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producing fresh and processed fruit and vegetables
in a context of International liberalization**

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FOREWORD

The EU-Med Agpol project [contract SSPE-CT-2004-502457] is a research programme funded by the European Commission within the framework of the 6th FPRTD, priority 8.1 - Policy-oriented research, *Integrating and Strengthening the European Research Area – [FP6-2002-SSP-1]*.

The aim is the study of the impact of the liberalisation of agricultural trade between the EU and partner countries in the southern and eastern parts of the Mediterranean area on the fresh and processed fruit and vegetables and olive oil sectors in EU member-countries before enlargement.

The research programme consists of nine themes:

- characterisation of the agricultural production, processing, distribution, and retail systems in the Mediterranean countries (Task 1).
- characterisation of the agricultural production sub-sectors in major European regions for production of fruits, vegetables, and olive oil (Task 2).
- description and quantification of the EU protection systems for fruits, vegetables, and olive oil as well as Mediterranean systems for cereals, meats, and milk products (Task 3)
- development of three realistic liberalization scenarios ranging from small changes to totally free trade (Task 4).
- estimation of the production and export potential for Mediterranean agricultural systems within three years and ten years using expert panels (Task 5).
- use of quantitative tools available to make estimates of possible changes in European and Mediterranean production, imports, and exports of agricultural commodities (Task 6).
- determination of the kinds and importance of interactions with other world markets and international trade negotiations (Task 7).
- estimation of the changes in European production of fruits, vegetables, olive oil, and other crops, agricultural incomes, EU budgets, social impacts, and other changes (Task 8).
- dissemination of the results of the research as widely as possible and throughout the duration of the project (Task 9).

The work is carried out by nine European and Mediterranean research teams.

The members of Team 2 handling theme 2 are Nassima Ayadi, project engineer at Agro Montpellier, Jean-Claude Montigaud, director of research, SEA2 Department, INRA, Professor Jean-Louis Rastoin, Agro Montpellier (WP2 coordinator) and Selma Tozanli, CIHEAM-IAM Montpellier. All four are research scientists in the MOISA joint research unit (Agro.M, CIHEAM-IAMM, CIRAD, INRA and IRD) in Montpellier (France).

This document is the third WP2 progress report. It concerns the characterisation of the 'processed fruit and vegetables' sectors in five Mediterranean countries that are part of the EU: Spain, France, Greece, Italy and Portugal. It is completed by a study on the European tomato processing industry drawn up by JC Montigaud with the help of J. Briz and C. Giacomini and that is provided in a separate volume.

**THE VULNERABILITY OF THE EURO-MEDITERRANEAN REGIONS
PRODUCING FRESH AND PROCESSED FRUIT AND VEGETABLES IN A
CONTEXT OF INTERNATIONAL LIBERALISATION**

CONTENTS

CONTENTS.....	3
INTRODUCTION	4
1 – CHARACTERISATION OF THE FRUIT AND VEGETABLES SECTOR.....	6
1.1/ Production	6
1-1.1 Fresh fruit and vegetables	6
1-1.2 Processed fruit and vegetables.....	8
1.2/ Distribution channels	9
1.3/ Regulation institutions	10
1.4/ Consumption	10
1.5/ International trade	12
2 – THE VULNERABILITY OF THE EU MEDITERRANEAN REGIONS PRODUCING FRESH AND PROCESSED FRUIT AND VEGETABLES.....	16
2.1 – The 30 regions identified for estimation of the vulnerability index.....	17
2.2 – Score functions.....	20
2.2.1 – Fresh fruit and vegetable sector	20
2.2.2 – Processed fruit and vegetables.....	22
2.2.3 – Marketing enterprises	26
2.2.4 – Regional wealth	28
2.3 – Calculation of the SRVI in four scenarios.....	29
2.3.1 – Scenario 1: Strength of F & V production.....	30
2.3.2 – Scenario 2: Strength of the downstream end of F & V chains	31
2.3.3– Scenario 3: Strength of the economic environment.....	32
2.3.4 – Scenario 4: Balanced strengths	33
2.4 – Discussion of the results	34
Conclusion.....	36

INTRODUCTION

This third report on WP2 concerning the study on the impact of trade liberalisation on the fruit and vegetables sector in the Euro-Mediterranean zone is a synthesis and a complement to report I, devoted to fresh fruit and vegetables (Ayadi N, Montigaud, Rastoin, 2005), and report II, devoted to processed fruit and vegetables (Ayadi N, Montigaud, Rastoin, 2006), available on CIHEAM-IAMM's website (www.iamm.fr) devoted to EuMedAgpol. The report addresses the estimation of a Regional Vulnerability Index (RVI) incorporating the various stakeholders in the 'fruit and vegetables' sector in 31 regions (NUTS 2) of the 5 EU countries with a Mediterranean coastline (Spain, France, Greece, Italy and Portugal) and that should therefore be more concerned by the EU-Mediterranean free trade zone that is currently being set up.

This evaluation is leading to performing an inter-regional comparative diagnosis (benchmarking) with identification of the strengths and weaknesses of the European regions that are strongly specialised in the fruit and vegetables sector.

The conceptual bases of this research are to be found mainly in theories of industrial organisation (Scherer, 1973), resources, skills and capabilities (Wernerfelt, 1984, Sen, 1985) and of global value chain (Gereffi, 1994). These theoretical models are well-suited to the analysis of agrifood chains (Montigaud, 1992).

In the literature devoted to the impact of international trade liberalisation on the countries concerned, neoclassic thinking uses so-called 'calculable general balance' models that measure variations in wellbeing (generally estimated by variations of the GDP) using hypotheses concerning supply and demand price elasticity.

Several models have concerned the liberalisation of Euro-Mediterranean trade (for example, those of Augier and Gasoriek, 2001, Radwan and Reiffers, 2003, Bchir et al., 2003). These models can be criticised for the numerous restrictive hypotheses used in their construction and their mechanical, stylised representation of reality and finally the considerable uncertainty in the quality and representativeness of many of the parameters used (Cling and Ould Aoudia, 2003).

Nevertheless, these models allow a certain formalisation of the questions and situations. They are still essential in the present state of instruments in economics and must therefore be used as a basis for analysis as long as they are completed by critical examination of the results, especially in the light of heterodox theoretical trends such as those derived from institutional economics. This is the approach used here; it does not consist of estimating impact from simulation performed using a global or sectoral mathematical model whose limits are specified but of identifying the levels of risk involved. Institutional (Nelson and Winter, 1982) and strategic theories (Wernerfelt, 1984) suggest the identification of factors of performance and, in contrast, of the weakening (or vulnerability) of the European fruit and vegetable production regions in a context of fiercer competition.

The concept of vulnerability

Vulnerability can be defined as 'the degree of loss to each element should a hazard of a given severity occur' (UNDP, 1991). This definition takes into account the vulnerability related to damage caused by natural catastrophes (an earthquake or the collapse of a structure for example) and climatic or economic hazards. Several USAID studies (Downing, 1991) address the question of the assessment of the vulnerability of social groups to famine, water shortage, reduction of aid and financial credit, etc.

FAO specifies that vulnerability is a relationship between three factors: risks, the resulting shocks and resilience¹. The risk/shock combination affects the wellbeing of population (e.g. food insecurity) whereas resilience concerns all the strategies used to avoid the impact of shocks. Vulnerability is therefore positively correlated with the impact of shocks and negatively correlated with resilience.

In other words, individuals are not defenceless in the face of risks. Some possess reaction capacity that enable them to overcome the constraints resulting from external shocks. Douglas North uses institutional change to explain this interactive dynamics between stakeholders and the context in which they operate (North, 1990). This concerns stakeholders' capacity to adapt to the changes made to institutions (economic, financial and social rules) using strategic behaviour. The most dynamic stakeholders should succeed in transforming probable changes into fruitful potential for their wellbeing (they are resilient) while others would be incapable of facing the situation (they are vulnerable).

Other authors, following the example of Sen, indicate the capacity of individuals to manage to their advantage the risks resulting from hazards through the notion of capabilities. Stakeholders use their resources (human, material and social) to grasp the opportunities provided by their environment and turn all these resources into capabilities (Sen, 1985).

The Resource-Based View (RBV) theory has been developed by management science. This stipulates that in an environment of increasing competitive intensity, the strategic advantages (and, conversely, the risks) of organisations depend on three sets of factors: resources, competencies and capabilities. Resources consist of specific assets such as natural goods, technology and equipment and, finally, human resources. Competences are represented by the knowledge and know-how of the staff of businesses. Capabilities stem from the ability to organise and combine the resources and competencies that businesses can mobilise (Wernerfelt, 1984).

If stakeholders possess a substantial potential of capabilities their vulnerability level is low. In contrast, vulnerability increases with inadequate capability levels. The degree of vulnerability is thus inversely proportional to the capability level. The approach aimed at assessing the capacity of stakeholders or organisations to face up to hazards is part of a preventive procedure.

The Euro-Mediterranean trade liberalisation envisaged in the agricultural sector would doubtless cause upheavals in the present balances. The impacts of this institutional change would be experienced in different ways depending on the country, the region and the products concerned. We have developed a composite regional vulnerability index (RVI) to show the complexity of the chains and the fragility of certain fruit and vegetable producing regions.

The first part of this report is a reminder of the key economic data in the sector in terms of production, international trade and consumption.

The second part is devoted to the presentation and analysis of the RVI.

¹ Resilience is a notion in physics that expresses the resistance of an object to a shock. The term is used by extension in biology and social science to indicate the capacity of resistance to external stresses (see Downing, 1991). Resilience also expresses the adaptability of a player to change in his technological and economic environment.

1 – CHARACTERISATION OF THE FRUIT AND VEGETABLES SECTOR

Like most agrifood chains, the fruit and vegetable sector consists of six sub-units:

- the production of raw materials (fresh fruit and vegetables in this case);
- processing, with an industry making several categories of product (from heat-treated to vacuum-packed);
- distribution channels that are concentrated and diversified to various degrees according to the country;
- associated industries and services (agri-supplies, equipment manufacturers, financial and logistic services, etc.);
- public and private qualification institutions (mainly training and R&D), regulation (common market organisation in particular) and standards bodies;
- consumption on domestic or foreign markets.

The performance of a chain depends on the shape of each of its constituents and the density of the relations between the latter. Indeed, each chain operates like a system. Here, the proximity factors associated with the various stakeholders in a chain are very important. Proximity may be geographic, and in this case reference is made to a cluster or a local production and marketing system, or reticular (with the notion of a network facilitated today by the Internet and information and communication technologies).

Given the strong demand for fresh produce, two sub-chains can be identified in the fruit and vegetables sector:

- a sub-chain supplying end-user markets;
- a sub-chain devoted mainly to the manufacture of processed products.

However, the physical and economic links between the two sub-chains are strong.

1.1/ Production

1-1.1 Fresh fruit and vegetables

Producing an average 129 million tonnes in 2003-2005, the 25-member European Union (EU-25) is the world's second largest producer of fruit and vegetables after China. Nevertheless, EU production is stagnating while that of its Asian competitors (China, India and Indonesia) display strong growth rates. The United States is in fourth position with 5% of the market (supplies), followed by six developing countries (Brazil, Turkey, Iran, Mexico, Egypt and Indonesia), all of which have large populations. Indeed, fruit and vegetables are part of the foundations of the diet in Asia, South America and the Mediterranean area.

