



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
<http://ageconsearch.umn.edu>
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

AGRICULTURAL COMPETITIVENESS AND SUPPLY CHAIN INTEGRATION: SOUTH AFRICA, ARGENTINA AND AUSTRALIA

K Mosoma¹

Abstract

The international competitiveness of South African agricultural exports relative to those of Argentina and Australia is considered. Competitiveness was measured in terms of the Relative Comparative Advantage (RTA) using data from FAOSTAT 2002, while trade perspectives were examined using data from the World Trade Organisation and the Trade and Industrial Policy Strategies (TIPS) databases. The results of the RTA show that South Africa's agricultural food chains are marginally competitive internationally, whereas Argentina and Australia's agricultural food chains are internationally competitive. The analysis also shows that South Africa has managed to move up the value chain relative to Argentina and Australia. Nevertheless, competitiveness decreases in all three countries when moving from primary to processed products in the chains, which implies that value-adding opportunities are limited. Based on their competitive status, there is a potential in certain agro-food chains for supply chain integration and co-operation. Strategic alliances are important instruments for competitiveness. They create flexibility in operations, enhance technology transfer and networking and exploit possible complementary and supplementary relations between industries and organisations.

1. INTRODUCTION

The last decade has witnessed a tremendous change in agricultural policy and practice in South Africa, with reforms centred on domestic and foreign market deregulation. The origin of these reforms can be found in the recommendations of the Kassier Committee (1992), which recommended the abolition of the agricultural control boards. The recommendations of the Kassier Committee (1992) were based on the premise that a stronger, more centralised and more representative authority was required to override the vested interests in the regulated marketing system, as it existed at the time (Van Zyl *et al*, 2001).

¹ Young Professionals Programme, Department Of Agriculture: Western Cape Province, and Postgraduate Student, Department of Agricultural Economics, University of Stellenbosch.

These changes, together with the successful conclusion to the Uruguay Round of the General Agreement on Tariffs and Trade (GATT), and South Africa's accession to the World Trade Organisation (WTO), meant that farmers had to position themselves as business driven competitors in a less controlled global trading environment (Esterhuizen & Van Rooyen, 1999). Thus, relative competitiveness now plays an important role in determining changes in trade patterns and flows in the South African agricultural sector.

The primary objective of this paper is to compare South African agricultural exports with those of Argentina and Australia, in order to answer the question, how internationally competitive are South African agricultural exports relative to those of Argentina and Australia? This comparison is largely motivated by the fact that these countries enjoy the same counter-seasonal advantage in access to developed country markets, and constitute competition for South Africa's highest value export sub-sectors namely, sugar, wine, citrus fruit and grapes in South Africa's top five export destinations, namely the United Kingdom, Netherlands, Belgium, Japan and Mozambique. Thus, a comparison with these countries presents a realistic picture of our future prospects in these markets. The second objective is to determine opportunities for supply chain integration between South Africa, Argentina and Australia. Value will be added or lost if the supply chain is not functioning in an effective and efficient manner. In the future supply chains will compete amongst one another, and if only certain elements in the supply chain perform efficiently the full potential for value adding will not be realized. South African agribusiness will find it difficult if these opportunities towards strategic partnerships in global agribusiness are not fully exploited.

The paper is organized as follows. The next section provides a brief description of the RTA and the appropriate definitions of comparative and competitive advantages. Section three presents South Africa, Argentina and Australia's global agricultural trade perspectives. Section four presents the competitive advantage for selected agricultural food chains and supply chain integration opportunities, while conclusions are drawn in Section five.

2. MEASURING REVEALED COMPARATIVE ADVANTAGE

The concepts of comparative advantage and competitiveness are two important foundations for understanding the importance of international trade in agriculture and to illuminate the underlying factors responsible for current trade patterns. Comparative advantage refers to the ability of one nation to produce a commodity at a lower opportunity cost of other products forgone than another nation, while competitive advantage indicates whether a

firm could successfully compete in the trade of the commodity in the international market given existing policies and economic structure (Warr, 1994).

