Estimation of supply and demand functions of the major food security crops in the Sudan (1974- 2004)

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ABSTRACT

This study aimed at estimating the supply and demand functions and measuring the food consumption gaps of the main food crops, namely sorghum, wheat and millet. Descriptive statistics and backward regret-ssion analysis were used as tools of analysis. Results showed that the quantity of food crops produced was far below the real needs for local consumption. Moreover, self-sufficiency ratio has declined from 100 % in 1981/1982 to 72.6% in 2000 /2001, indicating positive trend in the food consumption gap. Regarding sorghum crop, results showed that the most important factor affecting the supply of sorghum was the lagged producer price whereas the most important factors affecting demand for sorghum were consumer price of sorghum and per capita income. Results showed that the most important factors affecting the supply of wheat were the producer price of sorghum and the producer price of cotton whereas the most important factor affecting demand for wheat was the consumer price of sorghum. The millet crop was affected by the lagged producer price and consumer price of millet supply and demand functions, respectively. The results of this study indicated that, in a national sense, Sudan is food insecure during the period 1980/81-2004/2005. The shift in consumption habits towards wheat is highly responsible for the food insecurity.

INTRODUCTION

Sudan is the largest country in Africa, covering an area of approxim-ately one million square miles. Although over 200 million feddans are potentially usable for cropping and livestock raising, the utilized area in 2003 was about 40 million feddans of which 24 million feddans irrigated, 12 million feddans mechanized rain fed and 4 million feddans irrigated agriculture (Bank of Sudan 2004). The main food crops produced in Sudan are sorghum, wheat and millet with sorghum providing about 60% of total quantity of cereal consumption. Only in the southern states there are other carbohydrate food crops, particularly cassava and sweet potatoes, consumed in significant quantities. Sorghum and millet are grown throu-ghout the country during the rainy season, from April to October. During the winter months, from November to March, wheat is grown on the various irrigated schemes. Small, but locally significant, areas of maize (usually under mixed cropping) are also grown under traditional cultiva-tion systems in river areas in the south using residual moisture left by preceding floods.

The World Bank (1986) defined food security as "access by all people at all times to enough food for an active and healthy life". Its essential elements are the availability of food and ability to acquire it. This defini-tion implies that the problem of food security has two broad aspects; accessibility to food and availability of food. With regard to availability of food, the major problem is that domestic cereal output has been growing at a slower rate than population, implying that the per capita cereal output has been declining. In addition, scarcity of foreign exch-ange made it difficult to bridge the gap between consumption and production through commercial imports. Moreover, the food system in Sudan is subject to a high degree of intervention and is far from meeting the criteria of efficiency and equity (Maxwell, 1991).

Mahran (1996) addressed the problem of food security within a supply-demand empirical specification whereby the interaction of both the supply and demand factors was recognized. The analysis drew on the experience of Sudan with regard to the wheat question and examined the impact of wheat aid on domestic production and consumption and on self-sufficiency in wheat. Results obtained by them revealed that while food aid has played a significant role in stabilizing domestic consumption, dependency on wheat aid however, is likely to jeopardize efforts to achieve self-sufficiency in food. They argued that adoption of a self-sufficiency strategy was required to approach the wheat question. The food security in Sudan depends on three cereal crops, namely sorghum, wheat and millet. Moreover, wheat consumption has increased substant-ially due to increasing fluxes of migration and displacement to urban areas, changes in consumer habits, high consumer subsidies, population and income growth (Hassan and Ageeb, 1992). The average per capita consumption of wheat per year increased from 10.5 kg in1960 to 36 kg in 1996 (Elamin, 2000).

The significance of the agricultural sector in the Sudan stems from its high percentage contribution to the gross domestic product (GDP). It contributed 57% of the GDP in 1959 and maintained an average of 35% of the GDP during 1988-1996. The sector contributed over 45% during the second half of 1990's and the first half of 2000's. Table 1 indicated that the sector contributed an average of 46.76% during the period 1996-2004.

Table 1. Contribution of the agricultural sector to the GDP (Ls million), 1996–2004.

