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Full Length Research Paper

Domestic resource cost approach for international competitiveness of Turkish horticultural products

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The purposes of this paper can be translated into two main areas. Firstly, what are the main horticultural crops that can be produced and exported? Secondly, are these crops utilizing efficiently the limited resources available, and how much competitive is Turkey in relation to other producers within the region? This paper deals only with competitiveness in regards to price and not quality. Comparisons were made by calculating the domestic resource cost (DRC) ratios which refers to the ratio between Opportunity costs of domestic production and value added. The results highlighted the Turkish horticultural sector as having an international competitive advantage. The most competitive crops were tomatoes followed by melons, watermelons and tangerines for the year of 2004. These findings are also supported by foreign trade statistics on the basis of quantity and earnings.

Key words: International competitiveness, horticultural products, domestic resource cost, Turkey.

INTRODUCTION

Agriculture in Turkey has kept its role as a major contributor to the foreign trade. Turkey is a net exporter of agricultural products. Turkey's main partners for her products are the EU and USA. Turkey has a comfortable trade surplus with the EU mainly due to exports of edible fruits and nuts, preparations of fruit and vegetables as well as tobacco and tobacco products. Turkey has also important trade relations and a trade surplus with countries in the Mediterranean basin and the Gulf region (Anonymous, 2003). In the last ten years, Turkey's agricultural export to the EU has increased by almost 10%. The EU share of fruits and vegetables in total agricultural exports has remained consistently around 60%.

This paper mainly attempts to provide some figures on the competitiveness on a one to one product basis of some selected fruits and vegetables from Turkish agriculture.

There is no single measure or definition of competitiveness which has been accepted in economic literatures. The profusion of definitions has been assisted by the concept of competitiveness being applied to different organisations such as firms, sectors, regions and countries e.t.c. For all the organisations, competitiveness is a situation in a market in which a number of producers are attempting to increase their own profits at the expense of other competitors. This leads to price wars, attempts to increase market shares and product differentiation e.t.c (Yercan and Isikli, 2007).

Zawalinska (2002) and Vlachos (2001) stated that international competitiveness is the ability of a country to produce goods and services that meet the demands of international markets, and simultaneously maintain and expand the real incomes of its citizens.

Gorton et al. (2000, 2001) considered the competitiveness of agricultural production in Bulgaria, Czech Republic and Poland by using the revealed comparative advantage (RCA) and domestic resource cost (DRC). They said that DRC estimations indicate that Czech Republic and Bulgaria cereal producers were competitive at world market prices. However, they did not show RCA to be in trade with the EU. They found an inverse relationship between DRC and farm size. Gorton and Davidova (2001) examined the competitiveness of Central and East European Countries by using DRC methodology from the different sources. They stated that in general, a country's

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crop production is more internationally competitive than her livestock production.

Fertö and Hubbard (2003) examined the RCA for Hungarian agri-food sectors. They found that Hungary revealed a comparative advantage in 11 of 22 aggregated products including live animals, meat, cereals, vegetables and fruits, sugar, beverages and oilseeds e.t.c.

MATERIALS AND METHODS

Measuring international competitiveness

Generally, two approaches were used to measure comparative advantage. These are; (i) the Ricardian (classical) approach, and (ii) the revealed comparative advantage approach developed by Balassa. The classical approach is based on the concepts of profitability, specialisation, factor endowment and technology. The analysis uses mainly variables such as domestic and foreign prices of output, unit costs of factors of production and indicators of the level of technology employed. Balassa's approach is based on the assumption that the pattern of trade reflects relative costs as well as the differences in non-price factors. This approach is based on trade shares and their change over time (Zawalinska, 2002).

Balassa's method of revealed comparative advantage indicates "expost competitiveness"; thus competitiveness is revealed in the export performance of the country. Therefore, the main policy recommendation from this kind of approach is to develop the country's export potential in goods for which it already has a high export specialisation.