The concept of Revealed Comparative Advantage (RCA) is grounded in conventional trade theory. Balassa (1965) argued that revealed comparative advantage could be indicated by the trade performance of individual commodities and countries in the sense that the commodity pattern of trade reflects relative market costs as well as differences in non-price competitive factors. The Balassa (1965) method compares a country's share of the world market in one commodity relative to its share of all traded goods. An improved version of Balassa's original version, namely the Relative Revealed Comparative Trade Advantage (RTA) index, offered by Vollrath (1991) reflects both imports and exports, and is formulated as:

$$RTA_{ij} = RXA_{ij} - RMP_{ij}$$

$$RXA_{ij} = \left(X_{ij} / \sum_{1,1 \neq j} X_{i1} \right) / \left(\sum_{k, k \neq i} X_{kj} / \sum_{k, k \neq i} \sum_{1,1 \neq j} X_{k1} \right)$$

$$RMP_{ij} = \left(M_{ij} / \sum_{1,1 \neq j} M_{i1} \right) / \left(\sum_{k, k \neq i} M_{kj} / \sum_{k, k \neq i} \sum_{1,1 \neq j} M_{k1} \right)$$

X (M) refer to exports (imports), with the subscripts i and k denoting the product categories, while j and 1 denote the country categories. The numerator is equal to a country's export (imports) of a specific product category relative to the export (import) of this product from all other countries. The denominator reveals the exports (imports) of all products but the considered commodity from the respective country as a percentage of all other countries' exports (imports) of all other products. The level of these indicators shows the degree of revealed export competitiveness and import penetration. Values below (above) zero point to a competitive trade disadvantage (advantage). The RTA considers both export and import activities and this seems to be an advantage from the viewpoint of trade theory. Due to the increase in intra-industry trade, this aspect, according to Froberg & Hartmann (1997) is also becoming increasingly important.

A problem with these types of indices is that observed trade patterns are likely to be distorted by government policies and interventions, and may therefore misrepresent underlying comparative advantages (Ferto'' & Hubbard, 2001). Furthermore it says nothing about how a country acquires its market share. Market share may well be maintained by costly government incentives.

3. TRADE PERSPECTIVES

3.1 Exports of agricultural products

Table 1 illustrates the exports of agricultural products and their share in the economy's total exports of Argentina, Australia and South Africa in the period 1990 and 2001. The data show that in 1990 Australia exported the greatest value of agricultural exports, valued at US\$11,628m, followed by Argentina with agricultural products, valued at US\$7,482m, while South Africa only managed to export agricultural exports valued at US\$2,881m in the same period. The situation is somewhat different in 2001. Australia increased its value of agricultural exports to US\$16,563m, surpassing both Argentina and South Africa who also experienced an increase the value of agricultural exports. Argentina's agricultural exports were valued at US\$12,199m, and South Africa's at US\$3,109m.

The share of agricultural products in the economy's total exports has also declined for all three countries. Australia experienced the greatest decline of about 14.8 percentage points in the period 1990 and 2001, followed by Argentina with a decline of about 3% and South Africa with a decline of 1.6%. The data also show that the agricultural exports of Australia contribute significantly towards total export earnings. South Africa and Argentina's low agricultural share in total exports indicates a more diversified economy. Furthermore, Australian agriculture's share in total exports is well above the world average of 12.2% in 1990 and 9.1% in 2001.

Table 1: Exports of agricultural products: 1990-2001

Country	Value in 1990	Value in 2001	Share in total exports 1990	Share in total exports 2001
Argentina	7,482	12,199	12.2	9.1
Australia	11,628	16,563	60.6	45.8
South Africa	2,881	3,109	12.2	10.6

Source: WTO International Trade Statistics (2000).

3.2 Product groups exported

Tables 2-4 illustrate the main agricultural product groups exported by Argentina, Australia and South Africa in 2001. The data provide a clear indication of the importance of each export product group in terms of its contribution to total export earnings. The top five export product groups with the greatest value in 2001 for Argentina (Table 2) were: a) animal feeds (HS 23); b) cereals; c) oilseeds, etc. (HS 12); d) fish and crustaceans; and e) edible

fruits, etc., with a share in the total export earnings of 9.87, 9.18, 5.26, 3.51 and 2.02% respectively, for a total of almost 30% of all agricultural exports.

Australia's five largest export product groups in 2001 (Table 3) included a) meat and edible offal meat; b) cereals; c) dairy products, eggs and honey; d) beverages, spirits and vinegar, and e) fish and crustaceans. Their contribution to total export earnings was 5.12, 4.3, 2.47, 1.74 and 1.29 % respectively, giving a total of 14.92%.

