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ΓΕΝΙΑ

SECTORAL STUDY

MEDICINAL & AROMATIC PLANTS

Coordinator: Dr. Christos Vasilikiotis, Assistant Professor
Project Leader: Dr. Ilias Kalfas, Researcher
Team members: Dr. Eleni Topalidou, Lecturer & Researcher, Michalis Genitsariotis, Adjuct Lecturer & Researcher, Konstantinos Zoukidis, Adjuct Lecturer & Researcher

PLANNING AND IMPLEMENTATION : **AMERICAN FARM SCHOOL**

The program **NEW AGRICULTURE FOR A NEW GENERATION** is

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Perrotis College

Agriculture · Environment · Life Sciences

New Agriculture for a New Generation: *Recharging Greek Youth to Revitalize the Agriculture and Food Sector of the Greek Economy*

Final Report Sectoral Study No 6

Medicinal & Aromatic Plants

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Executive Summary

Greece is experiencing the consequences of the hardest financial crisis of its history. As a result there is deep recession, companies are out of business and many people especially young ones are unemployed. In the past five years more than 200,000 young Greeks have migrated to other countries in order to find a job. The vast majority of them have university degrees, MSc or PhD, speak foreign languages and are skilled users of information technologies. In other words the most competent part of the population chose to leave the country and escape the dead-end of unemployment. The current project's aim is to investigate if the medicinal and aromatic plants (MAPs) sector could be an answer for recharging youth, and what should be done in order to enforce sustainability of the sector and reverse this negative trend.

Medicinal and aromatic plants comprise a very special group of flora with an extensive range of uses. They have been used since ancient times for health reasons, such as disease recovery and wound healing. They are special ingredients adding excellent taste to foodstuff while they are the basic material for perfumes and cosmetics. Although they were used for millennia MAPs have just recently started to be systematically cultivated. Packaging facilitates are found all over the country while distilleries are located in the northern part of Greece. There are a few companies that make exports of high added value products and certainly there is room for more.

The Global market for medicinal and aromatic plants is very large showing a constant upward trend. Greece has been blessed with having many indigenous MAPs and many biotypes have been evolved through millennia becaue of the diversity of microclimates. Furthermore topography of the country and variety in terms of different environmental conditions prevailing in several areas, render MAPs as one of the best choices, that can produce excellent crop in marginal land without being demanding crops. SWOT analysis was conducted for MAPs sector which revealed the fact that this sector is valuable and with appropriate choices can recharge youth. It has been shown that there is a great potential for MAPs sector in Greece which can create new jobs, not only farm relevant ones but industrial, scientific, jobs in sales and marketing, tourism and new technologies. However if this potential will finally be transformed into capacity it depends on those who will be involved and will manage it.

Η Ελλάδα βιώνει τις συνέπειες της σκληρότερης οικονομικής κρίσης της νεότερης ιστορίας της. Αποτέλεσμα αυτή είναι η βαθιά ύφεση, με εταιρίες να κλείνουν και ανθρώπους να
μένουν άνεργοι ειδικά νέους. Τα τελευταία πέντε χρόνια περισσότεροι από 200.000 νέοι Έλληνες έχουν μεταναστεύσει σε άλλες χώρες για να εργαστούν. Η συντριπτική πλειοψηφία τους διαθέτει πανεπιστημιακά πτυχία, μεταπτυχιακά ή και διδακτορικά, μιλάει ξένες γλώσσες και είναι ικανοί και έμπειροι χρήστες υπολογιστών. Με άλλα λόγια το πιο καταρτισμένο και ανταγωνιστικό τμήμα του πληθυσμού επιλέγει να εγκαταλείψει τη χώρα και μαζί της το αδιέξοδο της ανεργίας. Το παρόν έργο σκοπεύει να διερευνήσει αν ο κλάδος των αρωματικών και φαρμακευτικών φυτών αποτελεί την απάντηση στην αναζωογόνηση της νεολαίας και αν ναι τι θα έπρεπε να γίνει προς αυτή την κατεύθυνση.

Τα αρωματικά και φαρμακευτικά φυτά αποτελούν μία πολύ ξεχωριστή ομάδα με μεγάλο εύρος εφαρμογών. Χρησιμοποιήθηκαν από την αρχαιότητα για λόγους υγείας όπως η ανάρρωση από ασθένειες ή η περιποίηση πληγών. Αποτελούν εξαιρετικά συστατικά τροφίμων που προσδίδουν την ιδιαίτερη γεύση τους (καρυκεύματα), ενώ είναι πολύτιμα συστατικά καλλυντικών και αρωμάτων. Αν και χρησιμοποιούνται για χιλιετίες μόλις πρόσφατα άρχισε στη χώρα μας η συστηματική τους καλλιέργεια. Συσκευαστήρια αποξηραμένων αρωματικών φυτών βρίσκονται διασκορπισμένα σε όλη τη χώρα, ενώ τα αποστακτήρια αιθέριων ελαίων είναι συγκεντρωμένα στη Β. Ελλάδα. Υπάρχουν εταιρίες που πετυχαίνουν αξιόλογες εξαγωγές αλλά σίγουρα υπάρχει χώρος για περισσότερες.

Η παγκόσμια αγορά των αρωματικών και φαρμακευτικών φυτών είναι πολύ μεγάλη με σταθερά ανοδικές τάσεις. Η Ελλάδα ευτύχησε να φιλοξενεί πολλά αυτοφυή είδη και πολλούς βιότυπους αυτών που εξελίχθηκαν διαμέσου των αιώνων εξαιτίας του ιδιαίτερου
μικροκλίματος της κάθε περιοχής. Επιπλέον το ανάγλυφο και η ποικιλομορφία καιρικών συνθηκών που επικρατούν, καθιστούν τα αρωματικά φυτά ως μία από τις καλύτερες επιλογές καλλιέργειας που δύναται να παράγει προϊόντα εξαιρετικής ποιότητας σε γη χαμηλής αξίας χωρίς ιδιαίτερες απαιτήσεις. Η ανάλυση SWOT που διενεργήθηκε για τον κλάδο επιβεβαίωσε τη μεγάλη του αξία αλλά και τις προοπτικές που έχει ιδιαίτερα για την απασχόληση των νέων. Έχει μεγάλες δυνατότητες και μπορεί να συμβάλλει στη δημιουργία θέσεων εργασίας όχι μόνο στον γεωργικό κλάδο αλλά στον βιομηχανικό, τον επιστημονικό, τον κλάδο των πωλήσεων του τουρισμού των νέων τεχνολογιών κλπ. Το αν αυτές οι δυνατότητες αξιοποιηθούν πραγματικά και μετατραπούν σε προστιθέμενη αξία του κλάδου,

επαφίεται σε όσους εμπλακούν και χειριστούν τα επιμέρους ζητήματα.

Table of Contents

List of Abbreviations

AESGP: Association of the European Self Medication

Industries BRC: British Retail Consortium

CCSCH: Codex Committee on Spices and Culinary

Herbs CHPA: Consumer Healthcare Products

Association EFSA: European Food Safety

Authority

ELSTAT: Hellenic Statistical

Authority ESA: European Spice

Association

EUROPAM: European Herb Growers

Association EUROSTAT: European

Statistical Authority

FAOSTAT: Statistical service of Food and Agriculture Organization of

United Nations IFS: International Food Standard

IOSTA International Organization of Spice Trade

Association ISO: International Standardization

Organization

JAS: Japanese Agricultural Organic

Standard MAPs: Medicinal and

Aromatic Plants

MINAGRIC Ministry of Rural Development and Food (Ministry of

Agriculture) NOP: National Organic Program (USDA)

OECD: Organization for Economic Cooperation and

Development OPEKEPE: Greek Payment Authority of

Common Agricultural Policy OTC: Over-the-counter

medicines (do not need a doctor's prescription) UN

COMTRADE: Trade database of United Nations

WHO: World Health Organization

List of Tables

List of Figures

1. Introduction

1.1 Agricultural sector in Greece

(General analysis of the sector, contribution to GDP, employment data)
General information and Economic characteristics

Greece belongs to the Mediterranean basin and is divided into several geographical regions (Macedonia, Thrace, Epirus, Thessaly, Central Greece and Evia, Peloponnese, Ionian islands, Aegean islands – including Cyclades, Sporades, Dodecanese and Crete). The landscape is quite complex, characterized by different elements: sea, mountainous areas, river and coastal plains, interior valleys and basins. The largest plains are formed in Macedonia and Thrace and the second largest lowland area is found in Thessaly. The climate is characterized as temperate and mild, with hot, dry summers and mild, rainy winters. Snowfall is also common during winters in northern and north-western mountainous areas (Galanopoulos and Mattas, 2006). The different range of the landscapes and the differentiation in the climate among the different compartments of the country allow the creation of a wide variety of micro-climates and production conditions for many and diverse agricultural products.

The total area of Greece is estimated at 131,957 Km2, (European Commission, 2014) out of which 35,600.0 thousand stremmas (in 2012) are used in agriculture (ELSTAT, 2015). From 2010 to 2011 the utilized agricultural area was decreased by 2.9%, whereas from 2011 to 2012 was decreased by 0.2% (Table 1) (ELSTAT, 2015). In 2012, the utilization of the cultivated land/area was distributed as follows: 54.6% for arable farming, 2.8% for vegetables, 32.0% for permanent crops and 10.6% was fallow land (Table 1). In 2012 about the agricultural holdings of small or medium average size (5.8 hectares) were estimated at
717.000 (Tsiforos, 2015). Although, the physical context and the climate are ideal for the development of agriculture, the sector is significantly limited by the fragmentation of the agricultural land and the aging of the agricultural population, especially in the rural areas (Paseges, 2011, European Commission, 2013a) (Table 2).

The primary sector in Greece is a fundamental component of the national economy and especially for rural areas, which represent more than 80% of the territory in Greece (Rural

regions = 82%, Intermediate = 12.1% and Urban = 5.7%) (European Commission, 2013) (Table 2).

The contribution of the primary sector to the Gross Value Added (GVA) declined considerably within the last 20 years; it was 8.8% in 1995, 6.1% in 2000 and 4.3% in 2014 (Piraeus Bank, 2015). Nevertheless, the agricultural sector occupies an important position in the economy of the country and in 2012 contributed 2.8% of the Gross Domestic Product (GDP) (Tsiforos, 2015), whereas in 2014 the Gross Value Added of agricultural sector contributed 3.3% to the Gross Domestic Product (GDP) (Piraeus, 2015) and was estimated at
10.6 billion euros with crop output (€6.9 billion), animal output (€2.6 billion), the value of secondary services (€349 million) and secondary activities (€698 million) included (Tsiforos 2015). The GVA of the country at basic prices stands at the 5.5 billion euros and corresponds to approximately 5.2% out of the total economy. This ratio, although not high enough, is more than the double the average in the EU-27 (2.5%) (Tsiforos, 2015).