A large set of measures can be given for calculating the revealed comparative advantage. These are; revealed comparative advantage (RCA) index, trade coverage(TC) indicators, relative revealed comparative export advantage index (XRCA), relative import penetration index (MRCA), relative trade advantage index (RTA), revealed comparative advantage export indicator (XCA), import penetration index (MP) and the competitive position indicator(Ct), the intra-industry trade index (IIT), the price ratio algorithm (Zawalinska, 2002), Lafay's Index (Lf) (Arcangelis et al., 2001).

Among the Ricardian approach (ex-ante) measures of comparative advantage, domestic resource cost ratios (DRCs) have been widely used. The DRC compares the social opportunity costs of domestic production to the value added it generates in international prices. The numerator includes domestic resources and non-traded inputs valued at opportunity costs or shadow prices, and the denominator includes the net foreign exchange earned or saved by producing the good domestically when output and tradable inputs are valued in economic (border) prices that are adjusted back to the farm level (Zawalinska, 2002).

Methodology applied for DRC calculation

The domestic resource cost (DRC) approach was developed by Michael Bruno in the 1960s. It compares the domestic social costs of export production to foreign exchange earned. DRC analysis measures the economic resource costs of production based on "social prices" that is, prices of goods that reflect the true economic value devoid of price distortions from taxes, subsidies, price controls, import tariffs, or other government policies.

Gorton and Davidova (2001) stated that the DRC compares the opportunity costs of domestic production to the value-added it generates. The numerator is the sum of the costs of using domestic primary resources - land, labour and capital (non-internationally traded inputs) - valued in terms of shadow prices. The denominator is the value-added (value of output minus tradable input costs per unit of output) in border prices. The DRC for the production of commodity *i* can, therefore, be defined as;

$$DRC_i = \frac{\sum_{j=k+1}^{n} a_{ij} V_J}{P^r_i - \sum_{j=1}^{k} a_{ij} P^r_j}$$

where a_{ij}, j= k+1 to n is the technical coefficient for domestic resources and non-tradable inputs and V_j is the shadow price of domestic resources and non-tradable inputs necessary to estimate the opportunity costs of domestic production. P^r_i is the border/reference price of traded output, a_{ij}, j=1 to *k*, is the technical coefficient for traded inputs and P^r_j is the border/reference prices of traded inputs (Gorton and Davidova, 2001).

In other words, the numerator denotes the cost of domestic non-tradable factors which are primarily land and labour used directly and indirectly in the production and marketing of the products. In the denominator, the cost of tradable or foreign sourced inputs which are primarily fertilizer, chemicals, fuel and seed, e.t.c., are adjusted to border prices.

When the DRC is smaller than 1, domestic production is efficient and internationally competitive, because the opportunity cost of spent domestic resources is smaller than the net foreign exchange it gains in export or saves by substituting for imports. The opposite is true when the DRC is larger than 1. The balanced case is when DRC equals 1. Then the economy neither gains, nor saves foreign exchange through domestic production. DRC is widely used in policy analysis and advice. It identifies efficient and inefficient production and suggests where policies should be targeted and which areas productivity should be improved (Gorton et al., 2000).

In all these calculation of DRC ratio estimates, social prices and shadow prices are used as is mentioned in the above definitions. Social prices relate with outputs and tradable inputs as border prices (export/import parity prices) and most analysts adjust these prices to the farm level. For products which the country in question is a net exporter during the analysed period, an average FOB export parity price is usually taken as the unadjusted reference price (Gorton and Davidova, 2001).

The social cost of labour should be measured in terms of its opportunity cost. The opportunity cost of labour can be taken as the cost of labour in the manufacturing industry or construction sector as a proxy for this. The social price of land is typically measured as its rental value in the most profitable alternative use in agriculture (Gorton and Davidova, 2001).

DRC- based results for international competitiveness in the Mediterranean Basin

DRC has been widely used in the analysis of Mediterranean agricultural policy and international trade. Table 1 summaries the results of DRC ratios for the most commonly produced agricultural products. The data about the Mediterranean countries' results reflect different researchers' findings. These results have been taken in different assumptions, such as different years covered, different choice of social prices for output and tradable inputs and different production structures e.t.c. but, it gives us some rough idea between the countries.

DRC methodology applied to individual countries has a number of requirements. The approach taken in each study is different and it

Table 1. DRC-based results in the Mediterranean Countries.

