestic resources in wheat production.

During the 1980s, poor rainfall contributed to low and variable growth in food production. For example, a 10 percent decline in average rainfall levels induces a 5 percent drop in national cereal production (Teklu et al., 1991). Sorghum is more sensitive to drought than millet. While sorghum production fell by 7 percent between the 1982 and 1987, millet drop to only 3 percent.

The severe drought of 1984 caused sorghum and millet production in Northern Kordofan to decrease by 92 percent and 86 percent, compared with production between 1974 and 1981 (Teklu et al., 1991). The poor rainfall during the 1980s jeopardized the dependable supplies of sorghum and millet from rainfed areas. Thus, irrigated sorghum has gained increasing importance (Faki et al., 1995). To expand wheat and sorghum production to reasonably steady future growth rates, the government of Sudan planned to shift emphasis to the irrigated sector (Government of Sudan, 1990). Therefore, it is important to understand cereals in the Sudan in order to maintain efficient and sustainable agricultural and food production.

This paper analyzes Sudanese cereals by examining trends in cereal production, consumption, and trade during the past four decades, and identifies the elements that might affect future production and import demand. The focus is sorghum, wheat, and millet. Data were collected from the production and trade yearbooks of Food and Agriculture Organization of the United Nations (FAO) for various years. The per capita consumption is calculated using the formula $(\text{Production} + \text{Imports} - \text{Exports} - \text{Seeds}) / \text{Total Population}$.

Background

On a world production and utilization basis, wheat is the world's single most important food crop and wheat trade represents a significant component of the balance of trade of national economies (Henry and Kettlewell, 1996; Gooding and Davies, 1997). Wheat is used and processed for many products because of the large quantity produced by people of diverse cultures and socioeconomic groups. The global success of wheat as a

food crop not only derives from its geographical range of climate and soil tolerance, but also its adaptability for many different food products, thousands of which are produced worldwide (Faridi and Faubion, 1995).

Sorghum is the world's fifth most important cereal after wheat, rice, maize, and barley in both production and area planted (FAO/ICRISAT, 1996). Sorghum is one of the main staples for the world's poorest and most food-insecure people (Henry and Kettlewell, 1996). The crop is generally suited to hot and dry areas where it is difficult to grow other food grains. These are also areas subject to frequent drought. In many of these areas, sorghum is truly a dual-purpose crop; both grain and stover are highly valued outputs. In large parts of the developing world, stover represents up to 50 percent of the total value of the crop, especially in drought years.

Developing countries account for roughly 90 percent of the world's sorghum area and 70 percent of total output (FAO/ICRISAT, 1996). Asia and Africa each account for about 25 to 30 percent of global production. Nigeria and Sudan are the major producers in Africa. Production in Africa remains characterized by low productivity and extensive, low-input cultivation. Generally, sorghum is grown primarily for food in the developing countries and in the developed countries almost all sorghum production is used as animal feed.

Millet is the world's sixth most important cereal grain in total production (Henry and Kettlewell, 1996). Millet is a collective term referring to a number of small-seed annual grasses that are cultivated as grain crops, primarily on marginal land in dry temperate, subtropical, and tropical regions. Asia and Africa account for about 94 percent of global output (FAO/ICRISAT, 1996). Almost all millet is produced by small-scale farmers for household consumption and localized trade. For some of the world's hottest, driest cultivated areas, millet is critically important for food security. Very limited quantities of millet are produced in the developed countries, mainly for a high-value specialty market as birdseed. Only limited quantities are recorded in international trade.

Developing countries have increased in importance both as a proportion of world consumption and an export market for surplus producers. Cereal imports in these countries have grown at annual rate above 10 percent for grains and 4.5 percent for wheat during the 1980s (OECD, 1993). In addition, the growth rate for wheat slowed to 2.5 percent for the

same period. The developing countries account for more than 55 percent of cereal trade and more than 65 percent of wheat exports. The production of cereals in the developing countries has grown 2.5 percent in the last decade, but wheat consumption increased by 3.5 percent and coarse grain increased 2 percent over the same period. Higher cereal imports for the developing countries have been due to economic policies that have discouraged domestic production in some countries either through taxing of agriculture or through macroeconomic policies that have reduced needed agricultural investment and infrastructure (OECD, 1993).

Sudanese Cereal Demand and Production

The pattern of consumption for cereals over the last four decades has shown two major trends: the growth of grain consumption (Table 1) and the shift in the pattern of cereal demand from traditional staples (sorghum) to domestically produced and imported cereals (wheat) for food and feed uses.