The implementation of the Common Agricultural Policy (CAP) of Europe in Greece during the last decades had a large impact on the agricultural structure and the economy of the country. Implementation of CAP encountered opposition due to certain particularities of the Greek agricultural sector (Hellenic Ministry for the Environment, Physical Planning and Public Works, 2008). Due to the continuous reforms the sector was limited, traditional Greek cultures (eg. legumes, forage crops) were abounded and replaced by crops under subsidy programs, the competitiveness and the farm income were reduced, whereas the need for hired labor was increased (Kaditi, 2013). However, the new CAP aimed to more efficient and more sustainable management of the agricultural land, the adaptation of environmentally friendly agricultural practices and the results are already satisfactory under the Operational Programs "Agricultural Development and Reform of the country-side,2000-2006" and "National Strategic Plan for Agricultural Development, 2017-2013" (Hellenic Ministry for the Environment, Physical Planning and Public Works, 2008).

During the period 2005-2014, the Gross Value Added declined considerably (about 32%). In the same period the intermediate consumption (which makes up most of the input costs in agricultural production) increased at about 20.4% (was 4.5 billion in 2005 and 5.4 billion euros in 2014). Since the beginning of the recession, the input costs increased at about 14.7% (Fig. 1) (Tsiforos 2015).

Table 1 Areas under cultivation in Greece total during 2010 – 2012 in thousand stremmas. The type of cultivated crops is also presented. (ELSTAT, 2012 Annual Agricultural Statistical Survey).

Crop type	2010	2011	2012	2011/2010	2012/2011
Total cultivated agricultural land	36,709.3	35,666.2	35,600.0	-2.9	-0.2
Irrigated	13,718.0	13,844.8	13,860.6	0.9	0.1
1. Arable land	19,619.2	19,478.3	19,441.6	-0.7	-0.2
Irrigated	8,368.0	8,536.8	8,499.6	2.0	-0.4
2. Crops under vegetables (net area)	1,041.3	1,004.6	985,7	-3,5	-1,9
Irrigated	1,014.7	980,4	962,1	-3,4	-1,9
3. Permanent crops[2]	11,373.7	11,374.8	11,384.8	0.0	0.1
Irrigated	4,335.3	4,327.6	4,346.8	-0.2	0.4
4. Fallow land	4,675.1	3,808.5	3,787.9	-18.5	-0.5
1. Arable land					
1.1 Cereals for grain	11,576.3	11,161.0	11,251.4	-3.6	0.8
Common wheat	1,553.0	1,563.3	1,724.4	0.7	10.3
Durum wheat	5,821.8	5,315.0	5,165.5	-8.7	-2.8
Barley	1,207.6	1,211.7	1,279.5	0.3	5.6
Rice	300.5	309.1	307.9	2.9	-0.4
Maize	2,059.8	2,140.4	2,129.0	3.9	-0.5
Other cereals	633.6	621.4	645.0	-1.9	3.8
1.2 Edible pulses	[193.8]	203.3	206.7	4.9	1.7
Beans	96.2	97.8	98.1	1.7	0.3
Chickpeas	29.5	30,.9	33.2	4.8	7.4
Lentils	41.1	46,.5	49.1	13.1	5.6
Other edible pulses	27.0	28.1	26.3	4.1	-6.4
1.3 Industrial Plants	3,765.8	4,092.9	3,905.6	8.7	-4.6
Tobacco	160.4	158.9	164.0	-0.9	3.2
Cotton	2,769.2	2,975.1	2.914.7	7.4	-2.0
Sunflower	534.8	691.4	613.8	29.3	-11.2
Groundnuts	5.6	5.6	6.7	0.0	19.6
Sugar beets	156.0	96.1	111.3	-38.4	15.8
Oil seed rape	...	.....	76.2	...	.....
Other industrial plants	[139.7]	165.8	18.9	18.7	-88.6
1.4 Aromatic plants	23.1	19.3	18.1	-16.5	-6.2
1.5 Fodder plants	3,584.9	3,548.6	3,599.0	-1.0	1.4
1.6 Melons and water melons		252.2	235.7	-2.1	-6.5
Watermelons	168.2	167.1	157.6	-0.7	-5.7
Melons	89.2	85.1	78.1	-4.6	-8.2
1.7 Potatoes	448.0	448.1	441.4	0.0	-1.5
2. Crops under vegetables **2.1** Vegetable crops	1,105.0	1,069.7	1,050.5	-3.2	-1.8
Tomatoes	317.8	280.5	275.0	-11.7	-2.0
Industrial tomatoes	138.3	105.8	101.3	-23.5	-4.3
Tomatoes grown in the open	144.7	140.6	140.8	-2.8	0.1

Crop type	2010	2011	2012	2011/2010	2012/2011
Tomatoes grown in greenhouses	34.8	34.1	32.9	-1.9	-3.5
Green beans	74.0	73.9	72.1	-0.1	-2.4
Cabbages – cauliflowers	118.7	116.8	114.8	-1.6	-1.7
Lettuce	55.0	55.4	56.1	0.8	1.3
Other vegetables	539.5	543.1	532.5	0.7	-2.0
2.2 Market flower gardens	7.0	7.1	6.5	1.2	-8.5

[1] 1 stremma = 1,000 m^2 or 0.1 ha

[2] Areas under nurseries are not included due to their small contribution to the total of the cultivated area

[3] Also included greenhouses with vegetables and flowers. Vegetables include tomatoes, cucumbers,etc.

Note: Any discrepancies in the sums are due torounding.
Percentage changes were calculated beforerounding.

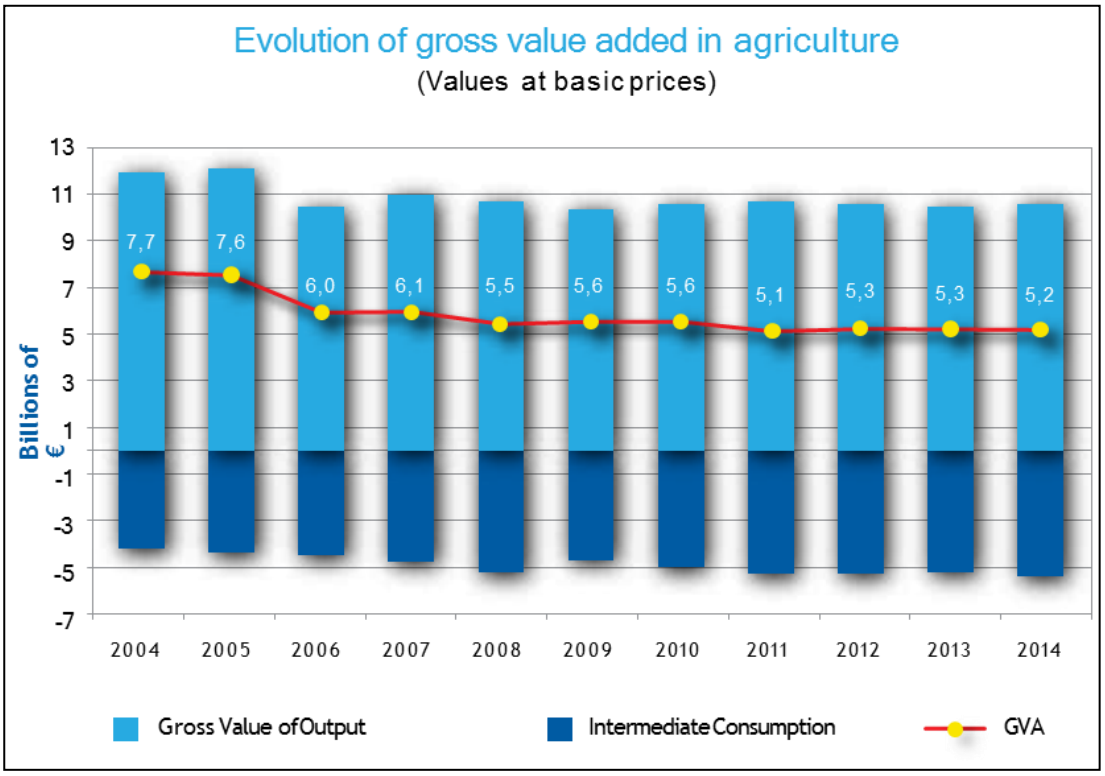


Figure 1 Evolution of Gross Value Added in Greek Agriculture in relation to the Intermediate Consumption throughout the period 2005-2015. (Tsiforos, 2015)

Table 2 Importance of rural areas. Source European Commission, Agriculture in the EU, Statistical and Economic Information, Report 2013, December 2013

	Territory (%)	Population (%)	Employment (%)	GVA (%)
		2010		
Rural	82	42.8	41.4	34.2
Intermediate	12.1	10.6	10.2	8.8
Urban	5.7	46.7	48.4	56.9
Age structure by typology of regions				
		2012		
	% 0-14 y.o	% 15-64 y.o	% 65+ y.o.	
Rural	14.0	64.2	21.8	
Intermediate	15.2	66.0	18.8	
Urban	14.5	67.5	18.0	

The agricultural sector plays a pivotal role in the food and beverage industry, because it is the most important supplier for processing, consisting of 21.2% of the enterprises, people employed at 25.2% and the Gross Value Added at 25.2% among all the sectors of the processing branches for 2012 (Tsiforos, 2015).

Crop production in Greece dominates the agricultural sector and in terms of the total agricultural production remains more important than livestock as indicated by the following numbers during the period 2012-2014: 19% vegetables, 18.5% fruits, 14.5% livestock, 14% livestock products (e.g. milk, eggs etc), 15% cereals and 8% olive oil (Piraeus Bank, 2015). During the past few years, significant changes were observed in terms of volume production of agricultural products (durum wheat, grain maize, cotton, sugar beets, potatoes, fruits etc) by groups and species of products as presented in Table 3 (ELSTAT, 2015). The agricultural sector is one of the key contributors to the country's external balance and remains stable and dynamic even during the period of economic recession. Agricultural products comprise 19% of total exports (Piraeus Bank, 2015) and represent a value close to 5 billion euros. In recent years the main exported products (olives and virgin olive oil, dairy products, fruits such as apricots, cherries, cotton etc) are highly ranked in terms of quality, which makes them more

competitive (Piraeus Bank 2015, Tsiforos, 2015). On the other hand, the imported agricultural products (including food and beverages) cover 12.9% out of the total imports resulting in a negative trade balance, estimated at approximately 1.6 billion euros in 2013 (Tsiforos, 2015).

Employment Data

The unemployment rate in Greece, estimated at 24.6% in August 2015, was slightly reduced since August 2014 (26.2%) (ELSTAT, 2015) but it is still the highest rate among the EU countries, followed by Spain (22.2%) (Eurostat, 2015a). The total number of employed people in August 2015 was estimated at 3.614.192 people, the unemployed at 1.180.001 and economically inactive population was estimated at 3.286.686 people. In regards to the two genders, unemployment is higher in women than in men, estimated at 28.5% in August 2015 (Table 4) (ELSTAT, 2015). At the same time unemployment rate in youth (young persons under 25) was estimated at 47.9% and was again the highest among the EU countries (Eurostat 2015). Unemployment rate is also high (31.3%) in the age group of 25-34 years old (Table 5) (ELSTAT 2015). Moreover, according to the Organization for Economic Cooperation and Development (OECD) 27% of youth (aged 15-29 years old) was neither in employment nor in training (OECD 2015).