Table 1 – World fruit and vegetable production

Average 2003-2005	Fruits			Vegetables and melons			Fruit and vegetables		
	Volumes (million t)	MS	Var. 94-04	Volumes (million t)	MS	Var. 94-04	Volumes (million t)	MS	Var. 94-04
1 China	83	16%	118%	423	49%	125%	506	37%	124%
2 EU-25)	63	12%	4%	66	8%	9%	129	9%	6%
3 India	47	9%	33%	80	9%	47%	127	9%	42%
4 USA	28	6%	-2%	38	4%	11%	67	5%	5%
5 Brazil	35	7%	8%	8	1%	30%	44	3%	12%
6 Turkey	11	2%	16%	25	3%	27%	37	3%	24%
7 Iran	13	3%	32%	14	2%	70%	27	2%	49%
8 Mexico	15	3%	33%	10	1%	53%	25	2%	40%
9 Egypt	8	2%	49%	16	2%	61%	24	2%	57%
10 Indonesia	14	3%	63%	7	1%	13%	21	2%	41%
Top 10	318	63%	32%	688	79%	74%	1 005	73%	58%
World	505	100%	26%	868	100%	62%	1 373	100%	26%

MS: market share (country/world total)

Source: FAO, FAOSTAT, 12 March 2006

At the world scale, vegetables form a larger tonnage (63%) than fruits (37%). Their growth is also stronger at 4.9% per year over the past decade² against 2.4% for fruits. China is the undisputed leader in the vegetable sector with 49% of world supplies for 21% of the world population. EU-25 has a comparatively more solid position in the fruit sector with 12% of supplies in comparison with China's 16%.

Mediterranean countries have a preponderant position in the EU as 79% of the fruits and 72% of the vegetable produced in EU-25 are from Italy, Spain, France, Greece and Portugal, that is to say a total of 93M tonnes of the 2003-2005 three-year average of 129M. However, annual growth of the fruit and vegetable sector in these countries is hardly greater than the European average, that is to say very small at hardly 0.5% for fruit and 1.2% for vegetables over the last ten years.

The weight of the 10 Mediterranean third countries (MTCs) is comparable overall to that of the 5 EU member countries (88M tonnes in comparison with 93M). However, the composition is different as the MTCs are mainly vegetable-oriented (67% of total fruit and vegetables) against 46% in the EU Mediterranean countries). Growth is significant in the MTCs at 2% per year for fruit and 3.4% for vegetables.

² Annual average growth rate between the three-year averages for 1993-95 and 2003-05.

Table 2: Fruit and vegetable production in the Mediterranean countries

	Average 2003-2005	Fruit			Vegetables and melons			Fruit and vegetables		
		Volumes (t)	MS	Var. 94-04	Volumes (t)	MS	Var. 94-04	Volumes (t)	MS	Var. 94-04
1	Italy	17 340 899	28%	-3%	16 011 269	24%	14%	33 352 168	26%	14%
2	Spain	16 479 049	26%	34%	12 520 458	19%	21%	28 999 507	23%	21%
3	France	10 319 411	16%	-6%	8 555 540	13%	9%	18 874 951	15%	9%
4	Greece	3 476 605	6%	-18%	3 969 950	6%	-5%	7 446 555	6%	-5%
5	Portugal	1 902 788	3%	11%	2 342 447	4%	10%	4 245 236	3%	10%
	Total 5 countries	49 518 752	79%	5%	43 399 664	66%	12%	92 918 417	72%	9%
	EU-25	62 822 269	100%	4%	65 953 335	100%	9%	###	100%	9%
1	Turkey	11 262 223	39%	16%	25 499 113	43%	27%	36 761 337	42%	27%
2	Egypt	8 052 814	28%	49%	15 847 338	27%	61%	23 900 152	27%	61%
3	Morocco	2 664 735	9%	16%	4 936 893	8%	89%	7 601 628	9%	89%
4	Algeria	1 898 308	6%	63%	3 269 007	6%	34%	5 167 315	6%	34%
5	Syria	1 624 598	6%	14%	2 651 758	5%	45%	4 276 356	5%	45%
6	Tunisia	1 028 883	4%	25%	2 241 863	4%	48%	3 270 747	4%	48%
7	Israel	1 165 633	4%	-18%	1 666 995	3%	19%	2 832 628	3%	19%
8	Lebanon	909 633	3%	-28%	799 967	1%	-20%	1 709 600	2%	-20%
9	Jordan	294 576	1%	-6%	1 090 984	2%	26%	1 385 560	2%	26%
10	Libya	343 400	1%	9%	865 633	1%	17%	1 209 033	1%	17%
	Total 10 countries	29 244 804	100%	21%	58 869 552	100%	39%	88 114 357	100%	34%

MS: market share (country/world total)

Source: FAO, FAOSTAT, 12 March 2006

It is noted that the 16 Mediterranean countries account for a significant proportion of world production (16% in 2003-05). The percentages of some species (citrus among fruits, tomatoes and aubergines among vegetables, etc.) are much higher.

1-1.2 Processed fruit and vegetables

In 2002, the European (EU-25) fruit and vegetable processing industry consisted of slightly more than 8,000 businesses with a turnover of a little more than EUR 48 billion and employing 264,000 persons³. The sector has a modest position in the agrifood industry, with 2% of businesses and 6% of turnover and jobs. Germany, Italy, France and the United Kingdom were the main players in 2001, each accounting for about 15% of EU-25 production. Spain was in 5th position with 10%. Greece was 9th (3%) and Portugal 16th (1%). There is thus a considerable difference between fresh fruit and vegetable production and that of processed products in the 5 Mediterranean countries that produce 72% of the tonnage of EU-25 fresh produce and only 44% of industry turnover. However, they account for 39% of jobs and 52% of the number of businesses. The supply structure of the fruit and vegetable industry in the Mediterranean countries is thus more scattered than in the rest of the EU.

³ Data source: Eurostat, 2005. The incomplete statistics for the agrifood industry in the EU (no figures for Greece), the absence of data on the size of enterprises and harmonisation between countries and lack of updating (in 2005, the series stopped in 2002) are regretted.

Table 3: The Fruit & Vegetable Industry in the EU Mediterranean countries - 2002

Country	Number of enterprises	Turnover (€m)	Employees
EU (25)	8 074	48 137	264 300
Italy	1 960	7 462	30 372
France	1 163	6 805	26 889
Spain	634	5 149	30 983
Greece (estimate)	300	1 500	11 000
Portugal	156	486	4 010
EU-Mediterranean countries	4 213	21 402	103 254
MC/EU	52%	44%	39%

Source: Eurostat, 2005

Turnover increased by about 50% in Spain and Italy between the end of the 1990s and 2002; this is twice the increase in Portugal and France.

Labour productivity in 2002 was some €250,000 per worker in Italy and France, €170,000 in Spain and €120,000 in Portugal. The differences are substantial and result from markedly different average technical levels and different management techniques.

The turnover of the entire fresh and processed fruit and vegetable sector in EU-25 in 2004 exceeded €100 billion (with 57% generated by the 5 Mediterranean countries) and about 950 000 jobs.

Table 4. Estimate of the production value of fresh and processed fruit & vegetables in EU-25, 2004

Country	Production value (M.€)		
	Agriculture	Industry	Total
EU (25)	51 800	50 100	101 900
Italy	11 080	7 800	18 880
France	6 510	7 100	13 610
Spain	12350	5 400	17 750
Greece (estimation)	3320	1 500	4 820
Portugal	2020	500	2 520
EU-Mediterranean countries	35 280	22 300	57 580
MC/EU	68%	45%	57%

Source : our estimation on Eurostat, 2005

It should be noted that fruit and vegetables form a large proportion of agricultural production, with EU-25 accounting for 17% in 2004, Italy for 25%, Spain, Greece and Portugal for 29% and France for 11%.

1.2/ Distribution channels

Fruit and vegetable distribution channels have become much more concentrated in the last 30 years and supermarket chains are now dominant for industrial products and, to a lesser degree, for fresh produce. This concentration is very strong in northern Europe and more moderate in southern Europe where there remains a comparatively large sector of retailers specialised in fresh produce. However, the medium-term trend is the strengthening of

supermarket chains in all the Mediterranean countries. Market power downstream of the sectors is being increased by the formation of large purchase centres combining several supermarket chains. The centres are generally located in Switzerland mainly for reasons of regulations as Switzerland is not a member of the EU.

This phenomenon of domination chains from downstream operates in several ways:

- the negotiation of pared prices because of the very strong competition between retail chains;
- the transfer of part of supermarket operating costs to suppliers;
- the defining of private standards (Eurepgap, BRC, IFS, etc.) by supermarket chains, leading to strict specification for the production sector in terms of quality, traceability, packaging, volumes and delivery dates;
- the use of logistic systems that marginalise remote production zones.

Fresh and processed fruit and vegetable production businesses are thus always encouraged to lower their costs and adapt to requirements in quality, volumes and management methods.

1.3/ Regulation institutions

The main industry regulatory instrument is the common market organisation (CMO) of fruit and vegetables⁴ whose principle is that of *ex ante* intervention in supplies by encouraging the grouping of producers, their modernisation and their efforts with respect to product quality and protection of the environment.

The results of the CMO are disappointing. The average rate of assembly in producers' organisations in EU-15 was still less than 40% in 2003. However, the results were much better in northern Europe (over 70% in the Netherlands and Belgium) than in the south (less than 10% in Greece and Portugal).

There is a strong disparity between the aid provided at FEOGA level (€1.5 billion in 2003 for fresh and processed fruit and vegetables, that is to say 3.9% of the total budget) and the economic weight of the sector (17% of end-products of agriculture).

The CMO of fruit and vegetable, as for all the other CMOs in the Common Agricultural Policy (CAP) was to be reformed in 2000, with the elimination of export subsidies, the decoupling of aid and the volumes produced, a single payment per farm and the application of environmental conditions.

1.4/ Consumption

No overall statistics are available for fruit and vegetable consumption. The hypothesis can be put forward that at world level it displays significant growth, accompanying that of production: +3.9% per year in the last 10 years (average production in 2002-2004 compared to the average for 1992-1994) world-wide, +8.4% in China, + 3.5% in India and +0.6% in EU-25.

Apparent consumption of fruit and vegetables can be estimated from the FAO food reports using the following formula:

$$AC = Y + M - X + Vs - AF - L - OU$$

in which AC: apparent consumption, Y: production, M: imports, X: exports, VS: variations of stocks, AF: animal feed, L: losses, OU: other uses

⁴ Regulation 2200/96 on fresh fruit and vegetables, 2201/96 on processed fruit and vegetables and 2002/96 on citrus.

The equation gives the availability of fresh and processed fruit and vegetables for human consumption.

Table 5: Per capita Fruit and Vegetable Apparent Consumption – Mean 2001-03

kg/year	Fruit	Vegetables	F & V
Greece	207	261	469
Italy	243	165	408
Spain	248	154	402
Portugal	213	184	397
France	223	141	364
China	52	256	308
European Union (15)	174	125	298
Austria	179	91	270
Netherlands	151	89	240
Europe	122	115	238
Denmark	134	98	232
Germany	128	92	220
Belgium	74	127	201
Ireland	112	82	194
United Kingdom	102	90	192
Sweden	110	77	187
Japan	56	107	163
Finland	89	70	159
Russian Federation	51	95	146
Brazil	98	40	138
India	37	67	104
World	69	114	183

Source: FAOSTAT, 18 March 2006

Annual EU fruit and vegetable consumption is very high at nearly 300 kg per capita. The Mediterranean countries stand out with more than 400 kg. As nutritionists recommend these foods very strongly, it can be forecast that world demand will increase in the coming years, probably with an increase in processed products in emerging countries and, in contrast, an increase in ready-prepared fresh produce in high income countries, as is suggested by ongoing trends in the United States.

Table 6: Fresh and Processed Fruit and Vegetable Consumption – USA (fresh equivalent)

kg/year Year	Fruit			Vegetables			Fruit & Vegetables		
	Total	Fresh	Proces.	Total	Fresh	Proces.	Total	Fresh	Proces.
Av. 71-73	108	44	64	153	68	86	261	112	149
Av. 01-03	124	57	67	187	88	99	311	146	166
Change	15.1%	29.9%	4.8%	22.2%	30.5%	15.7%	19.3%	30.3%	11.0%

Source: USDA/Economic Research Service. Data last updated Dec. 21, 2004.