Year	GDP	Agricultural GDP	Share (%)
1996	909.18	408.94	44.98
1997	966.87	461.20	47.70
1998	1208.86	588.72	48.70
1999	1270.58	631.09	49.68
2000	1525.97	708.05	46.90
2001	1502.81	701.25	46.68
2002	1553.90	725.17	46.66
2003	1215.50	771.50	45.05
2004	1450.30	602.20	44.52
Average	1289.30	622.00	46.76

Sources: Own calculations based on data from Bank of Sudan, annual reports, various issues and Central Bureau of Statistics, Khartoum (2004).

On the other hand, the agricultural sector contributes more than 40% of the total GDP and more than 80% of the total export in 2005 excluding oil. Moreover, the sector provides employment for over 65% of the population and about 50% of the raw materials for domestic industry (Geneif, 2006). The sector had grown at a rate of 9.6% in 2004 (Bank of Sudan, 2004).

The high fluctuation in prices of food crops have resulted in high fluctuations in the supply and demand of food crops; leading to transitory food insecurity The main objective of this study is to measure the responsiveness of the main food crops to prices, by estimating supply and demand functions for the main food crops. Moreover, the study aims at estimating the self-sufficiency ratio by measuring the food consumption gaps based on consumption and production levels.

METHODOLOGY

The model

For the purpose of achieving the stated objectives, a multi-market model was constructed. Multi-market models could be used to assess how the price change affects production and consumption and how these quantitative responses in turn affect producer incomes, consumer expenditure, government revenue and foreign exchange earnings, welfare, producer surplus, consumer surplus, efficiency losses and gains to the economy as a result of shifts in production and consumption (Tsakok, 1990). The constructed model included three food commodities namely, sorghum, wheat, and millet. In addition, the model included cotton as a cash crop. The selection of these commodities is justified by the following*:*

a- The selected food crops represent the main food crops in the Sudan.

b- Around 70% of the calories are obtained from cereals consumption.

c- Cotton as a cash crop (export crop) competes with wheat (import crop) in area and irrigation water.

Data used for the purpose of estimation of supply and demand equations covers the period from 1974 to 2004. The model will be represented by the following equations:

1- Supply function: The quantity supplied of a commodity depends on its own price and the prices of competing products. The supply function is given by the following specification:

$$Q_{is} = K_{is} (P_{is})^{\varepsilon ii} (P_{js})^{\varepsilon ij} \qquad i.j=1..4 \qquad (1)$$

Where:

Q_{is} = Quantity supplied of product *i*.

P_{is} = lagged producer price of the product *i*.

P_{js} = Producer price of product *j*.

K_{is} = Multiplicative constant.

ε_{ii} = Own price elasticity of product *i*.(substitutes and complements).

ε_{ij} = Cross price elasticity of supply of product *i* with price of product *j*.

2- Demand function: The quantity demanded of commodity *i* depends on its own price, the price of close substitutes and per capita income. Hence, the demand function is given by the following specification:

$$Q_{id}=K_{id}\,(P_{ic})^{\eta ii}\,(P_{jc})^{\eta ij}\,Y_i^{\alpha i}\ \text{i.j=1..4} \qquad (2)$$

Where:

Q_{id} = Quantity demanded of product *i*.

P_{ic} = Consumer price of the product *i*.

P_{jc} = Price of the competing product *j*.

K_{id} = Multiplicative constant.

η_{ii} = Own price elasticity of demand for product *i*.

η_{ij} = Cross price elasticity of demand for product *i* with price of product *j*.

αi = Income elasticity of product *i*.

Y_i = Per capita income of the consumer.

P = Population.

(3) The food consumption gap is calculated using the following equation:

$$g_i = Q_{is} - Q_{id} \quad \ldots\ldots\ldots \qquad (3)$$

Where:

g_i = Food consumption gap.

Data used for the purpose of estimating food consumption gaps covers the period 1981-2005. Backward regression was employed for the purpose of estimating the equations of the model. Descriptive statistics were used to estimate the food consumption gaps and self-sufficiency ratios based on the levels of production and consumption.