South Africa's top five export product groups with the greatest value in 2001 (Table 4) were a) edible fruits, b) sugars and sugar confectionery, c) beverages, spirits and vinegar, d) fish and crustaceans, and e) meat and edible offal meat, with a share of 1.61, 1.31, 1.19, 0.79 and 0.59% respectively, giving a total of only 5.4%. This low share of South African export product groups reflects the fact that South Africa's export portfolio is more diversified than that of Argentina and Australia.

The data also show that there is a greater variance in terms of the concentration of the greatest value of exports and the share of each export product group to total export earnings, reflecting structural differences within each country, indicating among others differences in resource endowment. Despite these differences, it is evident that certain product groups such as fish and crustaceans, meat and edible offal meat and beverages, spirits and vinegar feature prominently among the greatest value of exported product groups in Australia and South Africa.

Tables 2-4 also show the annual growth in the value of exports between 1997 and 2001. In the case of South Africa, eight of the export product groups experienced positive growth, compared to six for Australia and two for Argentina. The analysis above clearly shows that South Africa has managed to move up the value chain compared to Argentina and Australia, as South Africa's export portfolio is dominated by high value agricultural products. Moreover, South Africa exported more high value agricultural products than Argentina and Australia.

Table 2: Main product groups exported by Argentina in 2001

Hs rev.0	Product	Value 2001 US\$000	Annual growth 1997-2001 %	Annual growth in value of world exports, 1997-2001	Share in world exports	Contribution of each category to the total exports	Ranking in world exports
02	Meat and edible offal meat	221,601	-22	0	0.6	0.83	22
03	Fish and crustaceans	934,730	-1	2	2.2	3.51	17
04	Dairy products, eggs, honey	355,560	-2	0	1.2	1.34	15
07	Edible vegetables and certain roots	234,092	-15	1	1.1	0.88	17
08	Edible fruits, nuts, peel of citrus fruit, melons	536,263	-1	-2	1.9	2.02	13
09	Coffee, tea, mate and spices	66,909	-6	-12	0.6	0.25	96
10	Cereals	2,442,077	-6	-5	7.3	9.18	5
12	Oilseed, oleagic fruits, grain, seed, fruit, etc,	1,398,665	32	-2	6.9	5.26	4
16	Meat, fish and seafood food preparations	150,067	-18	0	0.9	0.56	24
17	Sugars and sugar confectionery	119,359	-2	-5	0.8	0.45	25
20	Vegetable, fruit, nut, etc food preparations	323,387	-4	0	1.6	1.22	14
22	Beverages, spirits and vinegar	209,123	0	1	0.6	0.79	21
23	Residues, wastes of food industry, animal fodder	2,626,593	4	-3	12.5	9.87	2
24	Tobacco and manufactured tobacco substitutes	169,800	-5	-5	0.8	0.64	22

Source: TIPS (2003).

Table 3: Main product groups exported by Australia in 2001

Hs rev.0	Product	Value 2001 US\$000	Annual growth 1997-2001 %	Annual growth in value of world exports, 1997-2001	Share in world exports	Contribution of each category to the total exports	Ranking in world exports
02	Meat and edible offal meat	3,240,677	7	0	8.1	5.12	4
03	Fish and crustaceans	819,804	3	2	2.0	1.29	19
04	Dairy products, eggs, honey	1,566,768	5	0	5.2	2.47	6
07	Edible vegetables and certain roots	403,441	5	1	1.8	0.64	10
08	Edible fruits, nuts, peel of citrus fruit, melons	310,573	0	-2	1.1	0.49	27
09	Coffee, tea, mate and spices	18,543	-3	-12	0.2	0.03	58
10	Cereals	2,736,138	-8	-5	8.2	4.3	4
12	Oilseed, oleagic fruits, grain, seed, fruit, etc,	647,872	21	-2	3.2	10.23	8
16	Meat, fish and seafood food preparations	104,120	-3	0	0.7	0.16	3.0
17	Sugars and sugar confectionery	96,898	-38	-5	0.6	0.15	31
20	Vegetable, fruit, nut, etc food preparations	129,326	-3	0	0.7	0.20	26
22	Beverages, spirits and vinegar	1,100,540	17	1	2.9	1.74	9
23	Residues, wastes of food industry, animal fodder	270,133	-2	-3	1.3	0.43	15
24	Tobacco and manufactured tobacco substitutes	36,810	7	-5	0.2	0.06	50

Source: TIPS (2003).