Country	Tomato	Olive oil	Orange	Straw beriess	Sweet peppers	Grapes	Green beans	Average rank
Lebanon[1]	0.77(7)	…	…	0.11(1)	0.50(2)	0.068(1)	…	2.8
Morocco[2]	0.36(6)	0.90(6)	0.49(4)	…	…	…	0.29(3)	4.7
Jordan[3]	…	…	…	0.52(4)	…	0.19(3)	0.28(2)	3.0
Cyprus[4]	0.17(3)	0.16(1)	0.47(3)	…	…	…	…	2.3
Israel[5]	0.30(5)	0.898(5)	1.57	…	…	…	…	
Syria[6]	0.23(4)	…	…	0.13(3)	0.54(3)	…	0.17(1)	2.7
Egypt[7]	0.14(2)	…	…	0.12(2)	0.11(1)	0.18(2)	…	1.7
Tunisia[8]	2.7	0.35(2)	2.60	…	…	…	…	
Greece[9]	0.23(4)	0.63(4)	0.26(2)	…	…	…	…	3.3
Spain[10]	0.092(1)	0.35(2)	0.12(1)	…	…	…	…	1.3
Turkey[11,12]	0.79(8)	0.57(3)	0.62(5)	…	…	0.46(4)	…	5.3

Note: Numbers within the brackets indicates the ranks between the countries. 1 refers the most Competitor country. Sources: [1] (Markou and Kavazis, 2006), [2] (Azzouzi and Abidar, 2005), [3] (Jabarin et al., 2000), [4] (Markou and Stavri, 2006), [5] (Markou et al., 2006), [6] (Jabarin et al., 2000), [7,8] (Lachaal et al., 2006a,b), [9] (Galanapoulos and Mattas, 2006), [10] (Roig and Lambarraa, 2006), [11] (Isikli and Yercan, (2005), [12] (Uysal, 2007).

is important that these differences are accounted for in any discussion of country comparisons. The requirements can be given in the following ways:

1. Finding technical coefficients for domestic resources and non-tradable and tradable inputs. The amount of inputs needed to produce one unit of output differs between different farm sizes and technology applied.
2. Calculating the social value of tradable inputs if there are direct payments or support for products (non-price assistance).
3. Finding the reliable farm gate prices.

In the light of these requirements, the results presented in Table 1 highlight that fruit and vegetable production in the Mediterranean basin is generally more internationally competitive. But, only the cases of Israel and Tunisia have a comparative disadvantage for oranges and tomatoes. Spain appears to be the most competitive country in the region. Spanish tomato, olive-oil and orange producers benefited from comparatively high international prices.

RESULTS AND DISCUSSION FOR TURKISH CASE

DRC Findings for horticultural products

In assessing the competitiveness of Turkish horticultural products, five main commodities were considered for five years. These products were chosen due to their relative importance. The products were tomatoes, melon, watermelons, tangerines and olive oil.

For the estimation of DRC, a number of data sets were used from various sources such as the Regional Directory of the Agricultural Ministry, the research Institute of Agricultural Economics, Aegean Exporters' Association and Olive oil Research Institute.

The social price of tradable inputs which are fertilizers, chemicals and seeds were taken into consideration without subsidy. In the year 2000, there was a subsidy policy in force in Turkey for fertilizers, chemicals and seeds. The policy was shifted dramatically later to no subsidy, hence private and social costs of these inputs are the same.

The social price of non-tradable inputs which are the cost of labour, land, interest and depreciation for long-term products, were taken as their social price which is said to be its value in realistic alternative use (that is, the social price of labour in agriculture is taken to be the average wage in the manufacturing industry).

For products for which Turkey is a net exporter, an average f.o.b export parity price was taken as the reference price.

Private input prices and quantities together with information on yields were taken from the Ministry of Agriculture and Rural Affairs along with some research findings. For annual crops, the opportunity cost of capital is based on the average interest rate for lending capital in agriculture. This is taken only for working (current) capital. The social price of land was measured as its rental value. Another cost item is the depreciation of the long-term inventory. For the long term plantation, the land value was evaluated by 5% of the initial value of the land.