The specific functional equations used for each crop are as follows:

Supply of sorghum:

$$Q_s^s = K_s^s\, p_s^{\varepsilon ss}\, p_w^{\varepsilon sw}\, p_m^{\varepsilon sm} \quad \ldots\ldots\ldots \qquad (4)$$

where

Q_s^s = Quantity supplied of sorghum.

K_s^s = Multiplicative constant.

p_s = Lagged producer price of sorghum.

p_w = Producer price of wheat.

p_m = Producer price of millet.

0

ε_{sw} = Cross price elasticity of supply of sorghum with price of wheat.

ε_{sm} = Cross price elasticity of supply of sorghum with price of millet.

Supply of wheat:

$$Q_s^w = K_s^w \; p_w^{\varepsilon ww} \; p_s^{\varepsilon ws} \; p_c^{\varepsilon wc} \; p_{im}^{\varepsilon wim} \ldots\ldots\ldots\ldots \quad (5)$$

Where:

Q_s^w = Quantity supplied of wheat.

K_s^w = Multiplicative constant.

p_{im} =Import price of wheat.

ε_{ww} = Own price elasticity of wheat.

ε_{sw} = Cross price elasticity of supply of wheat with price of sorghum.

ε_{wc} = Cross price elasticity of supply of wheat with price of cotton.

ε_{im} = Cross price elasticity of supply of wheat with import price of wheat.

Supply of millet:

$$Q_s^m = K^m_s \; p_m^{\varepsilon mm} \; p_s^{\varepsilon ms} \; p_w^{\varepsilon mw} \quad (6)$$

Where:

Q_s^m = Quantity supplied of millet

K^m_s = Multiplicative constant

ε_{mm} = Own price elasticity of millet.

ε_{ms} = Cross price elasticity of supply of millet with price of sorghum.

ε_{mw} = Cross price elasticity of supply of millet with price of wheat.

Demand for sorghum:

$$Q_d^s = K^s_d \, p_{cs}^{\eta ss} \; p_{cm}^{\eta sm} \; p_{cw}^{\eta sw} \; y^{\alpha s} \; p \quad (7)$$

Where:

Q_d^s = Quantity demanded of sorghum

p_{cs} = Consumer price of sorghum.

p_{cw} = Consumer price of wheat.

p_{cm} = Consumer price of millet.

η_{ss} = Own price elasticity of sorghum demand

η_{sw} = Cross price elasticity of sorghum demand with price of wheat.

η_{sm} = Cross price elasticity of sorghum demand with price of millet
y = Consumer per capita income.
αs = Income elasticity of demand for sorghum.
P = Population.
Demand for wheat:

$$Q_d^w = K^w_d p_{iw}^{\eta ww} p_{cs}^{\eta ws} p_{cm}^{\eta wm} y^{\alpha w} p \quad \ldots\ldots\ldots\ldots \quad (8)$$

Where:
Q_d^w = Quantity demand of wheat.
P_{iw} = Import price of wheat.
η_{ww} = Own price elasticity of wheat demand.
η_{ws} = Cross price elasticity of wheat demand with price of sorghum.
η_{wm} = Cross price elasticity of wheat demand with price of millet.
αw = Income elasticity of demand for wheat.
Demand for millet:

$$Q_d^m = K^m_d p_{cm}^{\eta mm} p_{cs}^{\eta ms} p_{cw}^{\eta mw} y^{\alpha m} p \quad \ldots\ldots\ldots\ldots \quad (9)$$

Where:
Q_d^m = Quantity demand of millet.
η_{mm} = Own price elasticity of millet demand.
η_{ms} = Cross price elasticity of millet demand with price of sorghum.
η_{mw} = cross price elasticity of millet demand with price of wheat.
αm = Income elasticity of demand for millet.

RESULTS AND DISCUSSION

This section consists of two parts. Part one reports the results related to the self-sufficiency ratio and the food consumption gaps while part two reports the results obtained using the supply and demand equations of the constructed model.