Table 3 Production of agricultural products. Greece total, 2010 – 2012 in thousand tones. (ELSTAT, 2012 Annual Agricultural Statistical Survey).

				Change (%)	
Crop type	2010	2011	2012	2011/2010	2012/2011
Arable land					
1.1 Cereals for grain					
Common wheat	415.8	441.5	463.1	6.2	4,9
Durum wheat	1,504.5	1,416.0	1,373.9	-5.9	-3,0
Barley	311.1	319.0	336.3	2.5	5,4
Rice	208.2	250.7	230.7	20.4	-8,0
Maize	2,138.5	2,291.8	2,226.2	7.2	-2,9

Crop type	2010	2011	2012	Change (%) 2011/2010	2012/2011
1.2 Edible pulses					
	20.2	22,7	18,2	12.6	-19.8
Chickpeas	3.4	3.7	3.9	9,4	5.2
Lentils	4.0	4.8	6.5	19,6	35.5
1.3 Industrial plants					
	29.9	32.0	34.2	7.2	6.9
Cotton	710.5	814.5	795.5	14.6	-2.3
Sunflower	116.0	147.7	137.6	27.3	-6.8
Groundnuts	1.9	2.0	2.5	4.6	24.0
Sugar beets	889.4	581.5	647.8	-34.6	11.4
Oil seed rape	.....	.....	14.1	.....	.....
1.4 Fodder	2,490.2	2,457.6	2,522.7	-1.3	2.6
Fodder plants					
1.5 melons					
Melons	185.4	176.6	170.9	-4.7	-3.3
1.6 Potatoes	926.7	905.9	882.8	-2.2	-2.5
2. Vegetables					
	1,475.7	1,294.6	1,234.3	-12.3	-4.7
Industrial tomatoes	811.8	643.9	617.0	-20.7	-4.2
Tomatoes grown in the open	405.0	400.3	396.4	-1.2	-1.0
Tomatoes grown in greenhouses	259.0	250.4	220.8	-3.3	-11.8
Green beans	69.9	68.3	66.3	-2.3	-2.9
Cabbages - cauliflowers	223.7	230.1	224.7	2.9	-2.3
Lettuce	82.6	83.7	80.1	1.3	-4.3
3. Permanent crops					
3.1 Vineyards: grapes and raisins					
Wine	545.3	512.3	526.1	-6,1	2.7
Table grapes	174.9	147.5	139.4	-15.7	-5.3
Vines for currants	179.2	173.2	184.2	-3.3	6.3
Must	339.1	327.1	337.3	-3.5	3.1
3.2 Compact plantations					
3.2.1 Citrus trees					
Orange trees	905.1	847.3	849.6	-6.4	0.3
Mandarin trees	137.1	144.3	160.5	5.3	11.2
3.2.2 Fruit trees					
	76.5	90.3	87.7	18.0	-2.9
Apples trees	273.8	274.1	265.8	0.1	-3.0
Peach - Nectarine trees	822.3	821.0	825.9	-0.2	0.6
Apricot trees	62.7	66.8	79.5	6.5	19.0
Cherry trees	44.9	49.4	47.3	10.0	-4.3

Crop type	2010	2011	2012	Change (%) 2011/2010	2012/2011
3.2.3 Nut trees	43.2	40.1	42.0	-7.2	4.7
Walnut trees	22.6	22.9	23.7	1.3	3.5
Pistachio trees	7,8	8,0	8.0	2,6	-0.7
Fig trees	9.6	10.9	11,3	13.5	3.7
3.2.4 Olives	2,250.7	2,217.5	2,466.0	-1.5	11.2
Edible olives	308.9	273.5	359.3	-11.5	31.4
Olive oil	300,5	357,2	331.9	18.9	-7.1

Table 4 Unemployment rates (%) for males and females as estimated in August of 2015. (ELSTAT 2015)

Gender	August					
	2010	2011	2012	2013	2014	2015
Male	10.3	15.9	22.6	24.5	23.5	21.5
Female	16.5	22.3	29.5	31.7	29.6	28.5
Total	12.9	18.6	25.6	27.7	26.2	24.6

Table 5 Unemployment rates according to the different age groups during the period 2010- 2015. (ELSTAT, 2015)

	August					
Age Group	2010	2011	2012	2013	2014	2015
15-24 years old	32.2	45.5	56.6	57.6	49.8	47.9
25-34 " "	17.2	25.5	32.8	36.5	34.7	31.3
35-44 " "	10.8	15.4	21.9	24.1	22.8	22.2
45-54 " "	8.8	12.8	19.1	20.5	20.5	19.9
55-64 " "	5.8	8.4	14.2	15.9	16.4	16.2
65-74 " "	1.6	4.1	3.7	9.3	11.4	11.0
Total	12.9	18.6	25.6	27.7	26.2	24.6

Structure of farm labor force

Agriculture plays a vital role in the workforce of the country, since a large number of the active population is occupied in the sector (Table 6). Greek agriculture is traditionally dominated by small sized family farms which seldom utilize hired labor (Kaditi 2013). Due to this particular characteristic, in terms of employment there is a large number of farm owners who manage the farm by themselves and a large number of family members who work unpaid (Table 6). In more detail, about 98% of labor force consists of family holdings (Table 7), women are more frequently occupied in larger holding (42%) and the Annual Work Units (AWUs) are also increased in holdings over 2 hectares (Table 7). Consequently, the employment data in agriculture are not easily comparable with similar data of other sectors. According to Eurostat data (2015), 491.000 people (out of which 86.0% self-employment) were employed in the agricultural sector in 2011, which accounted for 11% of the total employment of the country. The number was reduced by 195.000 since 2000. Traditionally men are more frequently occupied in agriculture compared to women (Table 8) and the majority of people who work in this sector are aged between 40-64 years old (66.7%), followed by 15-39 years old (Table 8) (Eurostat, 2015). Moreover, it was estimated that 80.6% of the labor input in a total of about 396000 AWUs in 2012 was not paid (Eurostat 2015).

Table 6 Farm Labor Force in the Greece, in persons. Source Eurostat, FSS (online data codes:ef_lflegaa, ef_lflegecs, ef_kvage).

	Total	Sole holders	Family members	Non-Family members	By sex-men**	Average workers per holding	Working holdings with SO<4000 EUR	Working full time
	1000 person	% of total			% of total	Persons/ holding	% of total	% of total
Regular (in persons)	1212.7	59.6	38.3	2.2	60.4	1.7	47.3	8.6
NOTE: *Labor Force directly employed by the holding in persons only includes regular labor force (sole holders working on the farm + members of the sole holder's family + non-family regular workers								

	Total	Sole holders	Family members	Non-family regular workers	Non-family non regular workers	By sex-men	Average workers per holding	Working holdings with SO<4000 EU
	1000 person	% of total				% of total	AWU/ holding	% of total
Regular and non-regular	429.5	54.1	28.4	4.3	13.2	59.9	0.6	21.2
NOTE: *Labor force directly employed by the holding in AWUs includes both regular (sole holders working on the farm + members of the sole holders' family + non-family regular workers) and non-regular (non-family non-regular workers) labor force ** Only regular labor force								

Table 7 Structure of Agricultural holdings in Greece. Source Eurostat, Farm Structure Survey and Agricultural Census. Updated: October 2013.

Holdings less than 2 hectares			
	Status	persons	AWUs
Family labor force	Holders	373090 (of which 36.2% women)	72810
	Other family members	201200 (of which 51.8%)	33730
	Total	574290 (of which 41.7% women)	106540
Non family labor force	Regular non family labor force	5610 (of which 12.5% women)	3870
	Non regular (seasonal) labor force		12140
	Total		16010
Holdings more than 2 hectares			
Family labor force	Holders	349310 (of which 29.4%)	159630
	Other family members	262910 (of which 51.4% women)	88250
	Total	612220 (of which 38.8% women)	247880
Non family labor force	Regular non family labor force	20610 (of which 11.7% women)	14450
	Non regular (seasonal) labor force		44630
	Total		16010

*AWUs=Annual work units. An AWU is equivalent to a worker employed on a full time basis for one year.

Table 8 Employment in Agriculture in Greece. Source Eurostat (2015), Labor Force Survey (LFS)

Employment in Agriculture	
1000 persons	471.6
% men	58.7
% of persons aged 15-39	28.3
% of persons aged 40-64	66.7
% of persons aged 65 and more	4.9

1.2 Financial crisis and rural development

(Impact of the crisis on the agricultural income, rural development as an alternative for employment, trend to move from big towns to rural areas, farming as new occupation, aromatic plants as main or alternative income source)

Financial crisis and the impact on the agricultural income

The Greek recession started six years ago and is still in progress. Weak competitiveness, low productivity, rigid labor, product markets, large public deficit and debt levels are some of the most important causes which brought the Greek economy on the brink of default (European Commission, 2015). Uncertainty about the overall economic situation, tight financial conditions, difficulties and hesitations in prioritizing investments of many actors, cash flow deficiency, especially for small-sized enterprises and industries, high unemployment rates are only some of the obvious and most visible results observed due to the recession and the austerity measures which were applied to Greece (European Commission, 2015).

Despite the recession agriculture remains one of the most important and dynamic sectors for the recovery of the Greek economy, since the sector has enormous potential for improving the competitiveness of the country. However, the crisis has affected largely the primary sector and the effects can be viewed on supply and demand, as well as on consumer behavior since many consumers shifted to buying Greek products in order to support the Greek economy.

As indicated by the Economic Accounts for Agriculture with reference to the Income of the Agricultural Industry (growing crops, farming of animals) during the period 2009-2013 the total number of the agricultural units and the utilized land for agriculture declined (Table 9). The area cultivated perennial crops (e.g. vines and trees) was reduced, whereas the area of the annual crops was increased, as well as the irrigated areas (ELSTAT, 2015).

During the recession years, the cost of production in the agricultural sector was highly increased. The input costs in agricultural production were increased significantly during the period 2009-2013 as presented in Fig.2 (Tsiforos, 2015). Moreover, during the period 2009- 2014 investments in Greek agriculture were reduced by 2% (from 27% in 2009 to 25% in 2014). The amount of taxes in agricultural production from 2009 to 2013 was increased by about 247% (Fig. 3). The agricultural income during the recession period was reduced considerably as presented in Fig. 3 (Tsiforos, 2015). The shortage of capitals and cash flow is major obstacles to financing agricultural industries; it should be mentioned that according to Tsiforos (2015) the average financing for Greek agricultural enterprises was 1.8% during 2009-2014 and was the lowest among other sectors such as shipping (12.2%), tourism (6.6%), trade (21.1%) etc.