Table 1. Annual growth rates of Sudanese cereal production, consumption, and trade 1961-95.

	Average growth				Annual growth rate			
	1961-70	1971-80	1981-90	1991-95	1961-70	1971-80	1981-90	1991-95
Area Harvested	2186	3857	5567	7733	6	4	3	10
		(thousand hectares)				(percent)		
Yield	7.8	6.4	4.9	5.6	-2	-3	1	-4
		(hg/ha)						
Production	1707	2484	2837	4320	4	1	4	5
		(tmt)						
Consumption	1716	2373	3060	4721	3	3	4	6
Imports	153	176	714	1016	1	15	4	17
Exports	119	227	425	498	7	6	2	14

During the period 1961-95, Sudanese cereal grain consumption rose at an annual average rate of 6 percent (Table 1) compared with the consumption growth rate of 1 percent for industrialized countries. This consumption growth is mainly because of continuing population growth (at 3 percent a year during the 1980s compared with 0.6 percent growth rate in the developed countries) and a relatively high income elasticity of demand for cereal products (Abdelrahman, 1990). In addition, there has been a continuous shift in the pattern of cereal demand away from the traditional basic staples (sorghum and millet) to wheat and wheat products (Figure 1).

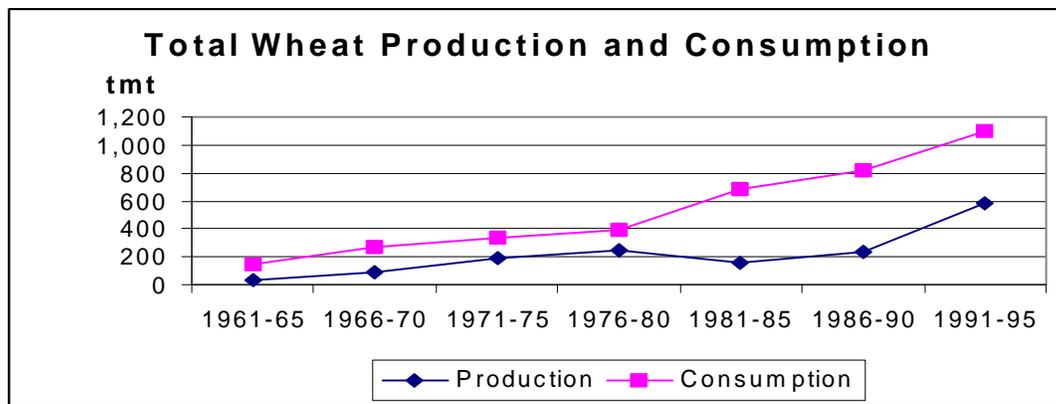


Figure 1. Total wheat production and consumption, the Sudan, 1961-95

While the average per capita consumption of sorghum and millet declined from 106 kg per year and 28.6 kg per year in 1969 to 68 kg per year and 16.39 kg per year in 1979, the average per capita consumption of wheat increased from 14.36 kg per year to 18.95 kg per year for the same period. The average per capita consumption of wheat continued to increase to 28.77 kg per year in 1989. However, the average per capita consumption of sorghum and millet declined to 52 kg per year and 6.24 kg per year, for the same year.

The continuous process of migration of the rural population to urban areas is one of the primary factors that helps to explain observed changes in consumption patterns in the Sudan. Rural areas usually rely on subsistence farming, which involved the production of sorghum and millet. In addition, even if the income of these rural populations were sufficient to permit them to pay for other foods, transportation systems are too expensive to allow diversification of the basic diet.

On the other hand, in the cities the relatively higher income levels, greater availability of imported food cereals, and a fundamental difference in life styles are all elements that encourage a shift from traditional staples to processed products. Given the preferences for wheat products and insufficient domestic production, there has been a tendency to feed urban consumers with imported wheat (Figure 2).