Table 4: Main product groups exported by South Africa in 2001

Hs rev.0	Product	Value 2001 US\$000	Annual growth 1997-2001 %	Annual growth in value of world exports, 1997-2001	Share in world exports	Contribution of each category to the total exports	Ranking in world exports
02	Meat and edible offal meat	199,821	61	0	0.5	0.59	24
03	Fish and crustaceans	271,235	7	2	0.6	0.79	36
04	Dairy products, eggs, honey	36,159	-9	0	0.1	0.11	45
07	Edible vegetables and certain roots	26,892	-10	1	0.1	0.08	53
08	Edible fruits, nuts, peel of citrus fruit, melons	549,188	-2	-2	1.9	1.61	12
09	Coffee, tea, mate and spices	32,860	0	-12	0.3	0.09	48
10	Cereals	133,466	-17	-5	0.4	0.39	29
12	Oilseed, oleagic fruits, grain, seed, fruit, etc,	59,573	4	-2	0.3	0.18	27
16	Meat, fish and seafood food preparations	19,475	8	0	0.1	0.06	64
17	Sugars and sugar confectionery	446,201	7	-5	2.9	1.31	10
20	Vegetable, fruit, nut, etc food preparations	207,999	-7	0	1.0	0.61	22
22	Beverages, spirits and vinegar	406,602	5	1	1.1	1.19	17
23	Residues, wastes of food industry, animal fodder	17,255	13	-3	0.1	0.05	57
24	Tobacco and manufactured tobacco substitutes	139,665	14	-5	0.7	0.41	26

Source: TIPS (2003).

4. COMPETITIVE ADVANTAGE

4.1 Competitiveness of selected agro-food commodity chains

Table 5 shows the competitive advantage of selected food chains in South Africa, Argentina and Australia and their trends between 1995 and 1998 based on the RTA index. The table clearly shows that the South African food chains are generally marginally competitive, whilst Argentina and Australia's food chains are internationally competitive.

Table 5: Competitive advantage of selected food chains based on the RTA Index

Chain	Product	South African RTA 1998	Trend 1995-98	Argentinean RTA 1998	Trend 1995-98	Australian RTA 1998	Trend 1995-98
Cotton Chain	Cotton seed	-6.23	-	4.78	+	38.25	+
	Oil of cotton seed	-0.53	-	-343.7	-	4.81	=
	Cake of cotton seed	-26.74	-	-222.58	=	9.79	=
	Cotton lint	-1.59	+	5.71	n/a	13.94	+
	Cotton linter	0.42		1.05		-0.27	=
Tobacco Chain	Tobacco leaves	0.06	+	3.62	+	0.63	=
	Tobacco	n/a	n/a	1.05	=	-0.48	=
	Tobacco products	-0.15	=	0.42	=	-0.25	=
Wheat Chain	Wheat	-0.85	-	19.17	+	16.60	+
	Flour of Wheat	1.26	=	-416.85	-	2.25	=
	Macaroni	-0.49	=	1292.86	+	-0.64	=
	Pastry	0.15	=	0.90	+	-0.52	=
	Bread	-0.13	=	0.03	=	0.82	=
	Breakfast cereals	-0.28	-	-0.26	=	0.36	=
Tomatoes Chain	Tomatoes	0.13	=	-0.29	+	0.15	+
	Tomato juice	0.36	+	n/a	n/a	n/a	n/a
	Tomato paste	-0.07	=	-2.96	-	0.11	-
	Peeled Tomatoes	-0.57	=	-0.21	=	-2.47	=
Maize Chain	Maize	2.44	+	34.99	+	0.03	=
	Flour of maize	28.55	+	2.03	=	-0.23	=
Soybean Chain	Soybeans	0.17	+	13.59	=	-0.05	=
	Oil of Soybeans	-0.85	=	76.35	+	-0.18	=
	Cake of Soya beans	-1.62	-	66.44	+	-0.21	=
	Soya sauce	-0.30	=	-0.18	=	-4.23	=
Sugar Chain	Sugar (Centrifugal, Raw)	8.88	+	0.97	=	28.76	+
	Sugar refined	2.08	+	0.77	=	0.86	=
	Sugar Confectionery	0.32	=	2.05	=	n/a	n/a
	Maple sugar and syrups	-0.02	=	-0.02	=	-2.23	=
Grape	Grapes	3.33	+	-0.96	=	14.12	=
	Grape Juice	33.10	-	0.44	-	7.65	+
	Wine	2.59	-	-1	n/a	4.02	+

Source: Esterhuizen *et al* (2001) and own calculations based on data from FAOSTAT 2002.