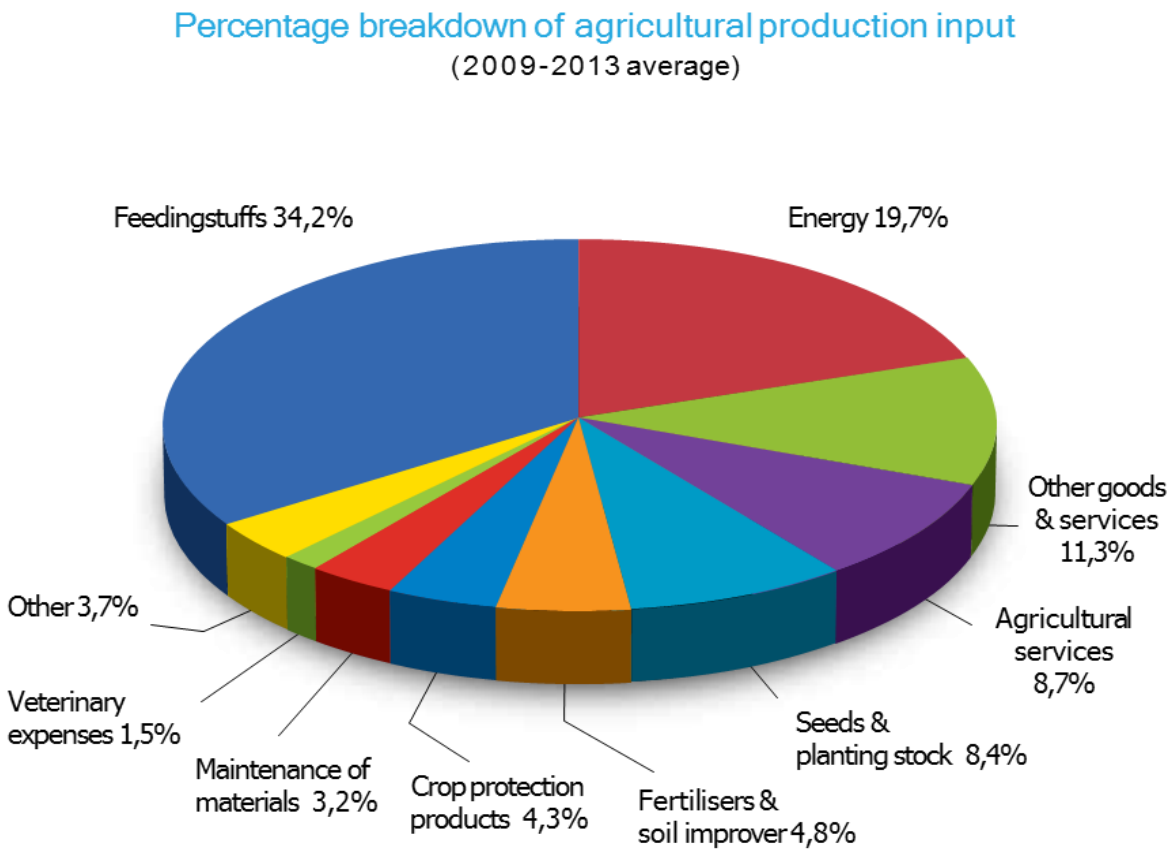


Figure 2 Input cost breakdown for the Greek agricultural sector during the period 2009-2013. (Tsiforos, 2015)

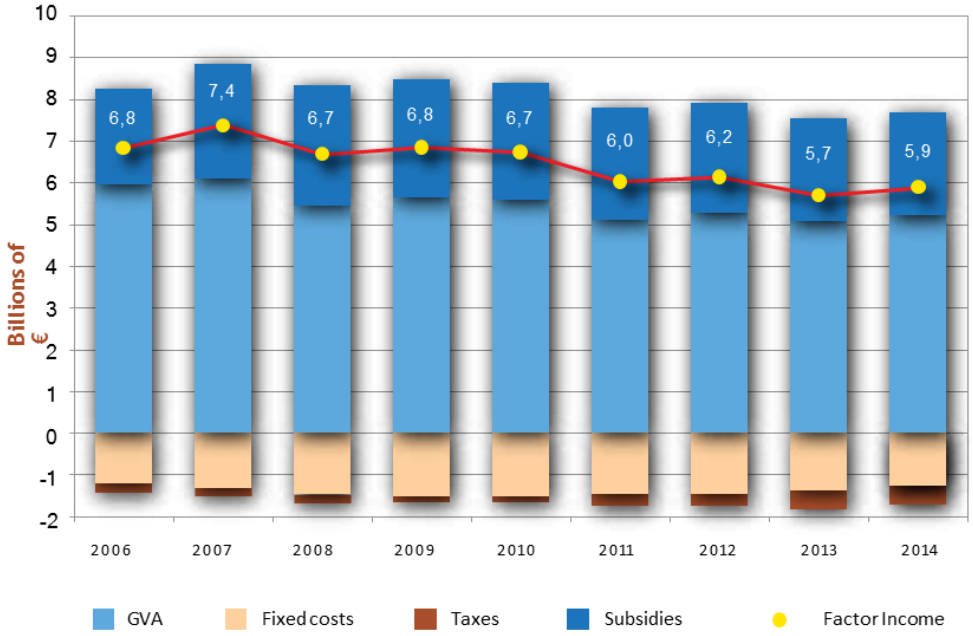


Figure 3 Evolution of agricultural income (values at current, basic prices). (Tsiforos 2015).

Rural development as an alternative for employment

The agricultural sector in Greece contributes substantially to the development of the country. It is extremely important to promote the integrated development of rural land based on local resources and reinforce the multifunctional character (Hellenic Ministry for the Environment, Physical Planning and Public Works, 2008). The rural development should be based on strategic plans in order to generate opportunities for employment. Agriculture is one of the important pillars for rural development and provided that important structural problems faced by the sector are solved, the sector has enormous potential to expand, modernize and increase employment, especially for young people.

Certain EU policies (e.g. new CAP) and investment funds, which are available to Greece for the period 2014-2020, should be used in order to reform the agricultural sector and prioritize certain actions which will promote the development of quantitative and qualitative Greek agricultural products.

The importance for rural areas in Greece was demonstrated in Table 2. The new EU policy framework (through the reform of CAP) allows the development of rural areas and points to the following targeted axes (European Commission, 2013):

- increase competitiveness of agriculture
- sustainable management of natural resources and environmentally friendly cultivation practices and natural ecosystem conservation
- Development of rural economies and communities in a balanced manner based on the use of local land and exploitation of local resources. The creation and maintenance of employment should be a key element in the strategic development of the rural areas.

For the implementation of the above development actions, a series of measures and reformations (some of which are already ongoing) should be applied. Such measures and reformations include (European Commission 2013): promote education and training of farmers, improve the social-cohesion and social services of rural areas in order to make living in those areas more attractive (especially for young people), adapt the use of land according the farmer needs and take measures in order to avoid land multi-fragmentation, enhance the research for promoting sustainable agriculture and implementation of modern technological

advancements in agriculture, make advisory services and guidance from specialists easily accessible to the farmers, help farmers in marketing their products and establishing cooperative bodies for promoting rural products, improve quality and certification of agricultural products, simplification of the bureaucracy involved in certification, packaging, transporting etc., especially for the organic products.

Trend to move from big town to rural areas, farming as new occupation

Until recently, young Greeks were unwilling to work in agriculture, primarily due to the quality of life in rural areas (especially in the mountainous and remote areas), which relates to the lack of adequate infrastructure for product and human transportation, education, e- commerce, social services (Katidi, 2013). However, there is growing evidence that migration to rural areas and adaptation of agricultural livelihood is a good option and an opportunity to survive the economic crisis (Daudon and Vergos, 2015). Growing evidence is showing that more people and especially youth find appealing the idea of getting involved in agriculture (Daudon and Vergos, 2015). Certainly there is a lot of room in agriculture to occupy people and according to ELSTAT (2013) the percentage of employment in the agricultural sector was raised (from 11.4% to 13.8%) during 2008-2013, while the total number of people employed in the sector has fallen during the same period (from 516,900 to 493,900) (ELSTAT 2009, 2014). In addition, from 2008-2013 net job creation for agriculture there was an increase of 9,600 for non-youth, while for youth there was a loss of 16,800 jobs. So it appears that the decline was primarily from job losses of the youth (ELSTAT 2015).

According to European Commission (2015) more than 149000 (>50%) Greeks below the age of 25 were unemployed at the begging of 2015. This in relation to the EU resources which are available for the support of young farmers who aim to set up small businesses (European Commission, 2015) provides an incentive for young people who are thinking to migrate in rural areas, especially if family land is available for use and exploitation. According to Daudon and Vergos (2015) a “back-to-the-land” or “farmitization” movement is generated in Greece, a trend which is also supported by the media that promote educated young adults who left urban areas and moved to rural areas and set up successful agricultural business (Daudon and Vergos, 2015). It has to be mentioned that from 2007-2013, the amount of 3,906,228,424 EUR was given by the EU for the support of rural development in Greece (European Commission, 2013).

Although agriculture has the potential to offer a viable livelihood for many young people who are willing to return to rural areas and take over the family land or move to rural areas and start from scratch an agricultural business, there are some serious challenges and obstacles which should not be ignored when it comes to take that decision. Such challenges involve the shift to a different lifestyle, family land is often too small to set up a viable business and they need to have a clear business plan and some available capital before initiating their business in order to avoid financial struggles latter on, lack of training and experience in farming knowledge and agricultural methods and techniques.

Growing evidence demonstrates that young people are willing to take advantage of revitalizing agriculture in Greece (Daudon and Vergos, 2015). However, as indicated by the recent Daudon and Vergos (2015) study, it is highly important to provide individuals with the necessary tools and support (financial and technical) in order to help them overcome the serious economic, education and governmental barriers.

1.3 Medicinal & Aromatic Plants - A new old story

First recorded instructions for the use of MAPs are found in ancient Egypt papyrus dated back to 2000BC (Castiglioni and Knopf 1947). Hippocrates (460BC) who is known as "father of medicine" reports more than 400 species of plants most of which are categorized as MAPs. Theophrastus (347BC) described several MAPs while Dioscourides reports about 600 MAPs. A plant is considered to be aromatic when it contains essential oils which emit characteristic odor when released. Medicinal plant is a plant that contains one or more active substances which prevent or cure a disease (Sarlis, 1994). Aromatic and Medicinal qualities are usually found together in a species (Koutsos, 2006).

Greek flora comprises about 6000 plant species of which 500-600 are MAPs which means that Greece has a comparative advantage in comparison to other European countries. Also soil and climatic conditions benefit the development of MAPs and lead to crops of excellent quality (Papanagiotou *et al.*, 2001).

Medicinal and aromatic plants are well connected to tradition and culture of Greek population. They can be found in traditional songs, in old paintings and they are used for relief and recovery from many diseases, a knowledge that was inherited from generation to generation until our era.

2. Methodology

The main objective of the primary research was to elaborate at least 10 case studies of successful and unsuccessful attempts on cultivation of Medicinal and Aromatic Plants. Sub- objectives included determination of critical success factors, identification of good practices applied by growers, exploration of major topics where the growers need support and training, identification of main problems faced by growers and elaboration of a business plan.