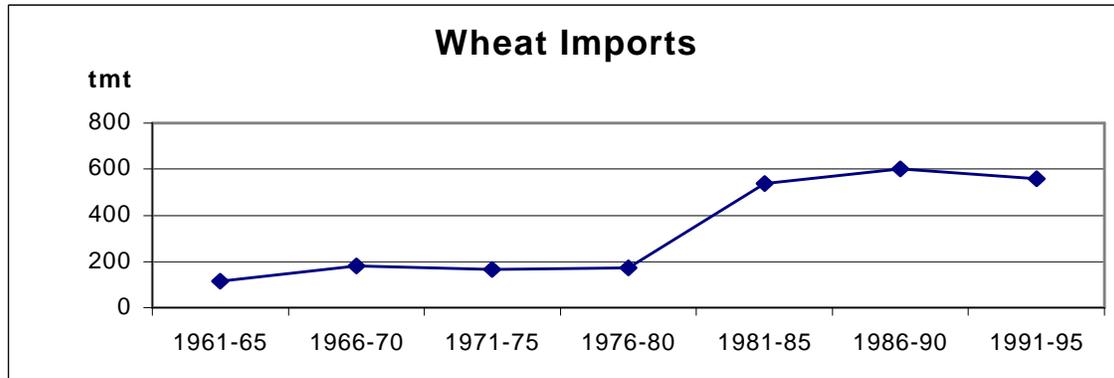


Figure 2. Total wheat imports, the Sudan, 1961-95

Total cereal production in the Sudan has increased rapidly and steadily since the 1960s (Table 1, Figure 3), but the base growth was below the increase in domestic consumption and wheat imports also increased (Figure 2) to meet the shortfall. Cereal production in the Sudan averaged 4.319 million metric tons in the 1991-95 period.

Comparing the results for the 1960s with the beginning of the 1980s, cereal production grows at 4 percent per year. Growth in cereal production may be attributed to changes in harvested area land (Figure 3) because comparing the results for the 1960s with the beginning of the 1980s, area harvested increased by 10 percent per year. The expansion of arable land has been the major source of production growth because yield for the same comparison period decreased at 4 percent annually. Therefore, the increase in area cultivated did not bring about the expected increase in productivity. The decline in yield is mainly due to the lack of transfer technology and inadequate logistical support to farmers (ICARDA, 1987).

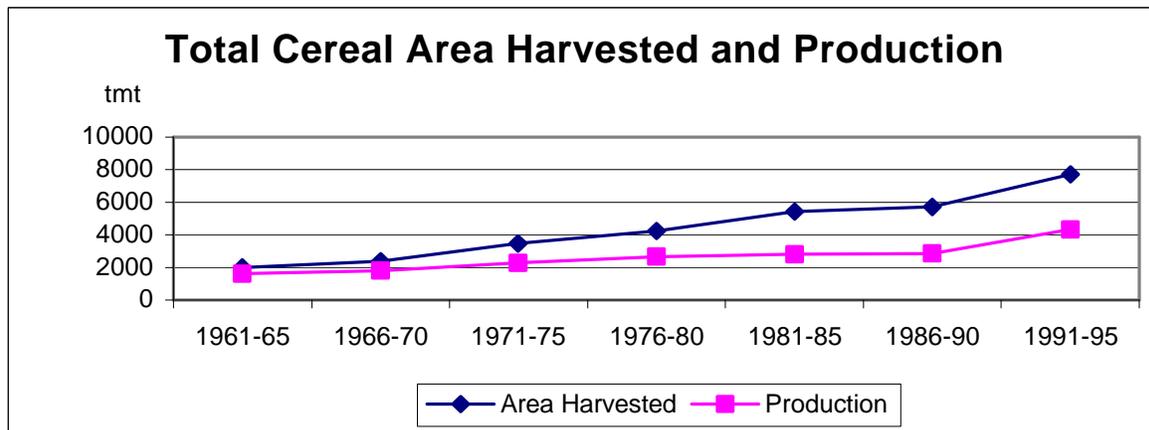


Figure 3. Total cereal area harvested (1,000 hectare) and production (tmt), the Sudan, 1961-95

Trends in Sudanese Cereal Production, Consumption, and Trade, 1961-95

Table 2 shows the average yearly production, area harvested, and yield of selected cereals for a 10-year period for the last four decades. Total cereals production increased by 45 percent between the 1960s and the 1970s from 1.707 million metric tons to 2.484 million metric tons, by 14 percent between the 1970s and the 1980s from 2.484 million metric tons to 2.837 million metric tons, and by 52 percent between the 1980s and the 1990s from 2.837 million metric tons to 4.320 million metric tons. The recent increase in total cereal production might be attributed to the increase in area harvested (Table 1, Figure 3).