Values below (above) zero point to a competitive trade disadvantage (advantage). Thus, the South African cotton chain is not internationally competitive. The primary product, cottonseed, cake of cottonseed and cotton lint, is highly uncompetitive, while cotton linter is marginally competitive. In Argentina, cottonseed, cotton lint and cotton linter are highly competitive internationally, although oil of cottonseed and cake of cotton are highly uncompetitive, while in Australia the entire cotton chain with the exception of cotton linter is highly competitive. The competitiveness of the cotton chains in

South Africa and Argentina show a declining trend between 1995-98 (with the exception of cotton linter in South Africa and cottonseed and cotton lint in Argentina), whilst Australia's cotton chain shows both positive and constant trends over this period.

The South African tobacco chain is marginally competitive, although tobacco products are internationally uncompetitive. In the case of Australia the tobacco chain is internationally uncompetitive, except in the case of tobacco leaves, while Argentina's tobacco chain is internationally competitive. The competitiveness of tobacco leaves has improved in both South Africa and Argentina, whereas it has been constant in Australia between 1995 and 1998.

Argentina's wheat chain is highly competitive internationally with the exception of flour of wheat and breakfast cereals, whereas Australia's wheat chain is marginally competitive and South Africa's wheat chain is internationally uncompetitive with the exception of flour of wheat and pastry, which are internationally competitive and marginally competitive respectively. The competitiveness trend is generally constant in South Africa and Australia. Wheat and breakfast cereals show a negative trend in South Africa and wheat shows a positive trend in Australia, with the exception of flour of wheat, which actually shows a negative competitiveness trend, while wheat, macaroni and pastry all show a positive growth and bread and breakfast cereals show a constant competitiveness trend in Argentina.

The tomato chain as a whole is marginally competitive in South Africa and Australia, whereas the tomato chain as whole in Argentina is internationally uncompetitive. Tomato paste and peeled tomatoes are both internationally uncompetitive in South Africa, while peeled tomatoes are internationally uncompetitive in Australia. The tomato chain shows a constant positive trend in all countries except tomato juice in South Africa, which shows a positive trend, tomatoes in Argentina, which shows a positive trend, and tomato paste in both Argentina and Australia, which shows a negative trend.

South Africa and Argentina's maize chain is highly competitive, whereas Australia's maize chain is internationally uncompetitive with the exception of maize, which is marginally competitive.

South Africa's soybean chain is internationally uncompetitive with the exception of soybeans, which is marginally competitive, while Argentina's soybean chain is highly competitive, with the exception of soy sauce, which is internationally uncompetitive. Australia's soybean chain is internationally uncompetitive. While Australia's soybean chain shows a constant competitiveness

trend, South Africa's soybean chain shows a positive trend with the exception of cake of soybeans, which shows a negative trend and oil of soybeans and soy sauce, which show a constant competitiveness trend. Argentina's soybean chain shows both constant and positive trends in oil of soybeans and cake of soy, and a constant trend in soybeans and soy sauce.

The fact that the RTA method shows that South Africa's raw and refined sugar production is internationally competitive, Argentina's confectionery sugar production is internationally competitive and Australia's sugar confectionery and maple sugar and syrups is internationally competitive reveals a major flaw in this indicator, as it ignores protection afforded to the countries' primary producers and refiners. Despite this protection, South Africa is only marginally competitive in the production of sugar confectionery, Argentina is marginally competitive in the production of raw sugar and refined sugar and Australia is only marginally competitive in the production of raw sugar and refined sugar. None of the countries is becoming more competitive.

