Review

Potential for agricultural trade in COMESA region: a comparative study of Sudan, Egypt and Kenya

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This paper aimed at quantifying the potentials of intra-regional agricultural trade in the COMESA region taking examples of Sudan, Egypt and Kenya. Different indicators and indices like instability index, production similarity index, comparative production performance index, export similarity index and revealed comparative advantage index were used. The results showed a promising potential for intra-regional agricultural trade. The instability indices of production in cereals, pulses, and roots and tubers were more stable at regional level than national one. The results of production similarity index indicate differences in production patterns of the three countries. Export similarity indices results show that countries are dissimilar in their export patterns. The revealed comparative advantage indices, considering each country separately, are generally higher for dominant export products. As dominant products differ among the countries the pattern of specialization differs considerably among these countries, and therefore, there is a potential for expanding intra-regional trade in the region. The paper concluded that the government policies of COMESA member countries, especially Sudan, should pay more emphasis to encourage integrating their markets regionally to benefits from potential of trade and comparative advantage exist in the region.

Key words: COMESA, potential for agricultural trade, comparative study

INTRODUCTION

The preferential trade agreement for eastern and southern African states (PTA) is initiated as the result of the first extraordinary conference of Ministers of Trade, Finance and Planning held in Lusaka, Republic of Zambia in March 1978. Second extraordinary session of Heads of States of the Organization of African Unity, held at Lagos in April, 1980, decided that an African common market should be established by the year 2000. The PTA treaty was signed in December 1981, implemented in 1983, by 22 countries; and Sudan became a member in 1990. The treaty establishing Common Market for Eastern and Southern Africa countries (COMESA) was signed on November 5, 1993 in Kampala, Uganda and was ratified one year later in Lilongwe, Malawi on December 8, 1994 (COMESA 2004). COMESA was established superseding

the Preferential Trading Agreement (PTA) for east and southern African states (Barry et al., 2001). The Treaty establishing COMESA binds together free independent sovereign States which have agreed to co-operate in exploiting the natural and human resources for the common good of their peoples. In attaining that goal, COMESA recognizes that stability, security and peace are basic factors in providing investment, trade, develop-ment and regional economic integration.

Sudan has signed and ratified its membership in COMESA from the beginning of its establishment and it is the first country to apply zero tariff commitment. Imports from COMESA countries to Sudan rose from US $65 million in 2000 to US $466.8 million in 2005. On the other hand, exports of Sudan to COMESA amounted to US $165 million in 2004, compared to US $36 million in 2000. Share of agricultural commodities in total intra-COMESA trade was not stable but are increasing as it reached 81.74% in 2004 compared to 59.57% in 2001. Cotton was the leading agriculture export commodity to COMESA

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countries followed by sesame and live animals and seed cake, while skins, groundnuts and meat contri-buted the smallest shares. Considering direction of Su-dan exports to COMESA countries, Egypt absorbed the most exports followed by Kenya for the period 2001– 2004 (Appendix 1). On the other hand, main import sup-pliers for Sudan during the same period were Egypt Su-dan exports to COMESA countries, Egypt absorbed, Ken-ya, Zimbabwe and Uganda (Appendix 2). It depicts that the main trade partners for Sudan in the COMESA region are Egypt and Kenya.

Trade in agricultural products serves three functions. First, trade can contribute to stabilizing supply when national fluctuations in production are greater than the fluctuations in the region. Thus, free intra-regional trade among the COMESA countries could be an efficient substitute for national stockpiling and might be used to even-out fluctuations in national production. Johnson (1978, 1981) shows that worldwide free trade in grains would drastically reduce the need for holding carryover stocks, because fluctuations in world cereal production are minimal compared to fluctuations in national production. The same may hold true if variability in production in individual member countries is greater than variability in production for the COMESA region as whole. However, if production in all countries were perfectly correlated, intra-regional trade could not help stabilize consumption. Second, trade in agricultural products may partly substitute for working stocks if the harvesting calendar differs somewhat among trading partners. Third, trade may allow countries to specialize in production in accordance with comparative advantage. Thus, trade would help to increase national income and improve food security.

The objective of this paper is to investigate the potential of COMESA intra-regional trade in agricultural commo-dities specifically between Sudan, Egypt and Kenya. To realize this objective the following indices and coefficients were computed: instability index, correlation coefficient matrix, production similarity index, comparative produc-tion performance (CPP), export similarity index and re-vealed comparative advantage measure (RCA).