1.Food consumption gaps in the Sudan

The contribution of the locally produced food crops to the total consu-mption (self-sufficiency ratio) has declined from 100 % in 1981/ 1982 to 72.6% in 2000 /2001 (Table 2). It is clear from Table 2 that with the exception of seasons 1981/1982, 1987/1988 and 2002/2003, the self–sufficiency ratio is less than one indicating that in a national sense, Sudan is food insecure during the period 1980/1981-2004/2005. Moreover, it is clear from Table 2 that the self-sufficiency ratio is highly fluctuating during the period 1980/1981-2004/2005. This necessitates the build up of efficient storage facilities to help in meeting consumption needs during the poor harvest seasons. However, the degree of insecurity differs from one year to anther depending on the food consumption gaps.

The food consumption gaps may be attributed to lower production and shift of consumer preferences towards wheat. It is clear from Figure 1 below that with the exception of the year 1991, wheat production was below consumption during the period 1974-2004.

The absolute production level displays seasonal variation due to fluctu-ations of the area under the crop and yield realized. The average grain yield achieved in the Gezira, New Halfa and Northern States were indeed low. These low yield levels are mainly attributed to poor crop establishment resulting from poor land preparation, inadequate finance as well as the high temperature prevailing during the early stages of crop growth and flowering.

Table 2. Cereal production, consumption, gap, and self-sufficiency ratio (1981-2005).

Year	Total production (000) tons	Total consumption (000) tons	Consumption gap (000) tons	Self-suff. ratio
80/81	2001	2013	332	99.4
81/82	2637	2493	438	100.5
82/83	3986	3889	434	97.7
83/84	2287	2339	283	93.2
84/85	2477	2656	591	80.2
85/86	1344	1679	501	93.6
86/87	4213	4498	573	94.9
87/88	3719	3917	559	107.9
88/89	1697	1572	533	96.4
89/90	5167	5359	441	80.2
90/91	2106	2624	184	74.3
91/92	1951	2153	250	89.7
92/93	4784	5330	525	97.6
93/94	4944	5064	528	88.4
94/95	3582	4048	672	92.1
95/96	5069	5502	810	92.1
96/97	3362	3647	920	89.8
97/98	5259	5643	1050	90.7
98/99	4110	4576	1198	93.5
99/00	5122	5641	1210	72.6
00/01	3160	4350	1234	72.6
01/02	3060	3990	1245	76.6
02/03	5219	4066	1250	128.3
03/04	3736	5466	1265	68.3
04/05	5858	6256	1277	93.6

Source: Own calculations based on data of Ministry of Agricultural and Forestry, Agricultural Economics Department.