1.5/ International trade

During the period 2001-2003, world fresh and processed fruit and vegetable exports reached nearly \$79 billion in value, making them the leading goods in agricultural and agrifood trade ahead of cereals (\$56 billion). With a 51% increase during the period 1993-2002 (centred three-year averages), fruit and vegetables have been distinctly more dynamic than world food exports as a whole (+41%). It can also be noted that international trade in fruit and vegetables has increased almost twice as fast as production (+26%) in the last ten years and this is a sign of the globalisation of the market. Nevertheless, the proportion of production exported is still modest at an average of some 10 to 15% because the goods are perishable.

Fruits form the largest part of exports in the sector and the increases are very similar for fresh fruit and vegetables and processed products (about 5% per year).

Table 7: World Exports of Fruit and Vegetables

	Mean 2001-2003		1992-94 to 2001-03	
	Value (M.\$)	Share	Total Change	Annual change
Vegetables	24 240	30.7%	53.7%	4.9%
Fruit	32 060	40.7%	52.3%	4.8%
Processed fruit & vegetables	22 557	28.6%	52.5%	4.8%
TOTAL	78 857	100.0%	52.8%	4.8%

Source: UN, Comtrade, 2005 & Emlinger, 2005

In 2001-2003, the export value of 26 products exceed €1 billion. The list was headed by fruit juices (\$6.7 billion), fresh vegetables (5.2), citrus fruits (5.2), bananas (4.6) and canned fruits (4.5). Other important Mediterranean produce includes tomatoes in 9th position (\$3.6 billion), grapes (10th, €3.3 billion), stone fruits (apricots, peaches, cherries: 15th, \$2 billion), dates, figs and tropical fruits (16th, \$2 billion). The strongest growth rates were displayed by frozen vegetables (+11.6% from 1993-2002), dates, figs, pineapple, avocado and mango (+10.6%), tomatoes, lettuce and carrots (more than 6%).

The European Union (EU-15) was by far the world's largest exporter of fruit and vegetables (\$35 billion, 44% of total exports in 2001-03), followed by NAFTA (18%), Greater China (6%) and Mercosur (3%). It is also the world's leading importer (\$40 billion, 52% of total imports), way ahead of NAFTA (19%), with the other zones of the world importing very little (China and Mercosur 1%). However, intra-regional trade forms the greater part of business, with 82% of exports and 70% of exports in the EU and 16% and 7% in the NAFTA countries. When intra-regional trade is excluded, the EU is still the world leader with 18% of total exports but followed closely by NAFTA (16%) and China (13%)

Table 8: International Trade Matrix of Fresh and Processed Fruit & Vegetables by Economic Region – Mean 2001-2003

Export (M.\$) =>	EU-15	SEMC	NAFTA	MERCO SUR	Great China	Oceania	RoW	Total Export	Export Market share	Intra-Region Export
EU-15	28 490	332	1 074	62	14	101	4 570	34 643	44%	82%
SEMC	2 299	152	214	13	8	43	1 269	3 998	5%	4%
NAFTA	1 622	159	8 660	31	110	105	3 538	14 225	18%	61%
MERCOSUR	1 424	25	517	298	12	27	335	2 638	3%	11%
Great China	669	64	425	20		54	3 090	4 322	6%	15%
Oceania	223	30	135	1	12	167	1 088	1 656	2%	10%
RoW	5 694	230	3 722	151	590	126	6 300	16 813	21%	37%
Total Import	40 421	991	14 747	576	747	623	20 190	78 294	100%	
Import Market Share	52%	1%	19%	1%	1%	1%	26%	100%		
Intra-Region Import	70%	33%	7%	11%	2%	16%	23%			

EU: European Union (15), NAFTA: North Atlantic Free Trade Agreement, SEMC: Southern and Eastern Mediterranean Countries

Source: calculated from UN, Comtrade, 2005 and Emlinger, 2005

The trade dynamics of the fresh and processed fruit and vegetable sector over a period of 10 years (movement from 1992-94 to 2001-03) reveals a dwindling of EU and Mercosur export market shares to the benefit of Greater China while EU, NAFTA and Chinese imports increased. The strongest movements were in exports of processed products from China (+145%) and Chinese imports of vegetables (+767%), fruits (+583%) and prepared fruits and vegetables (+175%). China's international trade is thus in two directions. NAFTA is the second economic zone to benefit from the globalisation of markets. Mediterranean third countries also displayed a strong increase in international trade but the volumes concerned remained small.

Table 9: Changes in Fresh and Processed F&V World Market Shares

Mean 1992-94 to 2001-03	Export Value		Import value	
	Market Share	Total Growth	Market Share	Total Growth
Greater China	1.0%	84%	0.7%	491%
SEMC	0.0%	52%	0.2%	87%
NAFTA	0.4%	54%	2.0%	69%
EU-15	-0.4%	50%	1.1%	54%
RoW	-0.4%	49%	-3.5%	34%
Mercosur	-0.6%	27%	-0.5%	-9%
World		51%		51%

EU: European Union (15), NAFTA: North Atlantic Free Trade Agreement, SEMC: Southern and Eastern Mediterranean Countries

Source: calculated from UN, Comtrade, 2005 and Emlinger, 2005

As has been seen, the EU relies on the member-states for 70% of its fruit and vegetable supplies. Examination of goods from outside the EU shows that Europe's leading supplier is 'the rest of the world', that is to say a set of countries in Latin America (especially Chile), Africa (especially Côte d'Ivoire) and Asia (especially Thailand).

Table 10: Foreign Suppliers of the EU Fruit and Vegetable Market

Mean 2001-03	Fruit	Vegetables	Processed	Total
EU	62.2%	81.6%	70.8%	70.5%
RoW	21.1%	8.5%	11.8%	14.6%
SEMC	7.2%	4.6%	4.6%	5.7%
NAFTA	5.8%	2.9%	2.7%	4.0%
MERCOSUR	3.2%	0.6%	6.9%	3.5%
Greater China	0.4%	1.8%	3.2%	1.7%
Total (Import Value, \$bn)	16 568	12 075	11 779	40 421
SEMC Share in extra-regional trade	19%	25%	16%	19%

EU: European Union (15), NAFTA: North Atlantic Free Trade Agreement, SEMC: Southern and Eastern Mediterranean Countries

Source: calculated from UN, Comtrade, 2005 and Emlinger, 2005

The SEM countries cover only some 6% of the total European import market and account for 19% of extra-community supplies worth \$2.3 billion, with 61% of EU imports from SEM countries consisting of seven products: walnuts and hazelnuts (\$355m), citrus fruits (\$224m), canned fruits (\$198m), dates and figs (\$184m), grapes (\$173m), other fresh vegetables (aubergines and beans, \$140m) and tomatoes (\$128m). The economic stakes of Euro-Mediterranean trade in fruit and vegetables considered from the point of view of the EU as a whole are small in comparison with total trade and concentrated on a small number of products. We also know that in contrast exports of fruit and vegetables from Mediterranean countries form a significant proportion of total agricultural and agrifood exports.

Whereas the average ratio of 'fruit and vegetable exports:total agricultural and food exports' in the world and in the European countries was 17% in 2002-2004, it exceeded 26% for the Mediterranean countries. The highest ratios were observed for Morocco (71%), Turkey (55%), Spain (47%) and Israel (45%). These countries thus depend strongly on fruit and vegetables.

France is the only exception in the Mediterranean area as a result of the agro-climatic diversity of its territory and hence of its crops. Its 'F & V exports:agricultural exports' ratio is 10% and its agricultural foreign trade balance is therefore much less dependent on fruit and vegetables. In contrast, the Mediterranean regions of France are characterised by a strong fruit and vegetables sector as is seen in the second part of this report.

The 'F & V exports:agricultural exports' ratio remained constant overall from 1992-94 to 2002-04 for the 16 exporting Mediterranean countries. However, the average masks a significant decrease in specialisation in fruit and vegetables for the two leading countries (Spain, - 8.5%; Italy, - 6.4%) and for the small exporters (Syria, Lebanon and Algeria), whereas Turkey gained 8% and France 1.5%.

Table 11: Fruit & Vegetable Sector Foreign Dependency of the Mediterranean Countries

	Country	Mean 2002-2004		1993-2003 Ratio Change
		Export Value (\$m)	F&V / Total Agri. Export Ratio	
1	Spain	9 846	47%	-8.5%
2	Italy	5 267	25%	-6.4%
3	France	4 250	10%	1.5%
4	Turkey	2 629	55%	8%
5	Greece	1 063	37%	-0.9%
6	Morocco	650	71%	-8%
7	Israel	549	45%	-4%
8	Portugal	392	19%	1.1%
9	Egypt	246	24%	-8%
10	Syrian Arab Republic	179	18%	-23%
11	Jordan	174	37%	-15%
12	Tunisia	120	20%	1%
13	Cyprus	90	37%	7.0%
14	Lebanon	78	35%	-32.7%
15	Algeria	19	38%	-49.7%
16	Malta	3	3%	-10.3%
	Sub-total for 16 countries	25 555	26%	0.6%
	European Union (15)	36 428	17%	2%
	World	88 851	17%	1%

Source: FAOSTAT, 19 March 2006

2 – THE VULNERABILITY OF THE EU MEDITERRANEAN REGIONS PRODUCING FRESH AND PROCESSED FRUIT AND VEGETABLES

The European fruit and vegetable sector displays considerable diversity according to subsector, country and region. The interactivity of the different factors determining the functioning of the chains leads to multiple configurations that are specific to the regions. The importance of F & V business in the regional economy, the level of economic development, the structure and dynamism of the enterprises making up the production fabric, the effectiveness of public or professional institutions and the natural assets of the regions (climate, soil quality, water, etc.) mean that performance is uneven in the F & V sector. The issues of trade liberalisation are thus felt differently according to the region. The aim here is to define the vulnerability levels of regions specialising in F & V production in Spain, France, Greece, Italy and Portugal according to present potential and constraints and the prospects of the opening up of Euro-Mediterranean trade using a synthetic indicators, the RVI (Regional Vulnerability Index).

The method developed is original in that it does not start with the concept of international 'competitiveness' that has been the subject of publications that are now classics in the literature (for example using the calculation of 'revealed comparative advantages'). The method is inspired by an approach borrowed from management science and known as the 'Resource-Based View' (RBV) whose theoretical foundations stipulate that in an environment in which the intensity of competition is increasing, strategic advantages (and, conversely, the risks) for organisations depend on the resources, competencies and capabilities that they can mobilise. The capabilities notion has also been used by the Nobel prizewinner A. Sen, UNDP and FAO.

The approach has a double advantage. Firstly, the RVI is a multiple indicator that enables the addressing of the agricultural and agrifood sector in its systemic environment and secondly leads to diagnosis of the SWOT⁵ type and hence to recommendations. Combining it with scenarios of the evolution of the market shares of exporters makes it possible to simulate impact in case of the liberalisation of the EU market supply regime.

However, the RVI remains an overall indicator that it has only been possible to calculate at the subsector level (fruit and citrus on the one hand and vegetables on the other) and the regional level (NUTS 2 in the European geographic classification) because of the information available. A closer analysis in terms of produce and local production areas is an essential complement for operators as regards strategic studies, given the very great diversity of the product-market chains in the world of fruit and vegetables.

Finally, the RVI is a first approach to the defining of sectoral and regional policies within the framework of the European Union with the prospect of the liberalisation of the Euro-Mediterranean agricultural trade.

In the preceding work in WP2, we calculated the RVI for fresh fruits (23 European regions in the 5 Mediterranean countries of the EU⁶), fresh vegetables (24 regions), fresh fruit and vegetables (34 regions) and processed fruit and vegetables (63 regions). The regions chosen for the calculation of the RVI are those with the largest sales at the beginning of the 2000s.