Production variability in cereals, pulses, roots and tubers

Empirical evidence provided by Valdes and Siamwalla (1981) proves that the food consumption in a region will be more stable if its production in the region is more stable than that in individual countries and if trade between countries is allowed. This assumption is tested by calculating instability index for cereals, pulses and roots and tubers for the three countries and for the region. This index is based on the coefficient of variation corrected by the fitness of trend function. The index is used to mea-sure instability at both the country and regional level and it is defined as follows (Cuddy and Della Vale, 1978):

$$I = C.V. \square \sqrt{- R^2} \qquad (1)$$

where:

I   = Instability index
C.V. = Coefficient of variation

R^2 = Adjusted coefficient of determination

Instability indices have been measured for total produc-tion, area and yield of cereals, pulses and roots and tu-bers on the basis of data from 1961 - 2005 for the three countries (Sudan, Egypt and Kenya). The relationship between the region's instability index and those of individual countries and the rest of the world indicates whether an individual country would be better-off by inte-grating regionally or with the rest of the world.

The results show that cereal production is volatile in the Sub-region countries of the COMESA (Table 1). Sudan has the highest instability index of 31.6. This could be attributed to its highest variability in area and yield of cereal which have instability indices of about 19.2 and 18.4 respectively. Egypt and Kenya showed less varia-bility in production comparing to Sudan (17.6 and 15.1 for Egypt and Kenya respectively) . Regional integration could reduce the instability index to 12.1 that means the three countries would gain from intra-regional trade. In pulses production, Sudan again showed the highest instability index of 30.1 followed by Kenya with an index of 25.8, and Egypt the least with 16.7. Regional inte-gration in pulses reduces fluctuation to 12.5. Production of roots and tubers showed less fluctuations in the three countries compared to cereal and pulses production with Sudan showing the minimum index of 12.7, followed by Kenya 13.2 and Egypt 16.6. Regional integration could reduce the instability to 10. Although the empirical results indicate that regional integration would be a reasonable strategy for achieving greater food security, the instability indices were higher for the sub-region than for the rest of the world in all the three categories of food crops. Per-haps on these grounds it would be better to integrate national markets directly into the world market. In reality, however, this may be less advisable than the instability indexes indicate.

Comparative advantage and the potential for trade expansion

There is widespread opinion that African countries have similar factor endowments, climatic conditions and their production patterns. Therefore, the potential of the intra-regional trade could be small.

To test this hypothesis, a production similarity index is calculated for all agricultural products of the countries under study. This index is defined by the following. The index measures the similarity of production patterns of countries a and b, an index value of 100 means that

Table 1. Instability indices for Sudan, Egypt and Kenya sub-region and the world (1961 - 2005).

Country	Crop	Area	Yield	Production
Sudan	Cereal	0.194	0.182	0.316
	Pulses	0.193	0.113	0.301
	Roots and tubers	0.132	0.069	0.127
Egypt	Cereal	0.081	0.085	0.176
	Pulses	0.178	0.057	0.166
	Roots and tubers	0.101	0.097	0.166
Kenya	Cereal	0.099	0.125	0.150
	Pulses	0.195	0.153	0.257
	Roots and tubers	0.119	0.112	0.132
Sub-region	Cereal			0.121
	Pulses			0.125
	Roots and tubers			0.103
World	Cereal	0.023		0.009
	Pulses	0.039		0.033
	Roots and tubers	0.035		0.016

Source: calculated using the FAO database.

Table 2. Production similarity index (1999 - 2005)

	Kenya	Sudan
Egypt	30.70	24.17
Kenya		37.23

Source: calculated using the FAO database

formula (Finger and Kreinin, 1979):

$$S^Q (ab,c) = (\text{ Minimum } [(x_i (ac), x_i (bc)])*100 \qquad (2)$$

Where:

$S^Q (ab,c)$ = Production similarity index

$X_i (ac)$ = Share of commodity i in a's agricultural production

$X_i (bc)$ = Share of commodity i in b's agricultural production

production patterns of the two countries are completely similar. Whereas 0 index implies complete dissimilarity in production patterns.

Table 2 presents the empirical results of production similarity index for average of period from 1999 to 2005. It identified the differences in production patterns of these because Egypt's resources and climate are relatively dissimilar from the other two countries. The actual cause three countries. Egypt is relatively more different in its production pattern from Sudan and Kenya. This could be may be revealed when the export patterns of the countries are investigated by the use of export similarity index.

Similarity of production patterns can also be examined by using comparative production performance coefficient (CPP) and is defined as follows (Koester, 1986):

$$CPP= (Q_{i j} / Q_i w) / (\text{ } Q_{ij} / \text{ } Q_{iw}) \qquad (3)$$

Where:

Q = Quantity produced and the subscripts i, j and w refer to the type of product, the country in question and the world, respectively.

Q_{ij} = Total agricultural production of the country in question.

Q_{iw} = Total world agricultural production

CPP index shows the importance of a commodity to country's production, an index value of more than unity means that the particular commodity has a larger share in total agricultural production of the individual country and has production comparative advantage.