Exploratory research in the form of in depth interviews was used to gain insight and understanding of the sector. Interviews were chosen over focus group, as some of the information is sensitive and to promote spontaneous responses. Interviews were conducted in two phases of stakeholder interviews. The first phase involved farm visits for in-depth interviews of existing farmers, using a structured questionnaire consisting of a series of open- ended questions, related to qualitative characteristics, to probe and encourage extensive and meaningful responses.

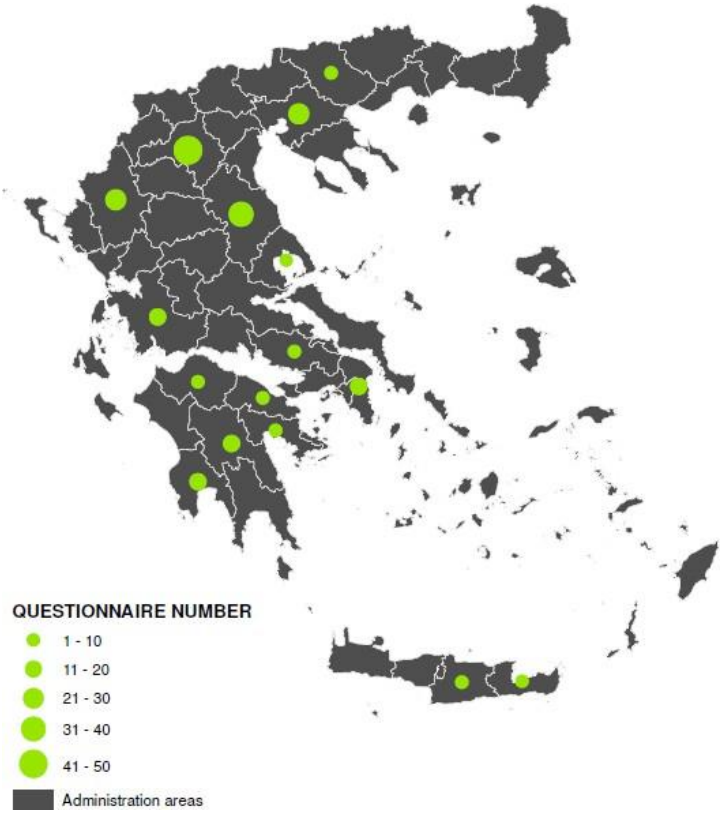


Figure 4 Questionnaire mapping in Greece

Based on these farm visits and interviews, 15 case studies were developed. The second stage involved on-site interviews of farmers and processors using a structured questionnaire to collect economic and technical data for the elaboration of a business plan. On-site interviews in farms with MAPs (16 mint, 48 oregano, 17 thyme, 22 mountain tea and 29 lavender) were performed for the economic analysis of the sector. To ensure the reliability of the data, the interviewers were trained in order to have the ability to control the quality of the data. It is important to note that newly established cultivations were also included in these on-site interview.

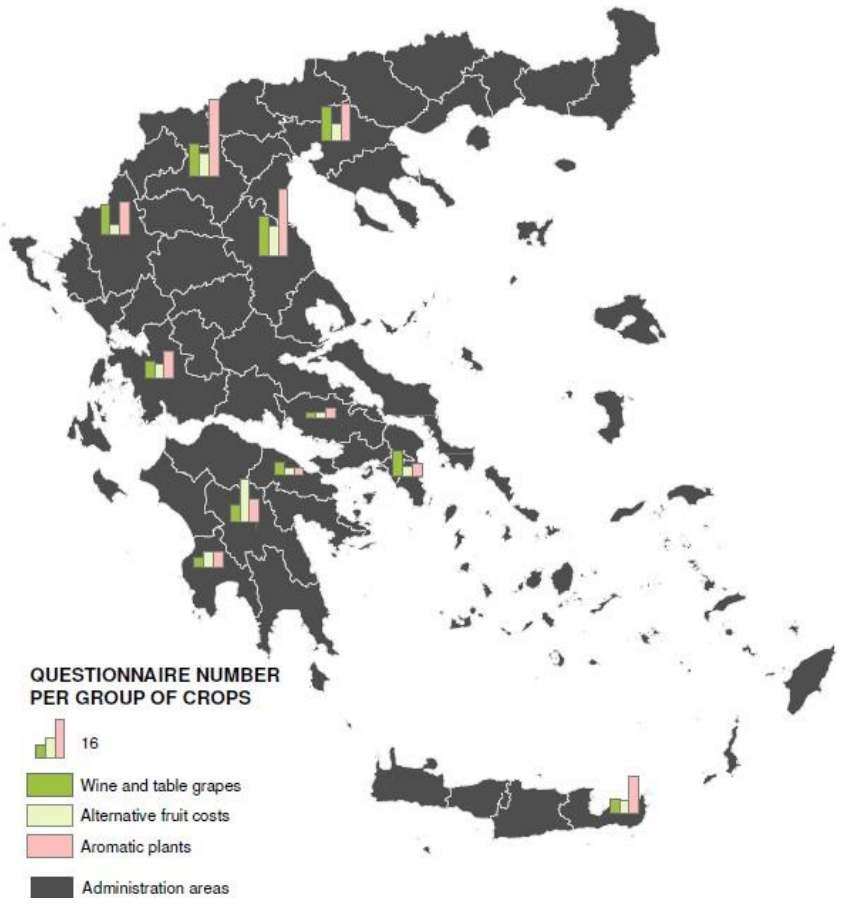


Figure 5 Questionnaire mapping per group of crops

Secondary research (literature review) examined the history, development, size of the sector, statistical information related to market size, imports and exports. Extensive literature review was made through internet research, books and articles, to collect historical data, botanic characteristic, soil-climate requirements and uses for each crop. Statistical information and

data were retrieved from Greek Authorities such as Hellenic Statistical Authority (ELSTAT), Greek Payment Authority of Common Agricultural Policy (OPEKEPE), Ministry of Rural Development and Food and European and International authorities and organizations such as Eurostat, FAOSTAT, UN COMTRADE, MarketLine, and International Trade Centre (ITC).

2.1 MAPs in Greece

In Greece there has always been wide use of medicinal aromatic plants for health boosting and beauty reasons. Traditionally the plant species that were involved in these tasks were collected from wild, native fauna. Lately there is an effort to cultivate them in more organized way. The cultivated fields are registered according to European regulations (C.A.P.) and the register is updated each year by declaration of each person or legal entity that is a farmer.

Looking into the registry the following plant species were found. These are Oregano, Lavender, Anise, Saffron, Mountain tea, Mustard, Lemon balm, Chamomile, Sage, Thyme, Rosemary, Peppermint, Spearmint, St John wort, Coriander, California bluebell, Lemon verbena, Fennel, Basil, Dittany, Marjoram, Samphire, Ghee, Wild mint, Nettle, Cardamom, Hyssop, Licorice, Cumin, Curry, Clary sage and Jasmin. There are more species cultivated in minor land areas that are not registered by their name (common or scientific) and instead of this they are registered as a common category named Several Aromatic Plants (ΑΡΩΜΑΤΙΚΑ ΔΙΑΦΟΡΑ).

The number of farms that are currently involved in MAPs cultivation has been fluctuating the last 10 years. Data taken from Hellenic Statistical Authority are presented in the following Table.

Table 9 Total number of farms that produce MAPs in Greece (ELSTAT, 2015)

Regional Unit	2005	2007	2009	2013
RU ATHENS				
RU AITOLOAKARNANIA			12	7
RU EASTERN ATTIKA				10
RU ARGOLIS		6		
RU ARCADIA			5	30
RU ARTA			3	7
RU ACHAIA				9
RU VOIOTIA				32

Regional Unit	2005	2007	2009	2013
RU GREVENA	3	3	8	
RU DRAMA	4		3	
RU WESTERN ATTICA				
RU DODECANESE				
RU EVROS	81	32	28	38
RU EVOIA	119	146	93	43
RU EYRYTANIA				
RU ZAKYNTHOS				
RU ILEIA		21		22
RU IMATHIA	4		10	7
RU IRAKLEION	4	76	22	67
RU THESPROTIA				
RU THESSALONIKI	115	225	271	238
RU IOANNINA				7
RU KAVALA	9	4		
RU KARDITSA	4	35	17	33
RU KASTORIA			9	15
RU KERKYRA				
RU KEFALHNIA				
RU KILKIS	21	96	40	53
RU KAZANI	788	685	413	489
RU KORINTHOS				5
RU KYKLADES		10		16
RU LAKONIA		5	3	9
RU LARISA		50	19	42
RU LASITHI				
RU LESVOS		17	27	28
RU LEYKADA				
RU MAGNESIA	132	109	103	61
RU MESSINIA			8	26
RU XANTHI	14	4		22
RU PEIRAIUS		6		
RU PELLA	12	5	10	56
RU PIERIA	12	20	16	52
RU PREVEZA				27
RU RETHIMNO		9		
RU RHODOPE	13	50	45	16
RU SAMOS	4	3		
RU SERRES	8	15	13	10
RU TRIKALA			11	10
RU FTHIOTIDA	6		5	21
RU FLORINA		47	54	74
RU FOKIDA				
RU HALKIDIKI	55	62	57	175
RU CHANIA				26
RU CHIOS		8		5
TOTAL FARMS	1408	1749	1305	1788

Table 10 Number of producers and mean area per cultivated MAP and producer (OPEKEPE, 2015)

Species	Nr of producers	Area (Hectares)	Mean area / producer
Oregano	1335	1366.99	1.02
Saffron	728	390.43	0.54
Mountain tea	618	305.36	0.49
Lavender	580	628.38	1.08
Melissa	468	96.40	0.21
Anise	312	509.14	1.63
Sage	285	63.72	0.22
Thyme	276	57.88	0.21
peppermint	247	24.47	0.10
Rosemary	246	46.80	0.19
Mint	188	25.15	0.13
Chamomile	162	81.20	0.50
Coriander	153	18.65	0.12
Basil	123	10.40	0.08
Fennel	107	14.26	0.13
Lemon verbena	105	16.03	0.15
St. John wort	84	21.90	0.26
Marjoram	78	8.36	0.11
Dittany	66	8.56	0.13
Critama	45	7.99	0.18
Cardamom	39	1.31	0.03
California bluebell	34	18.05	0.53
Mustard	33	97.63	2.96
Nettle	25	1.62	0.06
Ghee	19	3.65	0.19
Hyssop	18	1.13	0.06
Wild mint	17	2.03	0.12
Curry	8	0.32	0.04
Cumin	7	0.48	0.07
Lycorice	4	0.67	0.17
Clary sage	2	0.06	0.03

The MAP species that is cultivated by most farmers is Oregano (1335 farmers) followed by Saffron (728 farmers), Mountain tea (618 farmers), Lavender (580 farmers), Melissa (468 farmers), Anise (312 farmers), Sage (285 farmers), Thyme (276 farmers), peppermint (247 farmers), Rosemary (246 farmers) and Mint (188 farmers). The rest of MAPs are cultivated by fewer farmers while Clary sage is cultivated by only two farmers in the country.