⁵ SWOT: strengths, weaknesses, opportunities and threats

⁶ Spain, France, Greece, Italy and Portugal

Wee have drawn up a synthetic sector index for the requirements of the present report, assembling indicators concerning fresh and processed fruit and vegetable production enterprises, marketing enterprises, signs of quality and the regional economic environment.

Table 12: Composition of the synthetic RVI (SRVI)

Strategic determinants	Indicators
Structure and performances of fruit and vegetable producers (FVP)	<ul style="list-style-type: none"> - Total F & V production, production increase, average production per farm, investment rate, subsidy rate, margin, labour productivity, production costs of the 'fruit' (FADN-F) and 'vegetables' (FADN-V) sectors - The share of fruit and vegetables in regional agricultural production - Number of PDOs and PGIs
Structure and performance of the fruit and vegetable food industry (FIP)	<ul style="list-style-type: none"> - Size, concentration, increase of turnover, financial autonomy, return on assets, net margin, labour productivity, cost structures and levels: raw materials, interest rates, taxation - Density of F & V industries; proportion of regional manufacturing industry
Density and quality of wholesale marketing operators (WO)	<ul style="list-style-type: none"> - Number, total turnover, variation in total turnover, average turnover, gross margin, net margin, salary productivity of fresh F & V wholesalers - Number, total turnover, average turnover, personnel, assets, gross margin, productivity, profitability, financial autonomy of food wholesalers
Conditions of the regional economic and institutional environment (RWI)	<ul style="list-style-type: none"> - Population density, population growth - Growth of GDP, purchasing power, - Expenditure on R&D/GDP

The regional vulnerability index is inversely proportional to the sum of the scores of the four components. It is calculated using the following equation:

$$RVI = 1/[(FVP) \times \alpha + (FIP) \times \beta + (WO) \times \lambda + (RWI) \times \theta]$$

FVP, fruit & vegetable production; FIP, food industry performance; WO, wholesale operators; RWI, regional wealth index

α , β , λ and θ are weighting coefficients set by simulation and expertise.

Parameterizing the score function will then make it possible to develop scenarios of regional vulnerability according to the weight awarded to each of the coefficients.

2.1 – The 30 regions identified for estimation of the vulnerability index

Regions were chosen for calculation of the synthetic RVI so that all the information required for describing the entire F & V sector was available: the existence of fresh fruit and/or vegetable production, of a processing industry and, possibly, wholesale businesses handling fresh produce (specialising in F & V) or foodstuffs (general traders). A total of 30 regions in the five EU Mediterranean countries are presented in the table below.

Table 13: Regions selected for calculation of the Synthetic Regional Vulnerability Index

Country	EU NUTS 2 Region Number	Population (million)	GDP (€ billion)	GDP change	R&D/GDP	F&V Production (*) Mean 96-00 (€ m)	F&V Prod. / Agri Prod.	F&V AV / GDP
Year		2002		99-02	Mean 00-02	Mean 96-00		Mean 00-02
Italy	11	40,1	837	3,2%	1,0%	9 313	43%	1,2%
Spain	6	22,0	354	5,6%	0,7%	8 605	68%	2,8%
France	6	21,7	494	3,5%	1,9%	4 378	31%	1,0%
Greece	4	4,0	50	3,8%	0,4%	1 846	34%	4,2%
Portugal	3	7,2	74	4,9%	0,9%	735	20%	0,7%
Total 30 regions	30	94,9	1 808	4,0%	1,2%	24 876	43%	1,5%
Total 80 regions	80	178,8	3 756	3,6%	1,5%	34 784	23%	0,7%
30 regions/80	38%	53%	48%			72%		

(*) Fruit, horticultural products, potatoes

Source : Eurostat, 2006, Cronos/Regio : Sun, 19 Feb 06 07:19:08

It is seen that the 30 regions selected for calculation of the SRVI represent nearly three-quarters of the F & V production of the five EU Mediterranean countries and nearly half of their population and GDP. These regions displayed slightly greater economic growth than the national averages during the period 1999-2002 but invested less in R&D (1.2% against 1.5%). The 30 regions are strongly specialised in fruit and vegetable production (from 20 to 68% of final agricultural production). In contrast, the weight of F & V production in the regional economies is small, ranging from 3 to 8% with allowance of the added value (AV) of the processing industry; the latter doubles the agricultural AV.

In the early 2000s, the 30 regions of our sample generated turnover of slightly more than EUR20bn in fruit and vegetable processing and the figures for fresh and industrial produce were much the same. The production apparatus consisted of 316,000 farms and 720 industrial enterprises employing 600,000 and 38,000 persons respectively. Seven regions recorded sales of more than EUR1bn: Andalucia, Bretagne⁷, Murcia, Emilia-Romagna, Campania, Valencia and Provence-Alpes-Côte d'Azur. The difference in size is considerable in comparison with the small regions whose turnovers are less than <http://aggiehorticulture.tamu.edu/citrus/grapefruit.htm> EUR200,000,000: Toscana, Calabria, Castilla-la-Mancha, Alentejo e Algarve and Norte do Portugal.

⁷ Two non-Mediterranean French regions were chosen for the study because of their importance in the sector: Bretagne, the leading vegetable production region and Pays de la Loire.

Table 14: F&V Sector Characteristics of the Selected Region – Mean 1999-2004

	NUTS 2 Region	Country	Sector	Fresh & processed F&V	
				Turnover (€ 1000)	Employees
1	Andalucia	E	F&V	2 669 388	102 009
2	Bretagne	F	V	1 844 969	4 410
3	Murcia	E	F&V	1 756 886	39 415
4	Emilia-Romagna	I	F&V	1 601 341	20 901
5	Campania	I	F&V	1 442 909	30 893
6	Valencia	E	F&V	1 354 527	109 886
7	Provence-Alpes-Côte d'Azur	F	F&V	1 295 138	14 323
8	Sicilia	I	F&V	799 725	50 328
9	Veneto	I	F&V	754 471	12 055
10	Rhône-Alpes	F	F&V	750 781	5 382
11	Languedoc-Roussillon	F	F&V	617 505	5 913
12	Ipiros-Peloponissos-Nissi Ioniou	G	F&V	588 463	25 400
13	Cataluña	E	F	442 644	9 900
14	Stereia Ellas-Nissi Egaeou-Kriti	G	V	390 953	17 207
15	Pays de la Loire	F	V	350 930	3 428
16	Lazio	I	V	327 365	8 128
17	Anatoliki Makedonia, Thraki	G	F	302 681	22 349
18	Liguria	I	V	293 928	18 478
19	Piemonte	I	F	288 674	7 244
20	Trento	I	F	287 465	7 547
21	Aragón	E	F	254 137	10 141
22	Centro-Ribatejo e Oeste	P	F&V	252 895	19 337
23	Midi-Pyrénées	F	F	252 257	1 497
24	Thessalia	G	F	244 697	8 597
25	Puglia	I	V	232 007	4 582
26	Toscana	I	V	183 233	5 020
27	Calabria	I	F	166 718	11 337
28	Castilla-la Mancha	E	V	134 112	4 516
29	Alentejo e Algarve	P	F&V	115 468	12 127
30	Norte	P	F&V	75 313	10 454
30	Total			20 071 579	602 803

The 30 regions classified for both their significant fruit and vegetable production and their specialisation in these crops also allow the calculation of scores in both fresh and processed products. The four types of calculated scores are now analysed:

- Fresh fruit and vegetables (FF&V)
- Processed fruit and vegetables (PF&V)
- Marketing enterprises (ME)
- Regional wealth (RW)

It is important to stress that the sectoral data used to calculate RVI scores are taken from enterprise databases (FADN for agriculture and AMADEUS for the agrifood industry and trade). These databases are not exhaustive and are subject to the uncertainties of accountancy procedures that vary considerably from one country to another and from one business to another. The advantage of these databases is that they first make up for the

deficiencies in sectoral statistics and secondly reflect microeconomic reality. The regional wealth (RW) score and regional specialisation indices are drawn from Eurostat statistics (Regions Database).

It is reminded that each of these scores is a linear function of several performance indicators shown in Table 12. Each basic indicator is a ratio of a regional value to an interregional mean so that the regions can be benchmarked.

2.2 – Score functions

2.2.1 – Fresh fruit and vegetable sector

This relates economic indicators of sector dynamism, the performance of fruit and vegetable oriented farms, the existence of labels of geographic origin and finally the specialisation of regional agriculture.

The fresh F& V score reveals marked disparities between regions⁸, both at the European level and within each country (a difference of 1 to 30 between the first and the last).

⁸ It is noted that the list of 30 regions chosen for calculation of the SRVI does not include the two comparatively large regions Central Macedonia and Aquitaine. Indeed, it was not possible to observe wholesale trade in these regions and so the chains were incomplete. Our selection criteria for regions included the presence of a complete production-processing-distribution chain.

Table 15: Ranking of the Fresh F&V Score

	Regions	Country	Sector	Turnover (€ M.)	Number of Specialized Farms (000)	SCORE FF&V
1	Ipiros-Peloponissos-Nissi Ioniou	G	F&V	222	13,5	15,9
2	Languedoc Roussillon	F	F&V	359	2,5	15,6
3	Emilia Romagna	I	F&V	544	11,6	13,1
4	Valenciana	E	F&V	1 259	75,9	12,5
5	Andalucia	E	F&V	2 261	38,3	11,5
6	Campania	I	F&V	489	16,1	11,4
7	Sicilia	I	F&V	688	29,2	10,9
8	Murcia	E	F&V	765	19,4	10,4
9	Provence Alpes Côte d'Azur	F	F&V	819	5,0	10,2
10	Centro-Ribatejo e Oeste, Lisboa	P	F&V	165	8,9	9,6
11	Trentino	I	F	194	5,3	9,0
12	Rhône-Alpes	F	F&V	497	2,6	8,5
13	Stereia Ellas-Nissi Egaeou-Kriti	G	L	193	4,7	8,2
14	Veneto	I	F&V	273	5,2	8,2
15	Liguria	I	L	262	5,9	7,4
16	Bretagne	F	L	243	0,7	7,2
17	Puglia	I	L	156	1,4	7,1
18	Midi-Pyrénées	F	F	155	0,9	6,9
19	Pays de la Loire	F	L	304	1,0	6,2
20	Castilla-La Mancha	E	L	42	1,3	6,1
21	Calabria	I	F	126	8,3	5,8
22	Alentejo e Algarve	P	F&V	80	7,7	4,8
23	Aragón	E	F	172	7,1	4,3
24	Piemonte	I	F	126	5,0	4,2
25	Cataluña	E	F	275	6,8	3,9
26	Anatoliki Makedonia, Thraki	G	F	234	16,5	2,5
27	Thessalia	I	F	79	5,2	2,1
28	Lazio	I	L	249	2,5	2,1
29	Toscana	I	L	121	1,6	1,6
30	Norte	P	F&V	69	5,7	0,6
30	Total			11 422	316,0	9,6

Greek regions are thus in the lead (Ipiros-Peloponissos) or towards the bottom (Anatoliki, Thessalia) of the ranking. The major regions in Spain (Andalucia, Valencia, Murcia) and Italy (Emilia-Romagna, Campania) perform well. Farm size is an asset. With the exception of Ipiros-Peloponissos, the Huerta de Valencia, and Centro-Ribatejo, average fruit and vegetable turnover is high (more than €100,000). Languedoc-Roussillon's good position (No. 2) can thus be explained by farm restructuring and the economies of scale achieved. Finally, the regions that are most strongly specialised in F & L seem to benefit as the proportion of F & V in total farm production is over 30% in the regions that top the ranking.

2.2.2 – Processed fruit and vegetables

This score incorporates:

- indicators of economic dimension (turnover, capital assets, labour) and business growth (turnover from 2000 to 2004), referred to as 'dynamism',
- performance ratios (profitability: income/turnover, gross margin: EBITDA/turnover, financial autonomy; capital/liabilities, profitability: income per worker, productivity: turnover per worker),
- and costs (total production cost/turnover, financial expenses/turnover, taxes/turnover, purchase of raw materials/turnover, depreciation/turnover, and; for certain countries, labour costs/turnover).