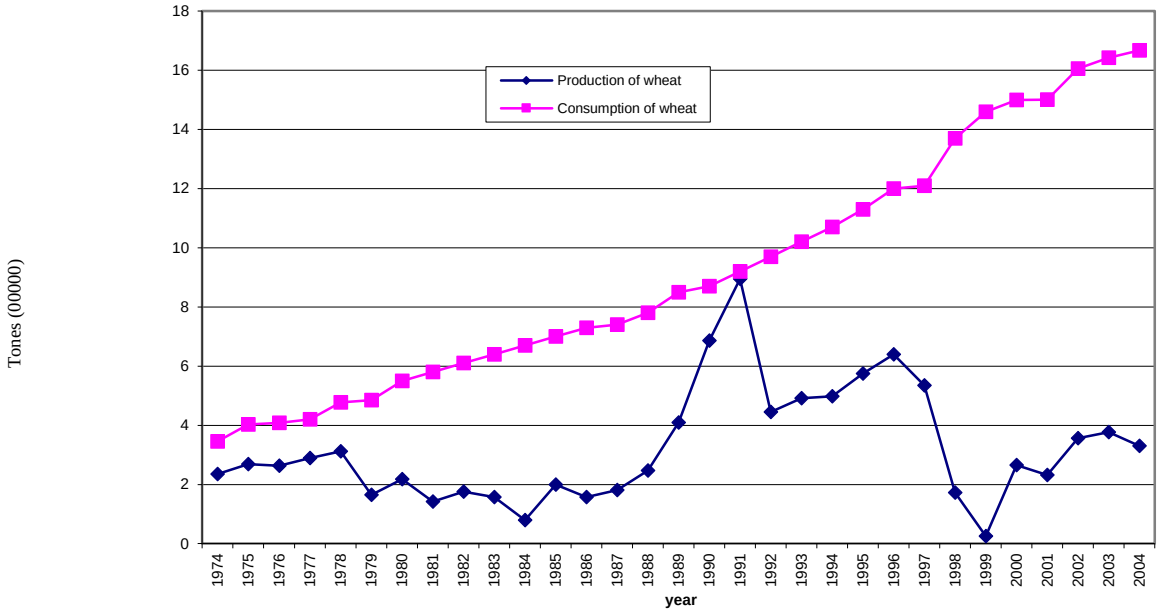

Figure 1. Production and consumption of wheat in Sudan

The contribution of domestically produced cereals could be substantially increased. Adoption of improved production technology and increasing the cropped area in the Gezira scheme could raise the contribution of the scheme to local consumption from 31% to 145% (Ali, 2003). Demand for wheat has increased overtime in urban areas to magnitudes that could no longer be satisfied by local production. Moreover, wheat consumption has gradually shifted towards rural areas, induced by a substantial shift in consumption habits away from the traditionally used sorghum. Wheat has increased from 1679 thousand tones in 1985/1986 to over 6 million tones in 2004/2005 (Table 2). Although population growth is partly responsible for that increase, much of the increase, which was encouraged by highly subsidized bread prices, has attributed to rising per capita demand, especially in urban areas.

Food crops consumption has grown tremendously though food aid, high consumer subsidies, and rapid urbanization; wheat consumption increased enormously during the three decades. Most of the demand is concentrated in urban areas where wheat has largely replaced sorghum.

Uncertainties about actual food crops demand were influenced by the levels of population and income growth, income elasticities of demand and prices levels. The positive trend of wheat consumption has resulted in a continuous and variable deficit between domestic needs and local production. This trend has necessitated the exertion of efforts to bridge the gap through imports. The country had to import, in most years, about three quarters of its annual needs that currently ranged between 1.2 and 1.6 million tons of wheat. Facing severe budgetary and trade deficits and reduced food aid, the government of Sudan launched a crash program in 1989 to achieve self-sufficiency in wheat by 1992. In addition to expanding Sudan's wheat area, the government strategy aimed at exploiting the potential gains from improved food crops technologies developed by the Agricultural Research Corporation (Ali, 2003).

It may be noted that this insecurity gap was measured within a self-sufficiency framework using only the food produced within the country (excluding imports) and not total supply. This may be explained by the large import bill of wheat that negatively affects the balance of payment. Moreover, the value of wheat and wheat flour imports is very high, absorbing almost all of the foreign exchange generated form total agricultural exports (Table 3).

Table (3): Value of wheat import and agricultural exports, 1997-2004.

Year	Total value of wheat and wheat flour (US $ millions)	Agricultural exports (US$ millions)	%
1997/98	138.40	133.37	103.70
1998/99	131.94	171.37	76.90
1999/00	123.33	142.56	86.50
2000/01	207.94	91.18	228.00
2001/02	138.09	265.52	52.00
2002/03	214.47	358.00	59.90
2003/04	255.56	410.25	62.30
2004/05	386.38	587.94	65.70

Source: Bank of Sudan, annual reports (2000 – 2004).

2. Results of the Cobb-Douglass Regression Model

2.1 Supply of sorghum

Backward regression that selects only the significant variables was applied to the log-linear form of equation (4) to obtain the following equation:

Ln supply of sorghum= 14.316 + 0.079 Lnps ……(10)

(111.74***) (4.06***)

R^2 = 0.36 F=16.512 Sig. = 0.000

(Figures between brackets in all equations are the absolute t-ratio of the estimated parameters).

From the above equation, it is noticed that the coefficient of the included explanatory variable namely producer price of sorghum is highly significant at P level (0.000); both individually as indicated by the T-statistics and collectively as indicated by the F-statistics. The coefficient of determination, R^2, is 0.36 indicating that 36% of the variation in the supply of sorghum is explained by the above mentioned variable.

2.2 Supply of wheat

Backward regression was also applied to the log linear form of equation (5) to derive the following equation.