Total cereals yield growth rates decreased by 17 percent between the 1960s and the 1970s from 7,790 hectogram (100 grams) per hectare to 6,442 hectogram per hectare, decreased by 23 percent between the 1970s and the 1980s from 6,442 hectogram per hectare to 4,944 hectogram per hectare, and increased by 14 percent between the 1980s and the 1990s from 4,944 hectogram per hectare to 5,624 hectogram per hectare. The human population increased by 30 percent from 12.541 million to 16.343 million, by 33 percent from 16.343 million to 21.695 million, and by 18 percent from 21.695 million to 25.625 million during the same three decades. Unless this trend can be reversed, there will be serious problems in the next decade. In addition, maintaining yield growth rates is considered critical for securing future food supplies in the Sudan as the world demand for cereals continues to increase substantially.

While wheat production increased between the 1960s and the 1970s by 238 percent from 65 thousand metric tons to 220 thousand metric tons, wheat production decreased by

11 percent between the 1970s and the 1980s from 220 thousand metric tons to 196 thousand metric tons and increased by 199 percent from 196 thousand metric tons to 578 thousand metric tons between the 1980s and the 1990s. The wheat production increase during the 1990s is mainly because the government of Sudan launched a crash program in 1989 to achieve self-sufficiency in wheat by expanding Sudan's wheat area (Hassan and Faki, 1993) (wheat area harvested increased by 127 percent from 57 thousand hectare to 182 thousand hectare between the 1980s and the 1990s).

Table 2. Average yearly production, area harvested, and yields of selected cereals for a 10-year period between the 1960s and the 1970s, between the 1970s and the 1980s, and between the 1980s and the 1990s

	<u>(1971-80)/(1961-70)</u>		<u>(1981-90)/(1971-80)</u>		<u>(1991-95/1981-90)</u>	
	Absolute Change	Absolute Change	Absolute Change	Absolute Change	Absolute Change	Absolute Change
Production	(percent)	(tmt)	(percent)	(tmt)	(percent)	(tmt)
Wheat	238	155	-11	-24	199	391
Sorghum	39	505	29	529	38	883
Millet	29	95	-33	-137	67	187
Cereals, Total	45	776	14	354	52	1482
Yield		(HG/HA)		(HG/HA)		(HG/HA)
Wheat	-9	-1128	21	2413	30	4133
Sorghum	-14	-1217	-24	-1749	5	281
Millet	-33	-1871	-47	-1776	22	443
Cereals, Total	-17	-1348	-23	-1497	14	679
Area Harvested		(thousand hectares)		(thousand hectares)		(thousand hectares)
Wheat	241	142	-28	-57	127	182
Sorghum	64	969	62	1541	37	1471
Millet	93	531	25	272	37	504
Cereals, Total	76	1671	44	1710	39	2166
Population		(thousand)		(thousand)		(thousand)
	30	3801.4	33	5352.1	18	3930.7

The government strategy aims to exploit the potential gains from improved wheat production technologies developed by the Agricultural Research Corporation (ARC). These technologies have been tested by the ARC in farmers' fields over several years. However, a wide gap remains between potential yields and farmers' yields. The wheat production increase during the 1990s might also be attributed to high prices for the farmers (FAO, 1997). With continuing high wheat prices, farmers have had a strong incentive to plant large wheat areas.

Sorghum production increased by 39 percent between the 1960s and the 1970s from 1.297 million metric tons to 1.801 million metric tons, by 29 percent between the 1970s and the 1980s from 1.801 million metric tons to 2.33 million metric tons, and by 38 percent between the 1980s and the 1990s from 2.33 million metric tons to 3.213 million metric tons. The sorghum production increase during the 1990s is mainly because of the major increases in sorghum planted area, stimulated by high prices at planting time, allied to better than average supplies of fuel and fertilizer and in the greater use of high potential cultivars combined to provide the conditions for the highest sorghum crop in recent years (FAO, 1997).

Millet production increased by 29 percent between the 1976s and the 1970s, decreased by 33 percent between the 1970s and the 1980s, and increased again by 67 percent between the 1980s and the 1990s. The poor rainfall during the 1980s contributed to reduce in millet production.

While both sorghum and millet yield decreased between the 1960s and the 1970s and between the 1970s and 1980s, it increased between the 1998s and the 1990s. Wheat yield decreased by 9 percent between the 1960s and the 1970s then increased by 21 percent between the 1970s and 1980s and by 30 percent between the 1980s and the 1990s. Low national yields may results in food shortages or high food prices for the poor, whereas high yields may results in unacceptably low prices for farmers and excessive government-owned food stock (Hazell, 1986).