These different ratios are related in a linear manner to give a regional score for the fruit and vegetable processing industry⁹.

Table 16 shows the classification of the 30 regions chosen according to the overall processed F & V industry scores. This puts four French regions at the top of the list¹⁰: Bretagne, a powerful agrifood region with 21 enterprises with total turnover of €1.6bn and the much more modestly sized Rhône-Alpes, Pays de la Loire and Languedoc-Roussillon. The large Spanish (Murcia and Andalucia) and Greek (Ipiros-Peloponissos and Sterea Ellias) regions are also well placed. The regions at the bottom of the list have small turnovers (Norte, Alentejo-Algarve, Aragon, Anatoliki Makedonia and Calabria) except for Emilia-Romagna. The scores are explained mainly by differences in growth (with the scale ranging from 1 to 11) and above all in performance (from -2 to 13). Three of the four last regions in the classification suffered losses. The specialisation indicator from 1 to 5 is less determinant than for fresh F & V, as is the cost indicator which varies by a factor of only 2.5 (from 3 to 7).

⁹ Calculation of the processed F & V score was performed on a slightly different basis to that used in the preceding report on processed fruit and vegetables after the 'cleaning' of the database to remove certain enterprises outside the scope of the subject or whose accounts were clearly erroneous. The scores obtained are not very different to those given in the document mentioned. In addition, national results are different because of the selection of regions (30 instead of the initial 63).

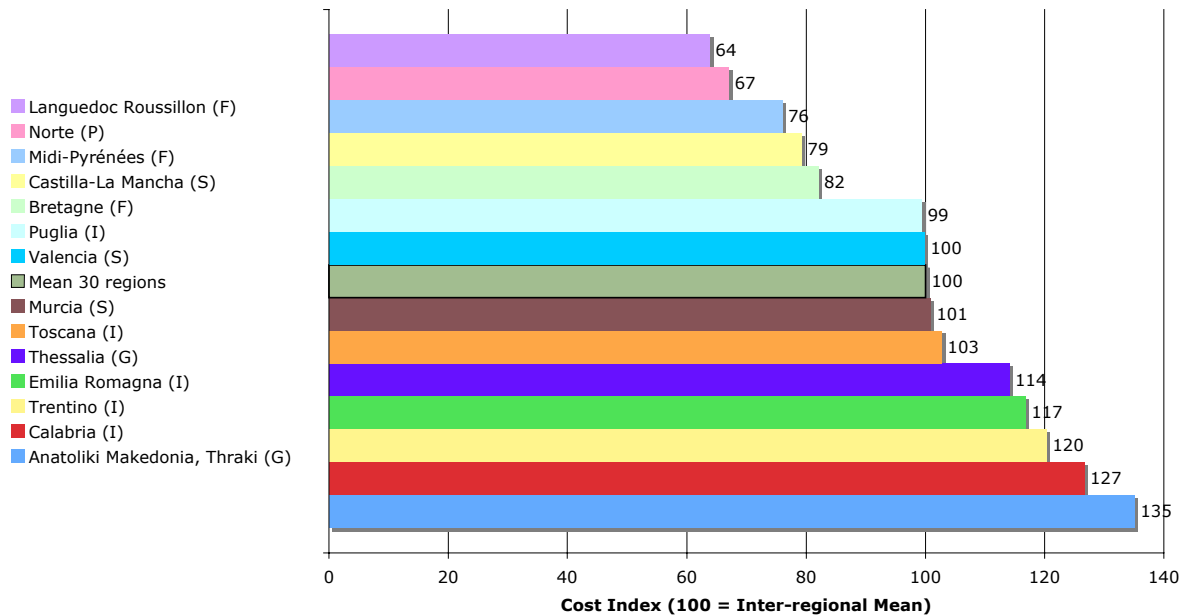
¹⁰ In addition to the major industrial regions in northern and eastern France and Aquitaine, our list does not include central Macedonia or Navarra for the reasons given in the preceding note.

Table 16: Ranking of F&V Processing Industry Scores

	Regions	Country	Turnover (€m)	Number of Enterprises	SCORE IF<
1	Bretagne	F	1 602	21	21.17
2	Rhône-Alpes	F	253	13	12.74
3	Pays de la Loire	F	47	3	11.56
4	Murcia	E	992	76	10.35
5	Languedoc Roussillon	F	259	10	10.31
6	Ipiros-Peloponissos-Nissi Ioniou	G	367	67	8.30
7	Andalucia	E	408	53	7.60
8	Stereia Ellas-Nissi Egeou-Kriti	G	198	41	6.34
9	Toscana	I	62	8	5.96
10	Ribatejo e Oeste	P	88	7	5.80
11	Cataluña	E	167	12	5.10
12	Provence Alpes Côte d'Azur	F	476	30	4.91
13	Piemonte	I	162	20	4.39
14	Puglia	I	76	23	3.95
15	Midi-Pyrénées	F	97	9	3.80
16	Trentino	I	93	5	3.55
17	Campania	I	954	93	3.37
18	Veneto	I	481	29	3.31
19	Castilla-La Mancha	E	93	15	3.05
20	Valenciana	E	96	13	3.01
21	Sicilia	I	111	18	2.61
22	Lazio	I	79	12	2.46
23	Liguria	I	32	5	2.43
24	Thessalia	G	166	28	2.39
25	Emilia Romagna	I	1 057	45	0.74
26	Norte	P	7	3	0.37
27	Alentejo e Algarve	P	35	15	0.14
28	Aragón	E	82	14	-1.19
29	Anatoliki Makedonia, Thraki	G	68	22	-1.62
30	Calabria	I	41	10	-2.03
	Total regions		8 649	720	5.08

The convergence of industrial costs is a remarkable phenomenon in the five countries studied as macroeconomic conditions are substantially different.

**F&V Manufacturing Industry Cost Variability
in Some EU Mediterranean Countries Regions, 2000-2004**



The cost index is indeed affected by the use of the accounts of individual businesses. However, the cost structure explains the counter-intuitive results of the preceding graph (50% positive cost gap between a Greek region and a French region¹¹).

The cost index is calculated by using 5 components in a linear equation: total cost (turnover-net income), financial expenses (interest/turnover), taxes (taxes/turnover), agricultural raw materials (raw materials/turnover), investment (depreciation/turnover). The weight of financial expenses and taxes accounts for the poor performance of certain countries (Spain and Italy). Labour costs are not measurable for Greek enterprises and are not taken into account in the calculation of the processed F&V score. The analysis is illustrated in the table below that contains the cost structures in the five Mediterranean EU countries (national averages calculated from a sample of 63 European regions) with incorporation of wages for four of the five countries studied.

Table 17. Cost Structure in the F&V Processing Industry, 5 countries, 2000-2004

Country (63 Regions)	Number of enterprises	Raw Materials	Wages & Salaries	Depreciation	Financial expenses	Taxes	Sub-Total
		(in % of Total Cost)					
France	165	45.6%	11.8%	3.2%	1.2%	1.0%	62.7%
Greece	286	55.6%	NA	4.3%	2.4%	0.7%	NA
Italy	299	65.8%	10.9%	3.9%	2.2%	1.1%	84.0%
Portugal	25	48.1%	10.5%	5.2%	1.4%	1.1%	66.2%
Spain	271	61.7%	11.6%	3.7%	2.0%	0.9%	79.8%
5 countries, mean	1 046	55.4%	11.2%	4.1%	1.8%	1.0%	73.4%
Gap between extreme values		44%	12%	62%	103%	62%	34%

Source: computed from Amadeus Database

¹¹ Cost gaps are strongly amplified by the method chosen (total cost not used but rather a partial cost that does not include labour costs).

It can be seen first of all that the net margin is very small in this industry (3 to 4%) and that there are no great differences between countries on the basis of this criterion. However, a cost breakdown to give an overall index of the partial cost (subtotal in the table above) reveals fairly substantial differences between countries and these explain the gap observed in the cost index in the graph above.

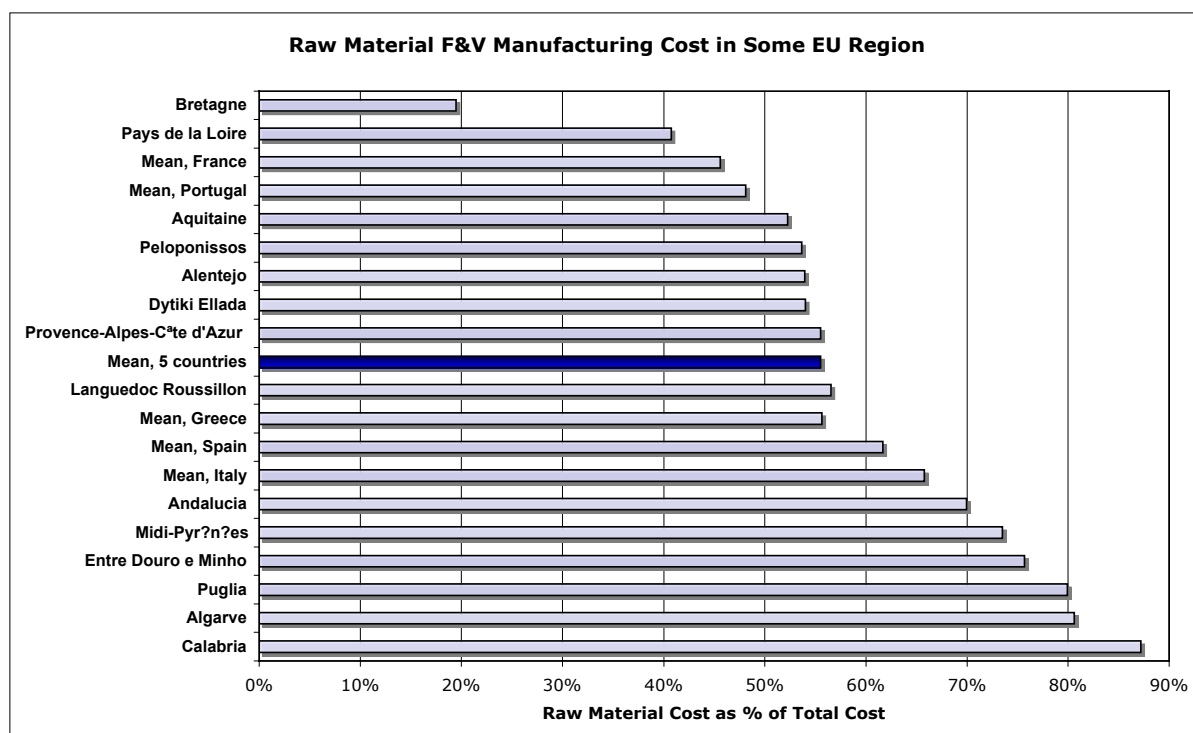
On the much-discussed subject of the differences in pay between countries, a 79% gap between France and the Iberian peninsula can be seen in Table 18. However, the proportion of the total wage and salary bill in the total cost remains very close at some 10 to 12%. There does not therefore seem to be any visible penalisation of cost competitiveness by the labour factor.

Table 18: Labour Cost in F&V Processing Industries, 2000-2004

Country	Number of enterprises	Per capita Wages & Salaries (€)
France	165	34 495
Greece	286	NA
Italy	299	28 100
Portugal	25	19 389
Spain	271	19 284
Mean, 5 countries	1 046	20 004
Gap between extreme values		79%

Source: computed from Amadeus Database

Raw materials (fruit and vegetables) costs are high at an average of 55% in the 5 countries considered and this reveals good agriculture/industry integration. However, it is not possible to identify the origin of the produce purchased by industry and hence pinpoint possible upstream or downstream driving effects in the territory in which the factories are located. Agricultural purchases are very large in certain regions with, as a corollary, low sophistication of the products manufactured. The hypothesis can be put forward that a high purchase ratio of raw materials corresponds to primary processing industries producing little differentiated or marketed intermediate products.