Ln supply of wheat = 11.970 - 0.175 Ln ps + 0.233 Ln pc …….. .(11)

(37.91***) (-1.85 ***) (2.544***)

R2 = 0.53 F=5.78 Sig. = 0.000

From the above equation it is noticed that the coefficient of the included explanatory variables namely the producer price of sorghum and the price of cotton are highly significant at the level of 0.000; both individually as indicated by the T-statistics and collectively as indicated by the F-statistics. The coefficient of determination, R^2, is 0.53 showing that 53% of the variation in the supply of wheat is explained by the above mentioned variables. This result indicated that a change in the price of sorghum had a negative effect on the price of wheat. In this respect, farmers will devote resources to the production of the comparatively higher price crop. Result also indicated that there is a positive relation between the supply of wheat and cotton price. This result may be interpreted by the fact that the study consider the total supply of wheat in the country rather than that in the public irrigated schemes where cotton and wheat compete for irrigation water. Another interpretation for this result could be the impact of the increased farmers' income due to the increase in cotton price so that farmers are better off and can devote some resources to wheat crop.

2.3 Supply of millet

Backward regression was applied to the log linear form of equation (6) to obtain the following regression equation.

Ln supply of millet = 11.704 + 0.145 Ln p_m …… (12)

(24.429***) (2.27***)

R^2 = 0.43 F=5.13 Sig.= 0.031

It is clear from the equation (14) above that the included explanatory variable namely the producer price of millet is highly significant as indicated by the T-statistics (2.27***) and collectively as indicated by the F-statistics (5.13) at the level of 0.031. The coefficient of determination, R^2, is 0.43 showing that 43% of the variation in the supply of millet is explained by the above mentioned variable.

2.4 Demand for sorghum

Backward regression was applied to the log linear form of equation (7) to derive the following equation

Ln demand of sorghum = 14.123+ 0.394 Ln yαs - 0.344 Lnp_{CS} ……. (13)

(106.497***) (3.523***) (-2.248***)

R^2 = 0.66 F=13.71 Sig.= 0.000

From equation (15) above, it is noticed that all the coefficients of the included explanatory variables namely the consumer price of sorghum and per capita income are highly significant at level (0.000) both individually as indicated by the T-statistics and collectively as indicated by the F-statistics. The coefficient of determination, R^2, is 0.66 indicating that 66% of the variation in the demand of sorghum is explained by the above mentioned variables. Results showed that, consumer per capita income and consumer price of sorghum are the most important factors affecting the demand for sorghum. The significant relationship between the demand for sorghum and per capita income may be interpreted by the fact that sorghum is the most important staple food crop for the rural people.

2.5 Demand of wheat

Backward regression was applied to the log linear form of equation (8) to obtain the following equation.

Ln demand of wheat = 12.63 + 0.127 Ln p_{cs} ……..(14)

(136.4***) (9.44***)

R^2 = 0.75 F=89.055 Sig.= 0.000

It is clear from the above equation that the included explanatory variable namely the consumer price of sorghum is highly significant at level (0.000) both individually as indicated by the T-statistics and collectively as indicated by the F-statistics. Similarly, the coefficient of determination, R^2, is 0.75 showing that 75% of the variation in the demand of wheat is explained by the above mentioned variable. The above result indicated the high competition between sorghum and wheat in the consumer market.

2.6 Demand for millet

Backward regression was applied to the log linear form of equation (9) to derive the following regression equation.

Ln demand for millet = 11.624 + 160 Ln p_{Cm} ……..(15)

(23.117***) (2.305***)

R^2 = 0.71 F=5.311 Sig. = 0.029

From equation (18), it is noticed the coefficient of the included explanatory variable namely the consumer price of millet is highly significant at level (0.029) both individually as indicated by the T-statistics and collectively as indicated by the F-statistics. The coefficient of determination, R^2, is 0.71 showing that 71% of the variation in the demand of millet is explained by the above mentioned variable. Result showed that consumer price of millet is the most important factor affecting the demand for millet. The positive relationship between the consumer price of millet and demand for millet may be interpreted by the fact that millet is the major staple food crop in western Sudan and little or no consumption alternatives are available for consumers.