The grape chain in Argentina and South Africa is internationally competitive, while Australia's grape chain is internationally uncompetitive, except for grape juice, which is marginally competitive. The whole grape chain South Africa reflects a positive trend, except for grapes, which shows a constant competitiveness trend in the 1995-2000 period, while the whole grape chain in Argentina shows a negative competitiveness trend, except for grapes, which shows a positive trend. And the grape chain in Australia shows a constant competitiveness trend, despite the fact that grape juice reflects a negative trend in the same period.

The analysis also reveals that there is a general decrease in competitiveness when moving from the primary to the processed product in the chains. This implies that value-adding opportunities in these countries' agricultural sectors are constrained.

4.2 Opportunities for supply chain integration

The RTA method can also be used to determine the opportunities for supply chain integration between countries and regions (Van Rooyen & Esterhuizen, 2001; ISMEA, 1999). A comparative analysis of supply chains in South Africa, Argentina and Australia is used to assess whether the current competitiveness status within chains provides a basis for increased trade between the countries. The analysis implies incomplete specialisation in any country, and

international tradability. The analysis only considers industries that can be regarded as competitive. RTA values in Table 5 form the basis for analysis.

Depending on the existence of trade barriers or free trade and the level of transaction costs involved, added value can be created by exploiting competitive positions through the following examples of supply chain integration: Soybeans activities could be located in Argentina, with South Africa being the possible partner (importer), Maize production in Argentina, with South Africa being the possible partner (importer), Wine production in South Africa, with Argentina being the possible partner (importer) and Tobacco leaves production in South Africa, with Australia being the possible partner (importer).

5. CONCLUSION

The ability to maintain and improve the competitiveness of the South African agricultural sector remains critical particularly when considering the changes that have occurred in the agricultural sector in the last decade. The analysis provided here shows that South Africa's agriculture remains marginally competitive internationally, and that Australia and Argentina's food chains are generally more competitive internationally than those of South Africa. The analysis also showed that South Africa has managed to move up the value chain compared to Argentina and Australia. The fact that in all these countries value-adding opportunities are limited is cause for concern. Thus a great deal of attention has to be given to creating value-adding opportunities through aggressive research and development of new products and production techniques.

REFERENCES

- BALASSA B (1965). Trade liberalization and revealed comparative advantage. *The Manchester School* 33:99-123.
- ESTERHUIZEN D & VAN ROOYEN CJ (1999). How competitive is agribusiness in the South African agro-food commodity chain. *Agrekon* 38(4):744-752.
- FERTO'' I & HUBBARD LJ (2001). *Regional comparative advantage and competitiveness in Hungarian agri-food sectors*. 77th EAAE Seminar/NJF, Seminar No 325.

FOOD AND AGRICULTURAL ORGANISATION (FAO) (2002). *Agricultural Data*. Web page: <http://www.fao.org>. Accessed on 18/07/03.

ISMEA (1999). *The European agro-food system and the challenge of global competition*. ISMEA, Rome.

FROHBERG K & HARTMANN M (1997). *Comparing measures of competitiveness*. Institute of Agricultural Development in Central and Eastern Europe, Discussion Paper, No 2, Web page: <http://www.landw.uni-halle.de/iamo/iamo.htm>. Accessed on 03/04/03.

KASSIER WE (1992). *Report of the Committee of Inquiry into the Marketing Act*. Department of Agriculture, Pretoria.

TRADE AND INDUSTRIAL POLICY STRATEGY (TIPS) (2003). *SA Trade Map*. Web page: <http://www.tips.org.za>. Accessed on 16/07/03.

VAN ROOYEN CJ & ESTERHUIZEN D (2001). Competing at the "cutting edge": Opportunities for agribusiness partnerships and co-operation in the southern African region. *Agrekon* 40(1):13-23.

VAN ZYL J, VINK N, KIRSTEN J & POONYTH D (2001). South African agriculture in transition: The 1990s. *Journal of International Development* 13:728.

VOLLRATH TL (1991). A theoretical evaluation of alternative trade intensity measures of revealed comparative advantage. *Weltwirtschaftliches Archiv* 130:265-279.

WARR PG (1994). Comparative and competitive advantage. *Asia-Pacific Economic Literature* 8(2):1-14.

WORLD TRADE ORGANIZATION (WTO) (2000). *International trade statistics*. Web page: http://www.wto.org/english/res_e/statis_e/stat_toc_e.htm. Accessed on 17/07/03.