Table 3 presents the average yearly net exports, imports, and per capita consumption of selected cereals for the last four decades. Total cereals exports increased by 92 percent between the 1960s and the 1970s from 119 thousand metric tons to 227 thousand metric tons and it increased by 87 percent between the 1970s and the 1980s from 227 thousand metric tons to 425 thousand metric tons. Between the 1980s and the 1990s, total cereal exports increased by only 17 percent from 425 thousand metric tons to 498 thousand metric tons.

On the other hand, total cereal imports showed a tremendous increase between the 1970s and the 1980s (by 306 percent from 176 thousand metric tons to 714 thousand metric tons). This is mainly because of frequent years of drought during the 1980s. Total cereal

imports increased by only 42 percent between the 1980s and the 1990s from 714 thousand metric tons to 10.16 million metric tons.

While wheat imports increased dramatically between the 1970s and the 1980s, they decreased by 4 percent between the 1980s and the 1990s from 504 thousand metric tons to 485 thousand metric tons. That is because the government of Sudan promotes domestic wheat production to reduce the reliance on imported food and to reduce foreign expenditures on wheat imports. In addition, the government gradually removed the high subsidy on bread prices during 1991, leading to reduce consumption (Hassan and Faki, 1993). Sorghum exports decreased by 15 percent between the 1990s and the 1980s from 210 to 178 thousand metric tons, perhaps to maintain food security for the country.

Table 3. Average yearly exports, imports, and per capita consumption of selected cereals for a ten-year period between the 1960s and the 1970s, between the 1970s and the 1980s, and between the 1980s and the 1990s

	<u>(1971-80)/(1961-70)</u>		<u>(1981-90)/(1971-80)</u>		<u>(1991-95/1981-90)</u>	
	Absolute		Absolute		Absolute	
	Change	Change	Change	Change	Change	Change
Exports	(percent)	(tmt)	(percent)	(tmt)	(percent)	(tmt)
Sorghum	100	55	90	100	-15	-32
Millet	-21	-1	-25	-1	2686	62
Cereals, Total	92	109	87	198	17	73
Imports						
Wheat	34	41	206	339	-4	-19
Cereals, Total	15	23	306	538	42	302
Per Capita Consumption		(kg)		(kg)		(kg)
Wheat	59	8.78	36	8.47	32	10.14
Sorghum	5	4.67	-3	-2.88	25	24.93
Millet	0	0.04	-48	-12.28	19	2.55
Cereals, Total	8	10.92	-3	-4.44	31	45.10

Total cereals per capita consumption increased by 8 percent between the 1960s and the 1970s, then decreased by 3 percent between the 1970s and the 1980s. Per capita consumption for total cereals increased by 31 percent between the 1980s and the 1990s from 145 to 190 kg. The annual per capita consumption of all cereals increased between the 1980s and the 1990s because of improved grain supplies and the downward pressure on real prices (FAO, 1997). This should allow improved intakes and reduce undernutrition.

Conclusion

The pattern of cereals consumption over the last four decades has shown two major trends: the growth of grain consumption and a shift in the pattern of cereal demand from sorghum, which is the traditional staple, to domestically produced and imported cereals, and wheat for food and feed uses.

An understanding of cereals in the Sudan is important for maintaining efficient and sustainable agricultural and food production. Therefore, this study has analyzed Sudanese cereals by examining recent trends in cereal production, consumption, and trade during the past four decades, with the identification of the elements that might affect the future outlook for production and import demand.

The findings have shown that between 1961 and 1995, Sudanese grain production rose at an annual average rate of 5 percent. Growth in cereal production is attributed to changes in harvested area land. Area harvested increased by 10 percent annually, but yield decreased by 4 percent each year for the same period. Thus, the expansion of arable land did not bring about the expected increase in productivity. To increase productivity growth, farmers should be provided with new technology, access to modern inputs, and adequate logistical support.

Between 1961 and 1995, total cereal consumption in the Sudan rose at an average annual rate of 6 percent. This growth in consumption is because of continuing population growth along with relatively high-income elasticity of demand for cereals and cereal products. To meet the shortfall between cereal consumption and production, cereal imports, especially wheat, increased.

Wheat imports increased by 15 percent annually for the 35-year period. Wheat imports have exerted a heavy burden on the Sudan's meager and deteriorating foreign exchange resources and have worsened its negative trade balance. Therefore, the domestic resources for wheat production should be fully utilized. The gap between potential yield and farmers' yields needs to be closed. In addition, to reduce wheat consumption and increase demand for sorghum, which is the traditional staple, the government should remove the high subsidy on bread prices.

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