Depreciation is small in operating accounts (some 4 to 5%), showing that the industry is not capital-intensive and that material investments are probably inadequate in a competitive international context.

The remaining costs concern intermediate consumption of goods and services (especially packaging, logistics and marketing). These costs are high and of the order of 25 to 35% of total production costs.

2.2.3 – Marketing enterprises

Many distribution channels are found in the downstream part of the fresh and processed fruit and vegetables chain: the wholesale trade, general and specialised food retailers, the catering industry, street markets and direct sales. The statistics available are inadequate for the study of all these channels. We address only buyers in contact with farmers or industries, that is to say the wholesale trade specialised in fresh fruit and vegetables and food purchasing centres.

Table 19: Fresh F&V and Food Wholesalers, 5 EU Countries, 1999-2004

Country	Fresh F&V Wholesalers			Processed Food Wholesalers		
	Number of Enterprises	Turnover (€m)	Employees	Number of Enterprises	Turnover (€m)	Employees
France	207	6 674	2 990	89	26 164	13 364
Greece	7	89	66	6	23	67
Italy	137	12 854	3 553	98	1 224	1 469
Portugal	12	236	NA	48	208	393
Spain	301	6 789	1 505	198	1 428	5 607
Total 5 countries	664	26 642	8 114	439	29 046	20 900

Source: computed from Amadeus Database

The figures above should be considered with caution because of the uncertain nature of the accounts of trading companies. In comparison with the turnovers estimated above for the production of fresh fruit and vegetables (€35bn) and processed products (€22bn), they seem underestimated, especially as the general food trade handles many different products. Nevertheless, they give a scale that gives an idea of the concentration of the food wholesaling business following the growth of supermarket chains and the appearance of very large integrated groups.

The aim here is not to provide absolute sizing of this trade sector but to appraise its density and performances within the regional framework. We put forward the hypothesis that the presence of a structured downstream end of the chain is a factor in the modernisation and dynamism for producers, but without underestimating the sometimes perverse effects of this type of chain on nearby production zones when these are small and unsuited to the requirements of the large distribution chains.

Table 20: Ranking of Fresh F&V and Food Wholesalers, 27 EU Regions, 1999-2004

	Regions	F&V Wholesalers			Food Wholesalers			
		Number of entr.	Turnover (ó M.)	SEA Score	Number of entr.	Turnover (ó M.)	Score SCA	SCA Score
1	Trentino	11	2 315	9,16	3	5	29,27	19,21
2	Puglia	2	1 759	26,70	2	7	5,67	16,18
3	Piemonte	7	218	3,76	5	21	18,03	10,89
4	Rh ^a ne-Alpes	12	338	3,30	3	2 266	11,80	7,55
5	Valencia	54	993	5,67	14	143	8,99	7,33
6	Cataluna	32	608	2,71	49	684	10,05	6,38
7	Languedoc-Roussillon	27	669	1,23	2	1 535	11,27	6,25
8	Murcia	78	1 803	2,15	6	21	9,72	5,93
9	Pays-De-La-Loire	13	350	0,80	7	4 836	11,06	5,93
10	Toscana	8	222	1,72	5	14	9,61	5,66
11	Midi-Pyr ⁿ es	10	362	2,34	6	2 482	8,17	5,26
12	Arag ⁿ	4	89	1,28	8	64	8,92	5,10
13	Liguria	3	95	2,20	2	290	7,97	5,09
14	Alentejo e Algarve	2	26	0,85	12	84	9,08	4,97
15	Lazio	9	457	2,81	1	22	6,79	4,80
16	Emilia Romagna	33	779	0,30	16	259	8,14	4,22
17	Norte - Entre Douro - Tras os montes	2	26	0,85	16	74	7,09	3,97
18	Bretagne	10	585	4,19	6	1 000	3,58	3,89
19	Veneto	19	596	2,81	16	116	4,31	3,56
20	Provence-Alpes-C ^a te d'Azur	26	1 067	1,77	4	814	4,93	3,35
21	Sicilia	5	117	0,01	18	57	5,66	2,84
22	Campania	6	171	0,90	7	76	4,35	2,63
23	Centro - Beira	8	182	0,02	6	24	3,61	1,81
24	Andalucia	102	2 446	1,47	27	80	0,44	0,95
25	Castilla-La Mancha	1	9	-0,36	2	8	-4,03	-2,20
26	Calabria	2	75	4,12				
	Total and mean	486	16 360	3,18	243	14 981	8,18	5,68

Source : computed from Amadeus Database, october 2005

Trade enterprise scores are very contrasted as a result of the great variety of size and performance among the operators observed. The score should be considered with caution in the case of a small number of small enterprises (food buying enterprises in the Trentino and Puglia regions). However, the presence of very large fresh fruit and vegetable wholesalers is observed in these regions and this justifies their classification. Italy and Spain possess strong structures in the fresh produce business in regions with large production zones (Trentino, Puglia, Piemonte, Valencia, Cataluña and Murcia), showing the organisation capacity of the downstream end of these chains. France has an advantage in the polyvalent food purchase centre sector (Rhône-Alpes and Languedoc-Roussillon) but the proportion of fresh and

processed fruit and vegetables is a small part of the turnover of these firms. Finally, Portugal and certain Italian regions (Sicilia and Calabria) display a weakness with regard to this criterion. It should be noted that Andalucia, a large producer, is penalised by the poor economic performance of its numerous fresh F & V wholesalers.

2.2.4 – Regional wealth

This score (RW index) measures the size and dynamism of the potential regional market through population, population growth, per capita income and economic growth together with the effort made in innovation through expenditure on R&D.

Table 21: Ranking of Population and Wealth, 30 EU Regions, 1999-2004

	NUTS 2 region		F&V/GDP	Population 2002 (million)	GDP/capita 2002 (€000)	GDP Change 99-02	R&D/GDP	IRR Score
1	Rhône-Alpes	F	0,3%	5,8	25,217	2,9%	2,3%	17,76
2	Cataluña	E	0,3%	6,3	20,190	4,9%	1,1%	16,03
3	Lazio	I	0,5%	5,1	25,374	3,5%	1,8%	15,67
4	Provence-Alpes-Côte d'Azur	F	1,3%	4,6	22,954	3,9%	1,7%	13,63
5	Andalucia	E	3,8%	7,4	12,915	6,0%	0,6%	13,52
6	Campania	I	1,6%	5,7	14,578	3,8%	1,0%	13,29
7	Veneto	I	0,5%	4,5	25,077	3,0%	0,6%	12,78
8	Emilia-Romagna	I	0,8%	4,0	27,742	3,4%	1,0%	12,31
9	Valenciana	E	1,8%	4,2	16,421	5,8%	0,7%	11,97
10	Piemonte	I	0,2%	4,2	25,348	2,6%	1,6%	11,29
11	Stereia Ellas-Nissi Egaeou-Kri	G	3,5%	1,5	15,209	4,5%	0,4%	10,97
12	Midi-Pyrénées	F	0,4%	2,6	21,903	3,5%	3,1%	10,37
13	Sicilia	I	2,2%	5,0	14,433	3,4%	0,7%	9,80
14	Centro (PT)	P	0,3%	2,3	10,207	4,7%	1,2%	9,63
15	Ipiros-Peloponissos-Nissi Ion	G	4,8%	1,1	11,829	4,7%	0,4%	9,63
16	Pays de la Loire	F	0,4%	3,3	22,373	3,7%	1,0%	9,60
17	Toscana	I	0,3%	3,5	24,273	3,1%	1,0%	9,31
18	Bretagne	F	0,5%	3,0	21,452	3,4%	1,5%	9,27
19	Languedoc-Roussillon	F	1,4%	2,4	19,305	3,6%	2,0%	8,91
20	Puglia	I	2,3%	4,0	14,666	3,4%	0,5%	8,49
21	Norte	P	1,3%	3,7	9,959	3,8%	0,6%	7,76
22	Murcia	E	4,6%	1,2	14,220	6,4%	0,6%	7,32
23	Trento	I	1,7%	0,5	26,249	2,7%	1,2%	6,00
24	Castilla-la Mancha	E	1,6%	1,8	13,610	5,0%	0,4%	5,63
25	Anatoliki Makedonia, Thraki	G	3,7%	0,6	9,827	3,6%	0,5%	5,05
26	Aragón	E	0,7%	1,2	17,957	5,2%	0,7%	4,73
27	Liguria	I	1,6%	1,6	23,941	3,2%	1,1%	4,71
28	Alentejo e Algarve	P	1,5%	1,2	11,583	6,2%	0,4%	4,46
29	Calabria	I	2,0%	2,0	13,690	3,3%	0,3%	3,91
30	Thessalia	G	4,0%	0,7	10,756	2,3%	0,3%	2,76
30	Total		0,8%	94,9	19,045	4,0%	1,2%	8,00
	Max		4,8%	7,4	27,742	6,4%	3,1%	17,76
	Min		0,2%	0,5	9,827	2,3%	0,3%	2,76

This is a strongly discriminating score as it ranges from 3 to 18, that is to say a spread factor of 6. The leading regions are in France (Rhône-Alpes and PACA), Spain (Cataluña and Andalucia) and Italy (Latium). Their common feature is that they have large populations

(more than 4 million persons), high incomes (over €20K per capita) and comparatively sustained technological intensity (R&D/GDP ratio greater than 1). In contrast, the regions with a low regional wealth index are sparsely populated, display less than the average per capita GDP (€19k) and mediocre investment in innovation (less than 1%). However, economic growth (variation in GDP between 1999 and 2002) is brisker than in the rich regions. These regions are in Greece (Thessalia, Makedonia), Portugal (Alentejo, Algarve), Spain (Aragon) and Italy (Calabria).

2.3 – Calculation of the SRVI in four scenarios

The large number of indicators taken into account for the estimation of the competitiveness (or its opposite, vulnerability) of the Euro-Mediterranean regions encourages the development of an aggregate, the SRVI (Synthetic Regional Vulnerability Index). This combines the four score functions analysed above (fresh F & V, processed F & V, EC and ME) using parameters:

$$SRVI = 1/[(FVP) \times \alpha + (FIP) \times \beta + (WO) \times \lambda + (RWI) \times \theta]$$

α , β , λ and θ are weighting coefficients established by simulation and expertise.

Vulnerability can be interpreted as the inverse of competitiveness as the score functions are estimators of regional sectoral and overall economic performance. It is reminded that the SRVI is a relative rather than an absolute yardstick of competitiveness/vulnerability. Indeed, the values of each score function making up the SRVI are calculated in relation to the average of the regions in question.

As the four functions cover varied sectors and fields, we have performed simulations by changing the values of the parameters in such a way as to construct four scenarios¹² that are characteristic of the F & V chains:

- Scenario 1: strength of agricultural production (the weighting coefficient for the fresh fruit and vegetables (FF&V) sector is high)
- Scenario 2: strength downstream (the coefficients concerning F&V processing industries (PF&V) and marketing enterprises¹³ (ME) are substantial)
- Scenario 3: the strength of the economic environment (high parameter for IRR)
- Scenario 4: balance between the four components of the SRVI

Table 22: Parameters of the Score Function Simulations

Scenario Parameters		alpha (FF&V)	beta (PF&V)	gamma (EC)	delta (IRR)
S1	Scenario 1: Strength of Fruit and Vegetable production	0.60	0.20	0.10	0.10
S2	Scenario 2: Strength of Marketing Channels	0.20	0.30	0.40	0.10
S3	Scenario 3: Strength of Economic Environment	0.25	0.25	0.20	0.30
S4	Scenario 4: Strength Equilibrium	0.25	0.25	0.25	0.25

The scores were out of 20 and the SRVI out of 10 to facilitate interpretation of the results of the calculations. The SVRI can thus be between 0 and 10.

¹² See Godet (2001) on the subject of the scenario method much used in forecasting.