If the hypothesis that the three COMESA countries have similar resources and climates is correct, CPP coefficients for individual products of the countries will vary only a little, if at all. Table 3 shows CPP coefficients of some selected agricultural products excluding fisheries, foresry and livestock for the three countries. By ranking top ten products for each country only four products ranked more than once in Sudan and Egypt. This clearly indicates that the agricultural production pattern differs considerably among the three countries.

Differences in production pattern will most likely reflected in differences in the export patterns of the individual countries. To investigate this hypothesis some additional indices have been calculated. One of those is the export similarity index which is completely analogous to production similarity index (Finger and Kreinin, 1979). This index is defined by the formula:

$$S (ab, c) = \text{ Minimum } [(x_i (ac), x_i (bc)] *100 \qquad (4)$$

Table 3. Comparative production performance (CPP) for Sudan, Egypt and Kenya (1990 - 2004).

Country	Product	Index		
		1990-1993	1994-1998	1999-2004
Sudan	- Sesame seed	47.06	63.01	51.39
	- Melon seed	57.72	58.86	37.40
	- Dates	24.44	18.91	31.03
	- Groundnuts in shell	8.06	15.08	27.50
	- Broad beans	7.97	2.63	17.99
	- Grapefruit	9.41	7.09	17.13
	- Eggplants	5.37	3.81	7.95
	- Tomatoes	4.73	3.92	4.50
	- Pumpkins and Squash	3.52	2.45	3.40
Egypt	- Clover	47.22	46.92	47.04
	- Dates	14.78	12.59	13.16
	- Figs	10.18	16.23	12.65
	- Broad beans	11.76	10.49	7.34
	- Tomatoes	5.40	5.27	4.76
	- Anise and Fennel	5.25	5.64	4.38
	- Lemons and Limes	4.33	2.66	2.06
	- Beans	3.27	3.19	2.81
	- Pumpkins and Squash	3.14	3.06	3.12
	- Artichokes	3.97	2.854	4.34
Kenya	- Pyrethrum	518.51	435.42	400.59
	- Sisal	65.84	56.35	41.75
	- Tea	52.90	57.08	55.93
	- Pineapples	19.92	22.65	24.06
	- Pigeon peas	16.29	13.26	17.67
	- Beans	17.12	10.66	12.79
	- Plantains	10.85	8.65	10.51
	- Avocados	8.1919	9.15	13.17
	- Cow peas	19.06	9.32	7.70
	- Cabbages	5.53	7.27	6.04

Source: calculated using the FAO database.

Table 4. Export similarity index (1999 - 2004).

	Kenya	Sudan
Egypt	10.10	4.97
Kenya		12.57

Source: calculated using the FAO database

Where:
X_i (ac) = Share of commodity i in a's export to c.
X_i (bc) = Share of commodity i in b's exports to c.

The index measures the similarity of export patterns of countries a and b to market c. If the export patterns of countries a and b are the same this means that x_i (ac) = x_i (bc) for each product i. In this case the export similarity completely dissimilar, the index will be equal to zero.

Table 4 presents export similarity indexes by pairing the three countries, the generally low indices indicates that countries are dissimilar in their export patterns. Exports of Sudan and Kenya registered the highest index of 12.5, and Sudan and Egypt the minimum index of 4.9. These low indices indicate that there is a wide scope for trade within the region because the countries are relatively dissimilar. This indication has agreed with export similarity indices found by Koester (1986) for SADCC countries which are not much different from indices calculated in this paper and even higher in some pairs (around 50). Higher index up to 50 do not support the hypothesis that there is limited scope for intra-regional trade because the countries are too similar. Finger and Kreinin (1979) found similarity indices of around 50 for US-EC exports in the early 1970s, but there has since been a significant expansion in US-EC bi-

Table 5. Revealed comparative advantage (RCA) for selected crops in Sudan, Egypt and Kenya (1990 - 2004).