It is clear from Table 2 that four crops (tomato, melon, watermelon and tangerine) have comparative advantages as concluded from their DRC values. But, Olive oil has been internationally disadvantaged in some years because of its periodised low yields. Crops which have a competitive advantage have a DRC value smaller than 1 which means that these crops allocate scarce domestic resources efficiently.

The process and estimations of DRC and some other protection coefficient such as nominal protection coefficient (NPC) and effective protection coefficient (EPC) for four crops in Turkey are depicted in Tables 2 and 3. At first glance, crops were competitive at world market prices for the period 2000 to 2004 (DRC < 1) excluding

Table 2. Data for Comparative Advantage of Some Selected Crops.

Indicators	Tomato*					Water melon					Melon				
	2000(1)	2001(2)	2002**	2003(5)	2004(6)	2000(1)	2001(3)	2002(3)	2003(3)	2004(3)	2000(1)	2001(3)	2002(3)	2003(3)	2004(3)
Yields(kg/ha)	200000	152000		118480	101300	22300	40000	37000	37000	37000	22020	23000	21000	22000	22000
Farm gate price($/ton)(Pf)	292	300		496	374	72	82	80	100	140	62	142	149	200	225
Export parity price ($/ton)(4) (Ps)	313	370		590	950	220	150	170	240	190	370	280	290	400	520
Private value of trad. Inp. ($/ton) (Ef)	118	114		107	37	8	16	23	27	32	10	26	39	51	54
Private value of non-trad. Inp. ($/ton) (VAf)	154	78		…	80	24	32	29	40	46	26	40	41	59	50
Social value of trad. Inp. ($/ton) (Es)	118	114		107	37	8	16	23	27	32	10	26	39	51	54
Social value of non-trad. Inp. ($/ton) (VNs)	150	121		153	139	49	31	32	42	46	54	51	55	68	75

	Tangerine					Olive oil				
	2000(1)	2001(3)	2002(3)	2003(3)	2004(3)	2000(7)	2001(7)	2002(3)	2003(3)	2004(3)
Yields (kg/ha)	20700	20400	20000	17900	17900	500	500	830	80	580
Farm gate price ($/ton)(Pf)	332	286	332	469	492	1300	1640	1970	2500	2249
Export parity price ($/ton)(4) (Ps)	380	310	350	530	510	1410	1820	2120	2740	2600
Private value of trad. Inp. ($/ton) (Ef)	26	38	43	56	76	672	484	80	1225	190
Private value of non-trad. Inp. ($/ton) (VAf)	219	183	163	226	262	2946	1998	586	6618	783
Social value of trad. Inp. ($/ton) (Es)	26	38	43	56	76	672	484	80	1225	190
Social value of non-trad. Inp. (VNs)	282	201	197	284	330	2946	1998	586	6618	783

*Greenhouse production, ** No reliable data for this year.
Sources: [1] (Anonymous, 2001), [2] (Engindeniz, 2003), [3] (Ministry of Agriculture and Rural Affairs, Records of Directorate of Izmir Province), [4] (Aegean Exporters' Associations), [5] (Bayraktar, 2005) , [6] (Yasarakinci et al., 2006), [7] (Records of Olive oil Research Institute).

olive oil. The results highlight that the most internationally competitive crop of those analysed was tomatoes for 2004. Moreover, tangerine was found to be the most profitable crop in terms of both private and social value added. Tables indicate that tomatoes and tangerines became more and more competitive during the studied years when compared with the initial year. Melon and watermelon had kept the competitiveness they had in the initial year.

Looking at year on year changes (Tables 2 and 3); the DRC estimations indicate that tomato and tangerine production became more internationally competitive between 2000 and 2004.

The same results were found by different researchers. Turkekul and Abay (2000) calculated the revealed comparative advantage index for tomato paste industry in Turkey. They stated that Portugal, Italy and Greece have a more competitive advantage than Turkey in this industry. Kutlu (2004) and Akgungor et al., (2001)

Table 3. Economic and financial analysis and protection coefficient.