¹³ It is noted that the 14 Greek regions are not documented with regard to marketing enterprises.

2.3.1 – Scenario 1: Strength of F & V production

In this scenario, the performances of the agricultural sector (farms specialising in fruit and vegetable production) determine regional competitiveness. Vulnerability is therefore an index of weak interregional competitiveness. The classification drawn up from the SVRI for each region is not identical to that of the 'fresh F & V' score because the index integrates variables other than those of the agricultural production sector alone (industry, trade and the regional economy). The scores given by this first simulation range from 1.16 to 10 with an average of 2.16: the vulnerability of more than 80% of the regions is less than 5/10.

The most vulnerable regions (Norte-Entre Douro, Thessalia, Makedonia, Toscana and Lazio) are comparatively poor and/or have a small fruit and vegetables sector, tending to specialise in either fruit or vegetable production. In contrast, the competitive regions produce both fruit and vegetables in large quantities in regions that tend to be rich and populated.

Table 23: Synthetic Regional Vulnerability Index (SRVI) Ranking in Scenario No. 1

	Regions	Country	Prod.	SCOR E F&LF	SCOR E IF<	SCOR E EC	SCOR E IRR	SRVI S1 agri
1	Norte-Entre Douro	P	f&l	0,72	0,35	4,13	8,74	10,00
2	Thessalia	G	fru	2,70	2,26		3,11	7,52
3	Anatoliki Makedonia, Thraki	G	fru	3,10	0,00		5,69	7,36
4	Toscana	I	lég	1,97	5,63	5,90	10,48	4,54
5	Lazio	I	lég	2,65	2,32	5,00	17,64	4,14
6	Aragón	E	fru	5,45	0,00	5,31	5,33	4,13
7	Alentejo e Algarve	P	f&l	6,02	0,13	5,17	5,02	3,84
8	Calabria	I	fru	7,33	0,00	2,14	4,40	3,54
9	Castilla-La Mancha	E	lég	7,65	2,88	-2,28	6,34	3,21
10	Cataluna	E	fru	4,88	4,82	6,64	18,06	2,81
11	Piemonte	I	fru	5,30	4,15	11,34	12,71	2,79
12	Liguria	I	lég	9,33	2,30	5,29	5,31	2,51
13	Midi-Pyrénées	F	fru	8,69	3,59	5,47	11,68	2,34
14	Pays de la Loire	F	lég	7,86	10,92	6,17	10,81	2,08
15	Veneto	I	f&l	10,32	3,13	3,70	14,40	2,07
16	Sterea Ellas-Nissi Egaeou-Kriti	G	lég	10,35	5,99		12,36	2,07
17	Puglia	I	lég	8,94	3,73	16,84	9,56	2,04
18	Centro-Ribatejo e Oeste	P	f&l	12,11	5,47	1,88	10,84	1,86
19	Sicilia	I	f&l	13,71	2,47	2,95	11,04	1,77
20	Trentino	I	fru	11,40	3,35	20,00	6,75	1,76
21	Provence Alpes Côte d'Azur	F	f&l	12,85	4,64	3,49	15,36	1,70
22	Bretagne	F	lég	9,04	20,00	4,05	10,45	1,65
23	Campania	I	f&l	14,41	3,18	2,74	14,97	1,62
24	Murcia	E	f&l	13,08	9,77	6,18	8,25	1,59
25	Rhône-Alpes	F	f&l	10,69	12,04	7,86	20,00	1,54
26	Andalucia	E	f&l	14,50	7,18	0,99	15,23	1,52
27	Emilia Romagna	I	f&l	16,51	0,70	4,40	13,86	1,51
28	Valencia	E	f&l	15,76	2,84	7,63	13,48	1,47
29	Ipiros-Peloponissos-Nissi Ioniou	G	f&l	20,00	7,84		10,84	1,22
30	Languedoc Roussillon	F	f&l	19,70	9,74	6,50	10,03	1,16
30	All 30 regions			9,57	4,56	5,68	10,76	2,16

2.3.2 – Scenario 2: Strength of the downstream end of F & V chains

Scenario 2 gives substantial weight to the downstream part of the chains (20% of the index for industrial fruit and vegetable processing enterprises and 40% for wholesale traders in fruit and vegetables and food purchasing centres).

The average vulnerability of the 30 regions is lower in this scenario, with the average being from 2.2 to 1.8 (on a scale of 1 to 10). This tends to indicate a strengthening of the competitiveness of the regions from downstream.

There is little difference with the results of the preceding classification: the same regions appear at the top and bottom of the list in a slightly different order. Thus, only Calabria (from position 8 to 4), Castilla (9 to 3) and Toscana (from 12 to 10) seem to be made more fragile by the weakness of the downstream end of the chain in the 10 most vulnerable regions in scenario S2. Conversely, 2 little vulnerable regions (among the last 10 positions) benefit from a solid downstream set-up and improve their classification: Pays de la Loire (moving from position 14 in S1 to 23 in S2) and Puglia (from 17 to 28).

Table 24: Synthetic Regional Vulnerability Index (SRVI) Ranking in Scenario No. 2

	Regions	Country	Prod.	SCOR E F&LF	SCOR E IF<	SCOR E EC	SCOR E IRR	SRVI S2 aval
1	Anatoliki Makedonia, Thraki	G	fru	3,10	0,00		5,69	10,00
2	Thessalia	G	fru	2,70	2,26		3,11	7,79
3	Castilla-La Mancha	E	lég	7,65	2,88	-2,28	6,34	5,62
4	Calabria	I	fru	7,33	0,00	2,14	4,40	4,30
5	Norte-Entre Douro	P	f&l	0,72	0,35	4,13	8,74	4,29
6	Aragón	E	fru	5,45	0,00	5,31	5,33	3,17
7	Alentejo e Algarve	P	f&l	6,02	0,13	5,17	5,02	3,12
8	Lazio	I	lég	2,65	2,32	5,00	17,64	2,38
9	Stereia Ellas-Nissi Egeaeou-Kriti	G	lég	10,35	5,99		12,36	2,33
10	Liguria	I	lég	9,33	2,30	5,29	5,31	2,29
11	Toscana	I	lég	1,97	5,63	5,90	10,48	2,17
12	Sicilia	I	f&l	13,71	2,47	2,95	11,04	2,06
13	Centro-Ribatejo e Oeste	P	f&l	12,11	5,47	1,88	10,84	2,02
14	Veneto	I	f&l	10,32	3,13	3,70	14,40	2,01
15	Midi-Pyrénées	F	fru	8,69	3,59	5,47	11,68	1,93
16	Campania	I	f&l	14,41	3,18	2,74	14,97	1,85
17	Emilia Romagna	I	f&l	16,51	0,70	4,40	13,86	1,79
18	Cataluna	E	fru	4,88	4,82	6,64	18,06	1,73
19	Provence Alpes Côte d'Azur	F	f&l	12,85	4,64	3,49	15,36	1,73
20	Andalucia	E	f&l	14,50	7,18	0,99	15,23	1,71
21	Ipiros-Peloponissos-Nissi Ioniou	G	f&l	20,00	7,84		10,84	1,60
22	Piemonte	I	fru	5,30	4,15	11,34	12,71	1,47
23	Pays de la Loire	F	lég	7,86	10,92	6,17	10,81	1,42
24	Valencia	E	f&l	15,76	2,84	7,63	13,48	1,42
25	Murcia	E	f&l	13,08	9,77	6,18	8,25	1,35
26	Languedoc Roussillon	F	f&l	19,70	9,74	6,50	10,03	1,14
27	Bretagne	F	lég	9,04	20,00	4,05	10,45	1,14
28	Puglia	I	lég	8,94	3,73	16,84	9,56	1,12
29	Rhône-Alpes	F	f&l	10,69	12,04	7,86	20,00	1,09
30	Trentino	I	fru	11,40	3,35	20,00	6,75	0,99
30	All 30 regions			9,57	4,56	5,68	10,76	1,79

2.3.3– Scenario 3: Strength of the economic environment

Scenario 3 lays emphasis on the income of the regions (30%) and on the production (25%) and processing (25%) sectors.

Scores range from 1.6 to 10 with the average rising to 2,8. The sensitivity of the regions to the macroeconomic wealth criterion (income) and to R&D is thus substantial overall.

The classification of the 10 most vulnerable regions is unchanged except for a few switches in position. Campania improves its position (from 16 to 22 in comparison with S2). Pays de la Loire slide from position 23 to 18. The rest of the list of low vulnerability regions remains practically identical.

Table 25: Synthetic Regional Vulnerability Index (SRVI) Ranking in Scenario No. 3

	Region	Country	Prod.	SCOR E F&LF	SCOR E IF<	SCOR E EC	SCOR E IRR	SRVI S3 éco
1	Thessalia	G	fru	2,70	2,26		3,11	10,00
2	Anatoliki Makedonia, Thraki	G	fru	3,10	0,00		5,69	8,74
3	Calabria	I	fru	7,33	0,00	2,14	4,40	6,06
4	Norte-Entre Douro	P	f&l	0,72	0,35	4,13	8,74	5,84
5	Aragón	E	fru	5,45	0,00	5,31	5,33	5,39
6	Castilla-La Mancha	E	lég	7,65	2,88	-2,28	6,34	5,32
7	Alentejo e Algarve	P	f&l	6,02	0,13	5,17	5,02	5,32
8	Liguria	I	lég	9,33	2,30	5,29	5,31	3,91
9	Toscana	I	lég	1,97	5,63	5,90	10,48	3,49
10	Lazio	I	lég	2,65	2,32	5,00	17,64	2,88
11	Midi-Pyrénées	F	fru	8,69	3,59	5,47	11,68	2,83
12	Stereia Ellas-Nissi Egaeou-Kriti	G	lég	10,35	5,99		12,36	2,79
13	Sicilia	I	f&l	13,71	2,47	2,95	11,04	2,73
14	Centro-Ribatejo e Oeste	P	f&l	12,11	5,47	1,88	10,84	2,70
15	Veneto	I	f&l	10,32	3,13	3,70	14,40	2,58
16	Piemonte	I	fru	5,30	4,15	11,34	12,71	2,57
17	Cataluna	E	fru	4,88	4,82	6,64	18,06	2,37
18	Pays de la Loire	F	lég	7,86	10,92	6,17	10,81	2,37
19	Emilia Romagna	I	f&l	16,51	0,70	4,40	13,86	2,32
20	Puglia	I	lég	8,94	3,73	16,84	9,56	2,31
21	Murcia	E	f&l	13,08	9,77	6,18	8,25	2,30
22	Campania	I	f&l	14,41	3,18	2,74	14,97	2,30
23	Provence Alpes Côte d'Azur	F	f&l	12,85	4,64	3,49	15,36	2,24
24	Trentino	I	fru	11,40	3,35	20,00	6,75	2,23
25	Andalucia	E	f&l	14,50	7,18	0,99	15,23	2,13
26	Ipiros-Peloponissos-Nissi Ioniou	G	f&l	20,00	7,84		10,84	2,13
27	Valencia	E	f&l	15,76	2,84	7,63	13,48	2,12
28	Bretagne	F	lég	9,04	20,00	4,05	10,45	1,94
29	Languedoc Roussillon	F	f&l	19,70	9,74	6,50	10,03	1,86
30	Rhône-Alpes	F	f&l	10,69	12,04	7,86	20,00	1,64
30	All 30 regions			9,57	4,56	5,68	10,76	2,75

2.3.4 – Scenario 4: Balanced strengths

This simulation awards equivalent weight to players in production, processing and distribution and to the macroeconomic parameters (25% each).

The classification varies from 1.27 to 10 with an average of 2.15; this decrease confirms the importance of the economic environment in the degree of vulnerability of F & V chains.

The positions in the classification are very similar to those of Scenario 2 that gives a strong weighting to the downstream part of the chains (processing and distribution).