Anise, lavender and oregano are the only MAPs that mean area per farm exceeds one hectare. All the rest species are being cultivated in far smaller mean area per farm.

Table 11 Spatial abundance of cultivated MAPs in Greece

Species➡ / Prefecture⇩	Curry	Wild mint	Basil	Anise	Rosemary	Dittany	Spearmint	Thyme	Cardamom	Coriander	Samphire	Saffron	Cumin	Lavender	Lemon verbena	Marjoram	Fennel	Lemon balm	Peppermint	Oregano	Mustard	Clary sage	St John wort	Mountain tea	Nettle	Hyssop	California bluebell	Sage	Chamomile	Licorice
ACHAIA					*			*										*		*				*			*			
AITOLOAKARNANIA			*		*			*						*	*	*		*	*	*			*	*				*	*	
ARCADIA			*		*			*				*		*		*	*	*	*	*	*		*	*				*		
ARGOLIDA					*		*	*									*	*		*								*		
ARTA																		*		*				*						
CHALKIDIKI			*	*	*	*	*	*	*	*	*			*	*	*	*	*	*	*			*	*		*		*	*	
CHANIA			*		*	*	*	*							*	*	*	*	*	*				*	*		*	*		
CHIOS				*			*	*						*		*		*		*								*		
KARDITSA			*		*		*	*						*	*	*		*	*	*			*	*	*			*	*	
THESSALONIKI	*		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
DRAMA		*			*			*	*	*				*		*		*	*	*			*	*	*			*		*
EASTERN ATTIKA			*		*	*	*	*	*	*	*			*	*	*	*	*	*	*			*	*	*	*		*	*	*
EVOIA			*	*	*		*	*	*	*				*	*	*	*	*	*	*			*	*	*		*	*	*	
EVRITANIA																				*										
EVROS					*		*	*		*				*	*	*	*	*	*	*			*	*				*	*	
FLORINA			*	*	*		*	*				*		*				*	*	*	*		*	*			*	*	*	
FOKIDA					*		*	*						*				*	*	*				*				*		
FTHIOTIDA			*	*	*	*	*	*				*		*	*			*	*	*				*		*		*	*	
GREVENA					*		*					*		*	*			*	*	*			*	*			*	*	*	
HERAKLEION			*		*	*	*	*			*			*	*	*	*	*	*	*				*	*			*	*	
IKARIA					*			*										*										*		
ILEIA			*		*			*						*	*		*	*	*	*				*				*	*	
IMATHIA	*		*	*	*	*	*	*	*	*			*	*	*	*	*	*	*	*	*		*	*	*	*	*	*	*	
KASTORIA					*			*						*				*		*				*				*		
KAVALA	*		*		*	*	*	*						*		*		*	*	*			*	*	*			*	*	
KEA					*	*		*						*						*			*					*	*	
KEFALONIA					*			*						*				*	*	*			*						*	
KERKYRA																		*		*										
KILKIS		*	*	*	*		*	*						*	*			*	*	*			*	*			*	*	*	
KORINTHOS		*	*		*	*	*	*	*	*				*	*		*	*	*	*				*	*			*	*	
KOS																		*		*										

Species➡ / Prefecture ➪	Curry	Wild mint	Basil	Anise	Rosemary	Dittany	Spearmint	Thyme	Cardamom	Coriander	Samphire	Saffron	Cumin	Lavender	Lemon verbena	Marjoram	Fennel	Lemon balm	Peppermint	Oregano	Mustard	Clary sage	St John wort	Mountain tea	Nettle	Hyssop	California bluebell	Sage	Chamomile	Licorice
KOZANI	*		*	*			*	*				*		*	*	*		*	*	*	*		*	*			*	*	*	
LAKONIA					*			*						*	*	*	*	*	*	*			*	*				*		
LARISA		*	*	*	*	*	*	*			*	*		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
LASITHI			*		*	*	*	*	*	*	*			*	*	*	*	*	*	*			*	*				*	*	
LEMNOS				*				*										*		*										
LESVOS				*									*					*		*										
LEYKADA			*		*			*						*				*		*								*		
MAGNESIA		*	*		*		*	*						*	*	*		*	*	*			*	*				*	*	
MESSINIA			*		*		*	*						*	*	*	*	*	*	*				*		*		*	*	
NAXOS		*			*			*			*			*				*		*			*				*	*		
PAROS					*	*	*	*						*	*			*	*	*								*	*	
PELLA			*	*	*		*	*	*	*				*	*	*	*	*	*	*			*	*			*	*	*	
PIERIA	*		*	*	*		*	*	*	*				*	*	*	*	*	*	*			*	*		*		*	*	
PREVEZA		*			*		*	*						*	*			*	*	*			*							
RETHIMNO	*	*	*		*	*	*	*				*		*	*	*	*	*	*	*				*	*		*	*	*	
RHODOPE					*			*		*	*			*				*	*	*				*			*	*	*	
RHODOS		*	*		*		*	*	*	*				*		*		*	*	*	*							*	*	
SAMOS					*	*								*	*	*		*		*								*	*	
SANTORINI								*						*				*		*										
SERRES		*	*	*	*		*	*		*				*	*		*	*	*	*			*	*		*	*	*	*	
SPORADES					*			*							*		*		*	*			*	*				*		
SYROS					*		*	*			*			*		*	*	*	*	*			*					*	*	
THASOS																		*		*				*				*		
THESPROTIA			*		*	*	*							*	*	*		*	*	*				*				*	*	
TINOS																		*												
TRIKALA					*		*	*						*				*	*	*			*	*			*	*	*	
VOIOTIA		*	*	*	*		*	*	*	*				*		*	*	*	*	*	*		*	*			*	*	*	
WESTERN ATTIKA			*		*		*	*	*	*	*			*	*	*	*		*	*			*	*				*	*	
XANTHI		*			*			*			*	*		*	*	*		*	*	*			*	*	*	*		*	*	
ZAKYNTHOS																				*										

Table 12 Distribution of MAPs cultivated area in Greece

Regional Unit	Area of MAPs	% of total MAPs area	Regional Unit	Area of MAPs	% of total MAPs area
RU THESSALONIKI	890.24	23.172	RU LEMNOS	12.26	0.32
RU KOZANI	803.17	20.905	RU IOANNINA	11.95	0.31
RU EVOIA	283.10	7.369	RU THESPROTIA	11.08	0.29
RU MAGNESIA	241.39	6.283	RU KORINTHOS	10.73	0.28
RU KILKIS	222.05	5.780	RU ACHAIA	10.08	0.26
RU LARISA	144.08	3.750	RU THASOS	8.97	0.23
RU CHALKIDIKI	142.05	3.697	RU NAXOS	8.82	0.23
RU SERRES	97.03	2.525	RU ARGOLIDA	8.66	0.23
RU PIERIA	89.80	2.337	RU KAVALA	8.30	0.22
RU FLORINA	81.03	2.109	RU WESTERN ATTIKA	8.15	0.21
RU GREVENA	79.81	2.077	RU EASTERN ATTIKA	5.50	0.14
RU KASTORIA	74.99	1.952	RU KEA	5.31	0.14
RU KARDITSA	58.62	1.526	RU CHIOS	5.19	0.14
RU RHODOPE	53.76	1.399	RU SAMOS	4.68	0.12
RU AITOLOAKARNANIA	46.57	1.212	RU KEFALONIA	4.39	0.11
RU FTHIOTIDA	44.34	1.154	RU LEYKADA	4.36	0.11
RU VOIOTIA	42.50	1.106	RU RHODOS	3.39	0.09
RU TRIKALA	33.44	0.870	RU SYROS	2.79	0.07
RU EVROS	29.45	0.766	RU SANTORINI	2.76	0.07
RU DRAMA	27.33	0.711	RU PREVEZA	2.58	0.07
RU IMATHIA	22.32	0.581	RU PAROS	2.57	0.07
RU ARCADIA	21.88	0.569	RU ARTA	1.65	0.04
RU HERAKLEION	20.91	0.544	RU FOKIDA	1.60	0.04
RU MESSINIA	17.79	0.463	RU IKARIA	1.54	0.04
RU LAKONIA	17.48	0.455	RU KERKYRA	1.31	0.03
RU XANTHI	15.84	0.412	RU EVRITANIA	1.25	0.03
RU LESVOS	15.75	0.410	RU KOS	1.07	0.03
RU LASITHI	15.12	0.393	RU MILOS	0.77	0.02
RU ILEIA	14.82	0.386	RU SPORADES	0.24	0.01
RU RETHIMNO	14.58	0.379	RU TINOS	0.09	0.00
RU PELLA	14.57	0.379	RU ZAKINTHOS	0.05	0.00
RU CHANIA	14.04	0.365			

2.2 Cultivation of MAPs

A brief description of cultivation needs of some of the most important greek MAPs is presented below.

Greek mountain tea, *Sideritis* sp.

Sideritis sp, is native to Greece and grows at altitude above 1000 m. in subalpine and alpine regions. It prefers rocky limestone. As cultivated plant it can withstand very low temperatures and has limited demands on soil nutritional elements. In order to avoid degrading the quality it should be cultivated under natural conditions, in terms of altitude and terrain. It can be propagated with seeds and with offshoots. Planting should take place in the fall (October- November) or early spring (February-March). The first period has been proven to be best.

Plant protection. There are not serious pests and diseases, Mountain tea has great need of weeding in order to avoid reduced production and maintain the productivity of the plantation for more years. Due to non-existence of an efficient herbicide, carving remains the best way for weed control

Harvest. This is usually done in July when the plants are in full bloom. The whole inflorescence is cut. Then the harvested flowers are taken to dry. Drying must be done in the shade in order not to have deterioration of quality. The length of sustainable production ranges from 5 to 8 years and from third year on production is about one ton per hectare (Goliaris *et., al.* 1999; Koutsos, 2006).

Oregano, *Oreganum* sp.

Native plant mainly found in calcareous soils. The main feature is that it prefers not so fertile soil. Its preference in arid areas rather is more related to the lack of serious competition from other plants. It can grow well on poor farmland. Propagation is done with seeds and rooted cuttings. Fertilization can affect timing of flowering, morphological features such as height and size of the inflorescence, dry weight, essential oil content, and other characteristics as the rate of moisture loss (drying in shade).

Plant protection: There are not significant pests or diseases under greek conditions.

Harvest: Oregano is harvested after flowering has finished. The cutting height should be about 5-8 cm. (Panou-Filotheou, 2009; Koutsos, 2006)

Mint – *Mentha piperita*

It prefers deep fertile soil, with humus in cool and well ventilated placea so that it can develop rhizomes. Preferred propagation method is by planting rooted cuttings. It is very demanding in water. 880 g water is required for the creation of 1 g of dry matter. Essential oils are secondary metabolites and their creation demands trace elements.