Country	Product	Period	Share in agricultural exports (%)	RCA
Sudan	Sesame seed	(1990-1993)	12.0	31.63
		(1994-1998)	18.7	31.76
		(1999-2004)	26.6	5.95
	Groundnuts	(1990-1993)	3.7	28.63
		(1994-1998)	6.8	29.53
		(1999-2004)	1.1	1.56
	Molasses	(1990-1993)	1.9	28.43
		(1994-1998)	1.8	27.77
		(1999-2004)	2.1	6.82
	Melon seed	(1990-1993)	2.6	28.90
		(1994-1998)	2.2	28.08
		(1999-2004)	1.4	12.72
	Cotton lint	(1990-1993)	29.3	33.21
		(1994-1998)	20.5	31.92
		(1999-2004)	15.9	9.03
	Sheep	(1990-1993)	12.8	31.74
		(1994-1998)	14.8	31.35
		(1999-2004)	18.1	14.81
Egypt	Beans	(1990-1993)	2.1	24.72
		(1994-1998)	2.2	18.63
		(1999-2004)	4.6	14.53
	Oranges	(1990-1993)	9.0	2.98
		(1994-1998)	4.3	0.99
		(1999-2004)	4.8	1.97
	Onions	(1990-1993)	3.6	1.24
		(1994-1998)	3.1	1.08
		(1999-2004)	2.7	1.70
	Bagass	(1990-1993)	1.2	1.28
		(1994-1998)	1.4	1.40
		(1999-2004)	0.1	0.58
	Anise, Badian and Fennel	(1990-1993)	1.4	0.50
		(1994-1998)	1.4	0.24
		(1999-2004)	0.8	0.36
Kenya	Pineapples	(1990-1993)	4.8	53.38
		(1994-1998)	4.2	20.79
		(1999-2004)	4.0	21.10
	Beans	(1990-1993)	2.1	24.72
		(1994-1998)	2.2	18.63
		(1999-2004)	4.6	14.53
	Tea	(1990-1993)	38.3	23.03
		(1994-1998)	35.7	16.95
		(1999-2004)	39.3	10.49
	Coffee	(1990-1993)	21.7	35.63
		(1994-1998)	23.3	23.50
		(1999-2004)	10.7	20.93
	Sisal	(1990-1993)	1.7	29.96
		(1994-1998)	1.1	21.78
		(1999-2004)	0.9	12.20

Source: calculated using the FAO database.

Table 5 shows the results of RCA coefficients together with the export shares for the most important top ten agricultural products for each country. The three countries appear to be highly specialized. Considering trade. If the countries under study were really similar in production and trade patterns indicated by the previous indices, coefficients for revealed comparative advantage (RCA) would be similar (Donges et al., 1982). The RCA indicator measures the country's revealed comparative advantage in exports according to the Balassa formula. The index compares the share of a given sector in national exports with the share of this sector in world exports. Values above 1 indicate that the country is specialized in the sector under review, the higher the RCA index, the more successful is the country in exporting the given export product.

The RCA index will be negative if the country is only importing the given product or if the ratio of export and import values for the product is smaller than the ratio of the total agricultural exports and imports. The revealed comparative advantage is defined as follows (Balassa, 1965; Finger and Derose, 1978; Donges et al., 1982; Yilmaz, 2003):

$$RCA = (X_i/X_{iw})/ (X_i/ X_{iw}) \qquad (5)$$

Where,
RCA = revealed comparative advantage
X_i = export value of product i
X_{iw} = world export value of product for each country separately, RCA coefficients are generally higher for dominant export products. However, the pattern of specialization differs considerably among the selected countries, which means that there is potential for expanding intra-regional trade in the region.

Conclusion

There is a great potential for intra-regional trade, especially in agricultural products, between COMESA member countries. This paper quantified the potentials of intra-regional trade between Sudan, Egypt and Kenya as sub-region of COMESA by using different indicators and indices. The instability indices of cereals and pulses production showed a relatively stable production of cereals and pulses in Kenya and Egypt, while in Sudan it was highly unstable. Regional integration could make production of cereals and pulses more stable as indicated by a lower instability index. Production of roots and tubers showed less fluctuations in the three countries compared to cereal and pulses production. Generally, world wide market integration would be better than the regional one on the basis of instability index results because region instability index is higher than that of the rest of the world. Regarding production similarities, there are differences in production patterns of the three countries. Egypt is relatively more different in its production pattern from Sudan

and Kenya. Also, the three countries are dissimilar in their export patterns. The RCA, considering each country separately, are generally higher for dominant export products. However, the pattern of specialization differs considerably among these countries, which indicates great potential for expanding intra-regional trade in the region.

The paper concludes that the government policies of COMESA member countries, especially Sudan, should pay more emphasis to encourage integrating their markets regionally to benefits from existing potential of trade and comparative advantage in the region. Stemming from the recent agreement between COMESA member countries to form a common external tariff and to proceed towards common market by the end of 2008, the intra-COMESA trade is expected to be increased substantially.

Appendix 1. Direction of Sudan exports to the COMESA region (2001-2004) in percent.

Country	2001	2002	2003	2004
Egypt	75.0	81.00	86.60	51.50
Ethiopia	2.1	0.02	1.90	1.40
Eritrea [(5)]	1.6	0.10	8.00	1.80
Kenya	21.2	10.10	3.40	1.90

Source: Bank of Sudan, Annual Statistical Brief (2004)

Appendix 2. Main suppliers of Sudan imports from COMESA countries (2001 - 2004) in percent.

Country	2001	2002	2003	2004
Egypt	47.0	46.60	62.70	71.40
Kenya	31.4	28.70	18.80	12.70
Zimbabwe	11.1	11.70	6.50	1.80
Uganda	10.1	12.70	8.60	10.2
Namibia	-	-	0.00	0.00

Source: Bank of Sudan, Annual Statistical Brief (2004).

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