The results of this study indicated that in a national sense Sudan is food insecure during the period 1980/81-2004/2005. The shift in consumption habits towards wheat is highly responsible for the food insecurity. Supply of sorghum and millet are affected by lagged producer prices. However, supply of wheat is affected by the price of sorghum and cotton. Sorghum demand is highly affected by per capita income and prices while wheat demand is affected by sorghum price indicating the high competition bet sorghum and wheat in the consumer market.

REFERENCES

Ali, G. A.A. 2003. Competitiveness of Wheat Crop in the Sudan Gezira Scheme. M.Sc Thesis, University of Gezira, Wad Medani, Sudan.

Bank of Sudan. Various issues (2000 - 2004). Annual Reports, Khartoum, Sudan.

Elamin, A. E.M. 2000. Policy Analysis of Wheat Production in the Sudan. Sudan Journal of Agricultural Research 3:77-83.

Geneif, A. A. 2006. Green Revival of Agricultural Production in Sudan. Study prepared by the High Consultancy Committee for the Green Revival Program, Ministry of Agriculture and Forestry, and presented to the Council of Ministers, Khartoum, Sudan (in Arabic).

Hassan, R. and O. A. A. Ageeb 1992. Towards higher Wheat Produ-ctivity in Gezira: The role of efficient input delivery systems and appropriate technology designs, pp. 212-219. In Proceedings of the Seventh Regional Wheat Workshop for Eastern, Central and Southern Africa., CIMMYT.

Mahran, H.A. 1996. Food Aid and Food Security in Sudan: An empirical Analysis (1970-1990), Discussion Paper, U. of G.

Maxwell, S. 1991. To Cure all Hunger Food Security and Food Policy in the Sudan. Intermediate Technology Publications, London.

Tsakok, I. 1990. Agricultural Price Policy, a Practitioner's Guide to Partial Equilibrium Analysis, Cornell University Press, Ithaca, New York, USA.

World Bank. 1986. Poverty and Hunger. Issues and Options for Food Security in the Developing Countries. Washington DC.

تقديرات دالتي العرض والطلب لمحاصيل الأمن الغذائي الرئيسة في السودان (2004 – 1974)

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الخلاصة

هدفت هذه الدراسة أساساً لبيان أبعاد مشكلة عدم الأمن الغذائي في السودان و تحديداً لقياس الفجوة الإستهلاكية للغذاء وتقدير دالتي العرض والطلب علي المحاصيل الغذائية الرئيسة وهي الذرة، القمح والدخن. لقد أستخدمت الدراسة أساليب التحليل الإحصائي الوصفي والإنحدار الخطي كأدوات أساسية لتحليل البيانات. وقد أظهرت النتائج أن كميات المحاصيل الغذائية المنتجة هي أقل بكثير من الإحتياجات الحقيقة من الإستهلاك المحلي. بالإضافة إلي ذلك فإن معدل الإكتفاء الذاتي قد تدني من 100% موسم 1982/1981 إلى 72% موسم 2001/2000 مشيرةً إلى الإتجاه الموجب للفجوة الغذائية . أظهرت النتائج أن أهم عامل مؤثر في عرض محصول الذرة هو سعر الذرة للمنتج بينما أهم العوامل المؤثرة علي طلب الذرة يتمثل فى سعر الذرة للمستهلك و دخل الفرد. فيما يتعلق بمحصول القمح فقد أظهرت النتائج أن أهم العوامل المؤثرة في عرض القمح هو سعر الذرة للمنتج وسعر المنتج من القطن بينما نجد أن أهم عامل مؤثر علي طلب القمح هو سعر الذرة للمستهلك. أما بالنسبة للدخن فوجد أن العرض والطلب لهذا المحصول يتأثران بصورةٍ مباشره بسعر الدخن للمنتج والمستهلك علي حد السواء. خلصت الدراسه إلي أن زيادة الفجوة الاستهلاكية فى المحاصيل الغذائيه الرئيسه يعزى أساساً إلي قصور مستوي العرض فى محصول القمح إضافةً إلى تزايد الطلب علي إستهلاكه نتيجةً لتغير النمط الغذائى.