	Tomato*					Water melon					Melon				
	2000	**2001**	**2002****	**2003**	**2004**	**2000**	**2001**	**2002**	**2003**	**2004**	**2000**	**2001**	**2002**	**2003**	**2004**
Private value added($/ton)(VAf=Pf-Ef)	174	186		389	389	64	66	57	73	108	52	116	110	149	174
Social value added($/ton) (VAs=Ps-Es)	195	256		483	913	212	134	147	213	158	360	254	251	350	467
Nominal protection coefficient on product (NPC=Pf/Ps)	0.93	0.81		0.84	0,39	0.32	0.55	0.47	0.42	0.74	0.17	0.51	0.51	0.50	0.43
Effective protection coefficient (EPC=VAf/VAs)	0.89	0.72		0.80	0,26	0.30	0.49	0.39	0.34	0.68	0.14	0.46	0.44	0.43	0.37
Domestic resource Cost (DRC=VNs/VAs)	0.77	0.47		0.32	0,15	0.23	0.23	0.22	0.19	0.29	0.15	0.19	0.22	0.19	0.16
	Tangerine					**Olive oil**									
Private value added ($/ton) (VAf=Pf-Ef)	354	248	289	413	416	628	1156	1890	1275	2059					
Social value added ($/ton) (VAs=Ps-Es)	354	272	307	474	501	738	1336	2040	1515	2410					
Nominal protection coefficient on product (NPC=Pf/Ps)	0.87	0.92	0.95	0.88	0.96	0.92	0.90	0.93	0.91	0.87					
Effective protection coefficient (EPC=VAf/VAs)	1.00	0.91	0.94	0.87	0.83	1.00	1.00	0.93	0.84	0.85					
Domestic resource cost (DRC=VNs/VAs)	0.80	0.74	0.64	0.60	0.66	3.9	1.49	0.29	4.3	0.32					

Source: *Greenhouse production, ** No reliable data for this year.
Sources: [1] (Anonymous, 2001), [2] (Engindeniz, 2003), [3] (Ministry of Agriculture and Rural Affairs, Records of Directorate of Izmir Province), [4] (Aegean Exporters' Associations), [5] (Bayraktar, 2005) , [6] (Yasarakinci et al., 2006), [7] (Records of Olive oil Research Institute).

stated that Turkey has a comparative advantage in the fruits and vegetables processing sector by using the export share index, revealed comparative index and net export index.

Cagatay and Guzel (2003) stated that the Turkish fruit and vegetable sector showed the greatest achievement on competitiveness. They used Lafay index to analyse the competitiveness and comparative advantage of trade flows.

The degree of protection was greatest for tangerines and tomatoes. The differences between farm gate prices and border prices were affected thereby leading to decreasing tendency of protection for these crops.

These results were supported by international trade statistics by products. In the analysed period, the export quantity of the four crops increased continuously. This can be an indicator of crops which are internationally competitive.

DISCUSSION

International competition in agricultural products is rather important for Turkish agriculture. This paper has presented a comparative analysis of competitiveness for some selected horticultural crops in Turkey.

A country that best utilises its given resources within its agricultural sector may enjoy a significant comparative advantage in international agricultural markets. There are two main factors underlying international competitiveness; price competitiveness and product quality. In the former case, long run competitive advantage depends on securing a lower comparative cost structure.

This methodology has not been widely applied to Turkish agriculture. These calculations are sensitive to the choice of shadow prices and to changes in international prices and the opportunity costs of factors of production considered.

Turkey is an important actor in the world market for some horticultural products. As expected, fruits and vegetables have significant shares in Turkish total agricultural exports. Indeed, the share of Turkey in world export is about 4% for vegetables, 6% for fruits and 5% for olive oil and the European Union accounts for more than half of Turkey's fruits and vegetables exports.

The results highlight that the Turkish horticultural sector has an international competitive advantage. The most internationally competitive crops were tomatoes, followed by melons, watermelons and tangerines for the year 2004. This can be interpreted as the comparative advantage which enjoys favourable climatic con-

ditions, competitive cost of production, especially labour and closeness to EU markets.

The competitive advantage of Turkey for horticultural products can be sustained and enhanced by taking care of environmental and food safety standards. Through high quality products, eliminating border and non-tariff barriers to trade in horticulture, Turkey would better exploit this comparative advantage.

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