According to this synthetic indicator, the 3 Portuguese regions, 3 out of 4 Greek regions, 6 out of 11 Italian regions and 1 out of 6 French regions appear to be vulnerable to intensification of competition in the fruit and vegetable sector.

Table 26: Synthetic Regional Vulnerability Index (SRVI) Ranking in Scenario No. 4

	Regions	Country	Prod.	SCOR E F&LF	SCOR E IF<	SCOR E EC	SCOR E IRR	SRVI S4 balanc ed
1	Anatoliki Makedonia, Thraki	G	fru	3,10	0,00		5,69	10,00
2	Thessalia	G	fru	2,70	2,26		3,11	8,09
3	Calabria	I	fru	7,33	0,00	2,14	4,40	6,05
4	Castilla-La Mancha	E	lég	7,65	2,88	-2,28	6,34	4,70
5	Norte-Entre Douro	P	f&l	0,72	0,35	4,13	8,74	4,65
6	Aragón	E	fru	5,45	0,00	5,31	5,33	4,55
7	Alentejo e Algarve	P	f&l	6,02	0,13	5,17	5,02	4,11
8	Liguria	I	lég	9,33	2,30	5,29	5,31	3,01
9	Toscana	I	lég	1,97	5,63	5,90	10,48	2,62
10	Lazio	I	lég	2,65	2,32	5,00	17,64	2,36
11	Stereia Ellas-Nissi Egeaeou-Kriti	G	lég	10,35	5,99		12,36	2,31
12	Sicilia	I	f&l	13,71	2,47	2,95	11,04	2,26
13	Midi-Pyrénées	F	fru	8,69	3,59	5,47	11,68	2,24
14	Centro-Ribatejo e Oeste	P	f&l	12,11	5,47	1,88	10,84	2,20
15	Veneto	I	f&l	10,32	3,13	3,70	14,40	2,12
16	Emilia Romagna	I	f&l	16,51	0,70	4,40	13,86	1,94
17	Campania	I	f&l	14,41	3,18	2,74	14,97	1,92
18	Piemonte	I	fru	5,30	4,15	11,34	12,71	1,92
19	Cataluna	E	fru	4,88	4,82	6,64	18,06	1,88
20	Provence Alpes Côte d'Azur	F	f&l	12,85	4,64	3,49	15,36	1,84
21	Pays de la Loire	F	lég	7,86	10,92	6,17	10,81	1,77
22	Andalucia	E	f&l	14,50	7,18	0,99	15,23	1,76
23	Ipiros-Peloponissos-Nissi Ioniou	G	f&l	20,00	7,84		10,84	1,75
24	Murcia	E	f&l	13,08	9,77	6,18	8,25	1,74
25	Valencia	E	f&l	15,76	2,84	7,63	13,48	1,70
26	Puglia	I	lég	8,94	3,73	16,84	9,56	1,65
27	Trentino	I	fru	11,40	3,35	20,00	6,75	1,56
28	Languedoc Roussillon	F	f&l	19,70	9,74	6,50	10,03	1,44
29	Bretagne	F	lég	9,04	20,00	4,05	10,45	1,42
30	Rhône-Alpes	F	f&l	10,69	12,04	7,86	20,00	1,27
30	All 30 regions			9,57	4,56	5,68	10,76	2,15

2.4 – Discussion of the results

Estimation of a synthetic index of regional vulnerability leads overall to results validated by field observations and underlines the effect of the economic environment on the performance of fruit and vegetable sectors. Nevertheless, several key points should be highlighted and borne in mind for the satisfactory interpretation of the regional classifications produced.

First of all, the general classification results from a composite index that takes into account not only the stakeholders in the F & V chains but also sectoral environment factors (the chain) and general factors (the economic situation and regional infrastructures).

Secondly, the statistical knowledge base is less complete and less fine for processed F & V than for fresh F & V. Furthermore, FADN sampling in the case of fresh F & V raises several problems of representativeness in the small production regions. We do not possess a

representative, homogeneous sampling for industry and trade. In addition, the AMADEUS database is not always very reliable with regard to the assigning of enterprises in the nomenclature or in the transcription of accounts¹⁴. Even when the nomenclature is correct and the accounts are right, the meaningfulness of the ratios calculated is biased by the fact that an enterprise has several activities (in the fruit and vegetables industry and elsewhere). In particular, the performances of enterprises are markedly different in primary, secondary and tertiary processing (or cooked vacuum-packed produce, as fresh-cut produce is in the fresh fruit and vegetables category).

Thirdly, activities are varied in the food wholesaling sector that includes purchase centres and processed fruit and vegetables are only one of the product lines concerned. In addition, the decision-making power for purchase centres is generally outside the regions in question and this has an adverse influence on this type of result.

Fourthly, certain macroeconomic data (R&D) are global and multisectoral and it is impossible to establish a direct link with the F & V sector.

Finally, the scoring method leads to the empirical assignment of a weighting coefficient to each component of the RVI. The score is very sensitive to these coefficients and close examination of the results is required to eliminate certain aberrant values. The scenario method makes it possible to smooth the distortions somewhat (Rastoin et al., 2005).

In spite of these reserves, it can be put forward that the classification of European regions presented here reflects real, deep-seated spatial disparities and that the rankings in the intermediate typologies drawn up are relatively reliable.

¹⁴ The inaccuracy of certain company accounts can also be mentioned.

Conclusion

The EU is the world's largest fruit and vegetables market with apparent per capita consumption of nearly 300 kg in 2001-2003, while the world average is 183 kg. Given the recommendations of nutritionists that underline the very great health benefits of F & V consumption, it can be considered that the growth prospects of the market are good. The historic trend for faster progress in processed fruit and vegetables in high-income countries reversed a few years ago. Fresh produce, including ready-to-eat products, displays the most rapid increase.

Europe is the world's second largest F & V producer with 9% of the total tonnage in 2003-05, way behind China (37%). The EU is losing ground because of its slow growth (6% from 1994 to 2004 against 124% in China and 42% in India). Producing nearly 50 million t, the five EU Mediterranean countries (Spain, France, Greece, Italy and Portugal) account for 72% of the fruits and vegetable production of EU-15. The southern and eastern Mediterranean (SEM) countries produce 30 million t with rapid growth (34% in the last 10 years against 9% in EU-15 and the five Mediterranean countries). The EU-15 fresh and processed fruit and vegetable sector as a whole generated turnover of €100bn in 2004 (57% accounted for by the Mediterranean member-countries) and nearly a million jobs (2 to 3 times more when related industries and services are included).

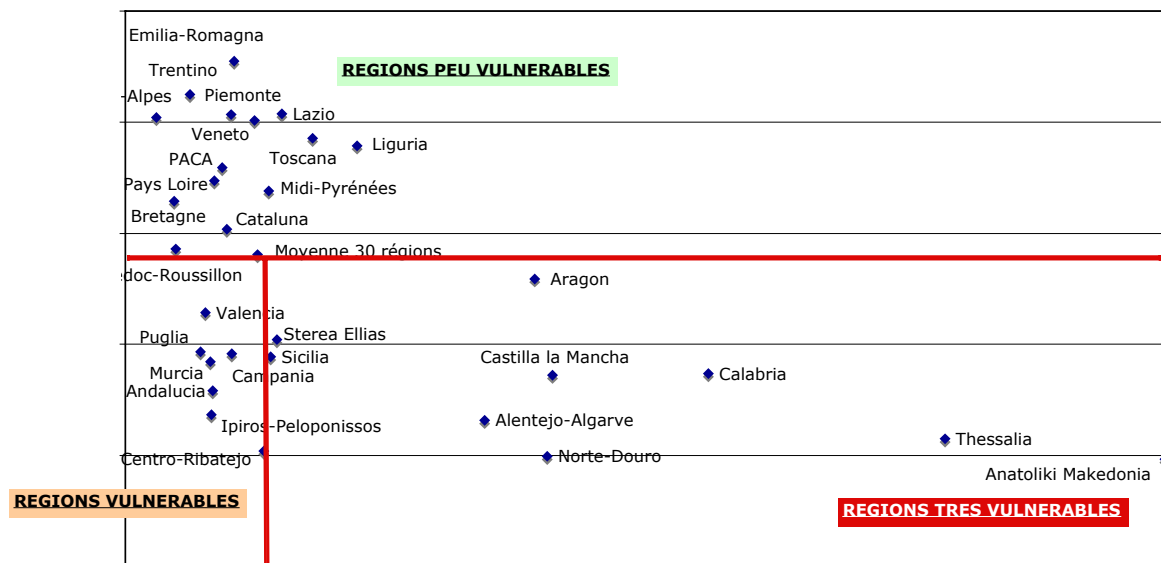
The EU is the world's leading exporter and importer of fruit and vegetables with some 50% of international trade (in value). However, 82% of EU exports and 70% of imports are the subject of intra-community trade. The EU's F & V trade balance shows a deficit of about \$6bn. Third country suppliers are the SEM countries with goods to the value of some \$2.3bn, that is to say 6% of total supplies and 19% of extra-EU trade flow.

Macroeconomic examination shows that the issues of fruit and vegetable imports from Mediterranean third countries is a small one. The values exports of SEM countries to the EU totals between 2 and 3% of the consolidated turnover of the EU-15 fruit and vegetable sector and double that (from 4 to 6%) in the 5 Euro-Mediterranean countries. A (very optimistic) hypothesis of the doubling of these exports within the framework of a Euro-Mediterranean free trade area and a pessimistic one of the stagnation of demand for F & V should not have a great overall impact on European producers.

Nevertheless, our calculations of vulnerability at the regional scale (NUTS 2) indicate strong interregional disparities, with a third of the EU Mediterranean regions currently displaying undeniable signs of economic fragility.

After this study we can put forward the hypothesis that the high-income regions will be better able to withstand the shock of competition than the poorest regions. Indeed, the former can invest in adapting their enterprises to a new trade situation and/or redeploy on a nearby market with high purchasing power, or again switch to other activities. Graphic representation of the relations between figures for SRVI and per capita GDP makes it possible to develop a typology of the 30 European regions studied, with distinction made between three categories as follows:

- low vulnerability regions (SRVI < 3 and per capita GDP > average, i.e. €19,045)
- vulnerable regions (SRVI > 2.15 and per capita GDP < €19,045)
- very vulnerable regions (SRVI < 2.15 and per capita GDP < €19,045).



The 'very vulnerable' category consists of the following regions in decreasing order of vulnerability: Makedonia, Thessalia, Calabria, Castilla-la-Mancha, Norte-Douro, Aragon, Alentejo-Agarve, Sterea Ellas, Sicilia and Centro-Ribatejo, that is to say mainly regions in Greece, southern Portugal and southern Italy (10 regions).

The 'vulnerable' regions are Liguria, Toscana, Sicilia, Midi-Pyrénées, Campania, Andalousia, Ipiros-Peloponissos, Murcia, Valencia and Puglia (10 regions in central Italy, southern Spain and the south of France).

Finally, 10 'low vulnerability' regions are counted: Veneto, Emilia-Romagna, Piemonte, Cataluña, Provence-Alpes-Côte d'Azur, Pays de la Loire, Trentino, Languedoc-Roussillon, Bretagne and Rhône-Alpes. These are thus regions in northern Italy, regions in Mediterranean and western France and a region in northern Spain.

Finally, there seems to be a positive relation between regional wealth, investment in innovation and the performance of fruit and vegetable chains.

From the agro-climatic point of view, there are complementary features in production calendar and quality ranges from the south to the north of the Mediterranean area. In the politically difficult to avoid prospect of the development of a Euro-Mediterranean area (Barcelona conferences in 1995 and 2005), specific support can be planned for the setting up of economic partnerships between professional stakeholders in Mediterranean countries. These partnerships could also have a strategic dimension for standing up to extra-regional competition (Australia, Argentina, Chile and the United States) for the conquest of the world market for Mediterranean crops (Regmi et al., 2004, Rastoin, 2005).

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