Plant protection: Mint is a competitive plant as it possesses many rhizomes in the ground and dense growth. Crafting is appropriate method for weed control. Numerous parasites identified in mint cultivation. Fungi attack the aerial parts (*Puccinia menthae, Verticillium dahliae, Verticillium albo-atrum, Verticillium nigrescens, Erysiphe cichoracearum, Ramularia menthicola*) and the underground part (*Rhizoctonia solani, Macrophomina phaseoli*). Insects attack the aerial parts (*Eu*pterix atropunctata, *Lygus sp., Syngamia abruptalis, Peridroma saucia, Loxostege stricticalis, Cacoecia epicyrta, Euxoa ochrogaster*) and infect leaves (*Cassida viridis, Chrysomela menthastri, Longitarsus waterhousei, Longitarsus lycipi, Oecanthus pellucens, Tetranycus urticae, Aleurodes menthae, Philaenus spumarius, Aphis menthae, Myzus persicae*). Nematodes attack the underground part (*Pratilenchus scribneri, Pratilenchus peetrans, Pratilenchus laticauda, Meloidogyne hapla, Longidorus elongates*) while viruses attack the leaves and transmitted by aphids *Aphis menthae* and *Myzus persicae*. Most important of them are *Pucinia menthae*, *Longitarsus* sp. and nematodes

Harvest: If the cultivation is for producing mint leaves two crops per year are possible, one before flowering at the end of June and one more in August. (Panou-Filotheou, 2009; Koutsos, 2006)

Lemon balm – *Melissa officinalis*

Duration of plantation is about five years. Propagation is done by seeds and rooting of cuttings. Each developed old plantation plant can produce 15-25 rooted plants. New plantations can be established during autumn and spring. It is a demanding crop in terms of irrigation and it likes partly shade. It needs fertile soil rich in nutrients in order to have a good produce. Melissa is very sensitive to herbicides.

Harvest is done by mower before flowering, preferably in dry weather (Panou-Filotheou, 2009; Koutsos, 2006).

Sage – *Salvia officinalis*

It is found in places that are rather warm with direct sun exposure. Plantation lasts three to five years. It is propagated by seeds or cuttings. It is not demanding crop in terms of irrigation or soil nutrients.

Plant protection: weed control must be done by carving between the lines. Fungi that attack sage are *Puccinia salvia* (leaves), *Oidium erysiphoides* (leaves) and *Thielaviopsis basicola* (roots) while insect pests that attack mainly leaves are *Psylliodes attenuate*, *Arima marginata*, *Arctia caja* and *Ceroplastes sinensis*.

Harvest is done in full bloom, from May to June. The entire aboveground part of the plant is harvested to a height of 10 cm, in order to be able to resprout (Panou-Filotheou, 2009; Koutsos, 2006).

Rosemary – *Rosmarinus officinalis*

It is a resistant plant at both low and high temperatures. It survives on poor, degraded soils but prefers the sunward, light, free draining soils. It does not like excess moisture in the soil. It is propagated with seed and rooted cuttings. Rosemary has limited demands in nutritional elements, however there is bigger production when fertilized.

Plant protection. Rosemary is very competitive crop. It needs weed control when it is young and small. There are no significant pests and diseases.

Harvesting. Rosemary has flowers almost all year. When it is harvested for leaf dry material is the criterion and best ratio of dry material is at winter time, while biggest content of essential oils is found in spring and summer (Panou-Filotheou, 2009; Koutsos, 2006).

Thyme – *Thymus vulgaris*

It grows abundant in Mediterranean and immediately adjacent to this zone from coastline up to 1400 m height. Regardless of the altitude, it is found in areas with degraded or much degraded vegetation after fire. Thyme is found in dry stone or sandy soils, well drained and

sunward. It is propagated by seeds or rooted grafts. It can successfully withstand periods of drought but it produces better yield when irrigated.

Plant protection: Thyme cannot compete broadleaf weeds when growing on fertile soil. If, however, sowing distances are such as to cover all the ground, then with slight support by hand cultivation remains clean. The fungus *Rosellinia necatrix*, grows between the bark and the wood and leads the plant to weakening and withering. Numerous nematodes are thyme pests like *Paratylenchus sp., Meloidogyne hapla, Ahelenchooides rizema bosi*, *Tylenchohynchus dubius* and *Paratylenchus crenatus*. Insects like *Empoasca vitis* infest young plantations.

Harvest: The time of harvest affects the quantity of crop. Essential oils present considerable variation as maturation of cultivation progresses (Panou-Filotheou, 2009; Koutsos, 2006).

Lavender – *Lavendula angustifolia*

There are early, mid, and late season flowering varieties available. Lavender grows best in light soil within a pH range of 6.4-8.3, sand, or gravel, in a dry, open and sunny position. It requires good drainage and prefers a warm, well-drained loam with a slope to the south or southwest. Lavender varieties are susceptible to frost injury. English lavender (*Lavendula angustifolia*) varieties prefer chalky soils, whereas the lavandin varieties (*Lavendula x. intermedia*) require slightly more acidic soils. Propagation is done by seeds, cuttings, layering and tissue culture (micropropagation).

Plant protection. Fungi: Lavender's most important problem is wilt. Pathogens associated are root rot (*Armillaria mellea, Fusarium* sp. *Phytophthora nicotianae Pythium* sp.), wilt (*Fusarium solani, Phytophthora* spp., *Verticillium* sp.), stem blight (*Phoma lavendulae*) and leaf spot (*Septoria lavandulae*). Nematodes: Lavender is susceptible to Southern Rootknot Nematode (*Meloidogyne incognita*). There are not severe insect pests. Weed control is done by mechanical cultivation or use of mulch.

Harvesting: English lavender cultivars are best for dried flower purposes because the flowers persist on the stems when dry. Lavandin cultivars are easily separated from the stem and are better suited for essential oil and potpourri purposes. Flowers for oil production are harvested

when at about 50% blooming. Dried flowers are harvested when the first few florets are open. Essential oils are accumulated in the flowers and flower stalks. (McCoy, 2015)

2.3. Potential for expansion

Medicinal and aromatic plants are cultivated to all Greek regions. However there is diversity in species cultivated in every area. Out of thirty different MAPs registered in the official national registry of cultivated land (OPEKEPE) 28 are cultivated in Thessaloniki, 26 in Larisa, 25 in Imathia etc. Details are presented in the following table.

Table 13 Cultivated MAP species per geographic area as declared in official registry (period 2015)

Regional Unit	Cultivated MAPs species	Regional Unit	Cultivated MAPs species	Regional Unit	Cultivated MAPs species
THESSALONIKI	28	KARDITSA	15	KEA	8
LARISA	26	DRAMA	15	KEFALONIA	8
IMATHIA	25	EVROS	15	ARGOLIDA	7
EASTERN ATTIKA	22	MAGNESIA	15	KASTORIA	7
CHALKIDIKI	21	MESSINIA	15	LEYKADA	7
EVOIA	20	RHODOS	15	ACHAIA	6
PIERIA	20	ARCADIA	14	IKARIA	4
RETHIMNO	20	AITOLOAKARNANIA	13	LEMNOS	4
VOIOTIA	20	GREVENA	13	LESVOS	4
LASITHI	19	SYROS	13	SANTORINI	4
PELLA	19	THESPROTIA	13	THASOS	4
SERRES	19	ILEIA	12	ARTA	3
KORINTHOS	18	LAKONIA	12	KERKYRA	2
KOZANI	18	RHODOPE	12	KOS	2
HERAKLEION	17	TRIKALA	12	EVRITANIA	1
WESTERN ATTIKA	17	PAROS	11	TINOS	1
XANTHI	17	NAXOS	10	ZAKYNTHOS	1
FLORINA	16	PREVEZA	10		
FTHIOTIDA	16	FOKIDA	9		
KAVALA	16	SAMOS	9		
KILKIS	16	SPORADES	9		
CHANIA	15	CHIOS	8		

From the data we can see that traditional agricultural areas present a wide range of cultivated species. In contrast, classic tourism destinations do not cultivate a big variety of MAPs. The variability of MAPs range cultivated per region does not seem to follow a specific pattern. Therefore there seems to be no geographic or climate factor that affects the distribution of species for example Serres and Trikala have about the same topography and climate and share common agricultural products, while Serres host 19 and Trikala 12 cultivated MAP species.

Table 14 Geographic areas that a MAP species is cultivated as they were declared in official registry (period 2015)

MAP species	Location	MAP species	Location	MAP species	Location
Oregano	59	Lemon verbena	32	Nettle	13
Lemon balm	56	St. John wort	32	Wild mint	12
Thyme	50	Basil	30	Samphire	11
Rosemary	49	Marjoram	30	Hyssop	10
Sage	49	Fennel	24	Saffron	9
Lavender	47	California bluebell	17	Mustard	8
Peppermint	42	Anise	16	Curry	6
Mountain tea	41	Dittany	16	Cumin	3
Chamomile	37	Coriander	16	Licorice	3
Spearmint	35	Cardamom	13	Clary sage	2

There are not so many restrictions in the species that could be cultivated. For example Mountain tea would suffer in very hot areas but it is cultivated from Crete to the very northern part of Greece, while the altitude that is selected for its cultivation is from 500 m and above. Greece offers a great range of microclimates that can permit the cultivation of a wide variety of MAPs all over the country. The existence of market or processing facilities for the products is one determining factor that can affect the decision of which crop is selected to be cultivated rather than climate, topography or soil. This fits perfectly the case of lavender. Lavender if found in almost all country. However the vast majority of cultivated area is in Kozani (37%), Kilkis (13%) and Thessaloniki (10%) followed by adjoined Grevena, Chalkidiki, Florina, Serres and Kastoria.

Table 15 Locations of main lavender cultivated areas

LOCATION	AREA	% OF TOTAL LAVENDER AREA
KOZANI	232.86	37%
KILKIS	84.42	13%
THESSALONIKI	62.14	10%
GREVENA	58.55	9%
CHALKIDIKI	26.93	4%
FLORINA	26.69	4%
SERRES	20.75	3%
KASTORIA	19.72	3%
REST OF GREECE	11.67	15%
TOTAL AREA	628.38	

There is no technical reason why this happens. The only answer is that obviously in those locations there was a rapid development of the cultivated lavender area because distilleries that produce lavender oil are concentrated there. The same pattern is observed for oregano that 50% of Greek oregano is cultivated in Thessaloniki area near oregano oil producing distilleries and meat industry. Similarly anise is mostly cultivated in Evoia, Thessaloniki, Chalkidiki, Florina, Larisa, Limnos and Lesvos where traditional greek spirits like ouzo and tsipouro producing distilleries are and use it as first material.

From all the above the conclusion is that there are no serious climatic or soil dependent factors that would restrict the development of MAPs all over Greece since there are suitable conditions (microclimates) in almost all geographic locations. However if this will happen it depends on how friendly will the economic environment be. It seems that at the regions that processing companies operate, the cultivated areas producing MAPs used as first materials exhibit rapid growth. In other words, if we want MAPs sector to be developed in this country we should have a holistic approach and we should develop the MAPs supply chain as a whole meaning primary production in combination with processing.

2.4 Technical systemic approach to Integrated Crop Management.

Preparation for cultivation of MAPs

Modern cultivation practice should incorporate the traditional farming knowledge together with administration and organization of work and farming functions. For the building of a successful business in agriculture there must be some preparation activities so that main factors that can affect its success will be studied and taken under consideration. For MAPs there are five distinct phases in order to go from the idea to selling ready to use products for the final consumers. Those phases are:

1. Phase 1: From idea to Decision. In this phase a comprehensive market research should be conducted in order to investigate what would be the best choice in terms of cultivated species, in which form these should be sourced to the market (dry plant material, essential oils etc.), what are the optimum soil and climate conditions and which is the range of values of the above mentioned parameters that permit the viable production of specific plant species. A master plan must be scheduled and this will be followed during the investment realization.

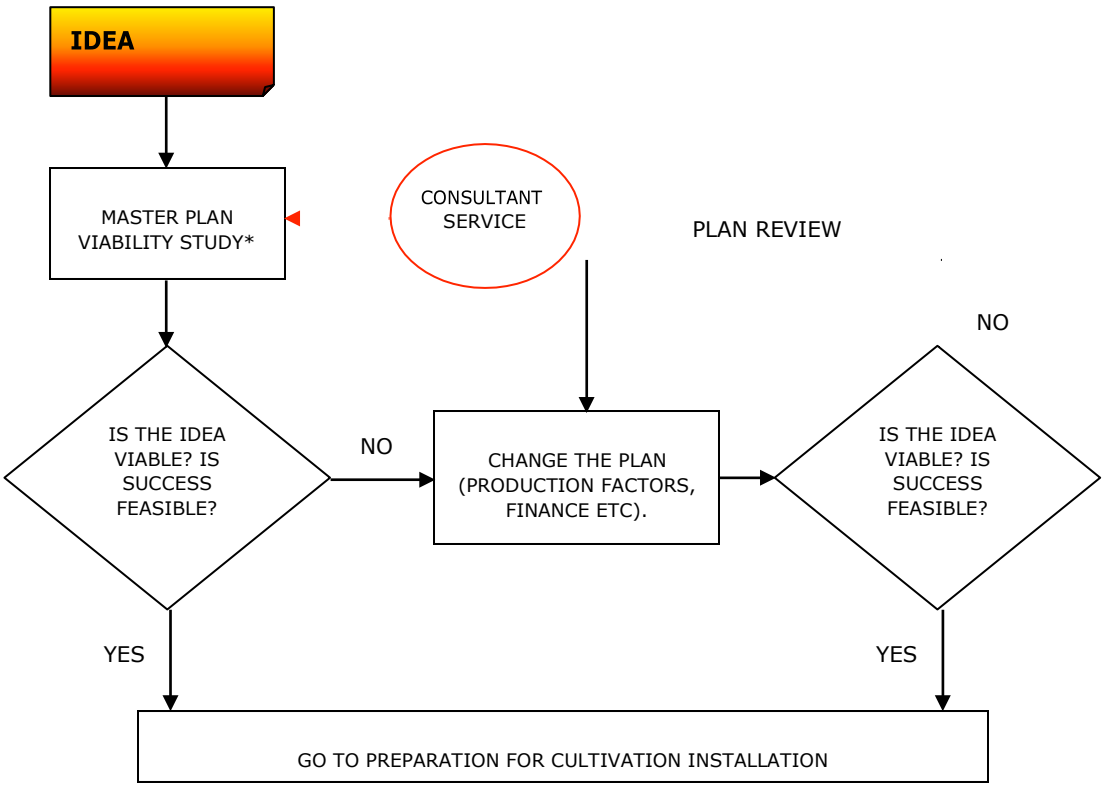


Figure 6 Preliminary works from idea to preparation for cultivation installation

2. Phase 2: Preparation for cultivation. In this phase. This phase includes all necessary actions for legal and financial arrangements as well as infrastructure construction so that everything will be taken care for the installation of plantations. In this phase land must be made available for the plantation and other facilities such as roads, irrigation networks, nurseries and other facilities must be programmed and/or constructed.

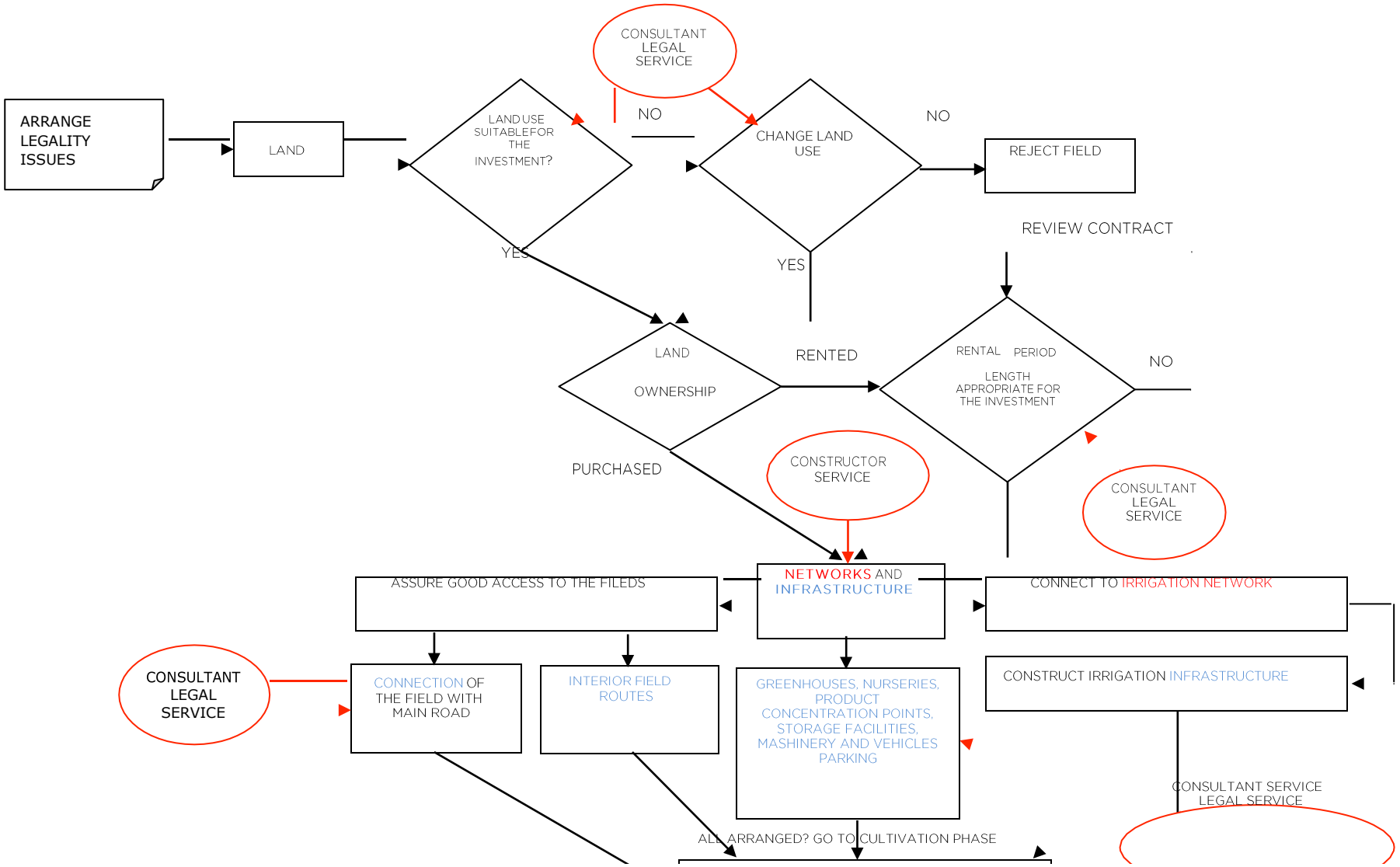


Figure 7 Preparation for cultivation installation

3. Phase 3: Installation of cultivation to harvest. This phase starts with the preparations for agriculture practice like soil analysis before seeding or planting. In terms of a modern knowledge based agriculture all major issues concerning agriculture should be arranged, programmed and all plants' needs and alternative actions to meet them should be written down in the form of management plans. Therefore there must be at least the following management plans:

   - Soil Management Plan, which describes the soil structure, its contained levels of nutritional elements and handling of soil via specific practices in order to protect from factors such as erosion or compaction and moreover to improve it in terms of mechanical or nutritional composition.
   - Propagation Material Management Plan which will describe what is the propagation material used by the company, how it is produced or purchased, what are the desired qualities, how they are assured and other technical issues like what is the time, manner, distances etc. of seeding or planting.
   - Irrigation Management Plan which describes the demands in irrigation, irrigation timing, quantity of water and means for irrigating the plants.
   - Cultivation techniques Management Plan, which describes the works done in the field (tilling, pruning etc.), when how and by whom they are done.
   - Fertilization Management Plan which describes the kind, timing, quantity and method of fertilizers and other substances used for plant nutrition
   - Plant Protection Management Plan which describes the exact actions that should be taken in the appearance of a pest or disease in the plantation, what plant protection product should be used, how, when, in what dosage etc.
   - Harvesting Management Plan which describes what it the optimum stage for harvest of the product, how the harvest should be done, by whom, so that the company would assure that it gets the best of plant qualities in the harvested product.
   - Infrastructure, Tools and Machinery Management Plan which describes maintenance, adjustments, calibration and verification of the used machinery and tools in the company.

- Personnel Health, Safety and Training Management Plan which describes all the precautions taken by the company for the safety of personnel during work as well as the training activities for the personnel so that it is highly qualified in order to “do the job right”.
- Emergency Management Plan should describe standardized operational procedures that should be applied in case of some emergency situation. This plan should include cases of extreme weather conditions, accidents that personnel is involved, cases like fire or even cases like changes in legislation or customer demands or even financial related issues (capital controls!)
- Environment Management Plan should describe all necessary procedures applied by the company in order to make sure that basic environmental legislation is met and its operation does not harm the environment.
- Economics and Finance Management Plan should be designed so that cash flow in critical periods of the season should be available for the smooth operation of the company. This because unlikely other business in agriculture everything must be on time because plant follow the rhythm of nature, so all works must be done when they must be done and should not wait for later.

Except the above mentioned management plans, a modern company’s operation should be based on written, well described operational procedures that would define its main functions. Operational procedures implementation is a standardized way and is considered to be a prerequisite for all companies that seek a good reputation in terms of organization of their work, stable quality and continuous improvement. Nevertheless the existence and implementation of standardized operational procedures is an integral ingredient of quality management system of a company. The quality management system is the base for a company certificates that assure the implementation of certain standards or protocols during cultivation or processing the product. Especially for MAPs it is more than certain that a Greek company seeking for a place on the selves of stores has to have valid certificates for organic production for its products.

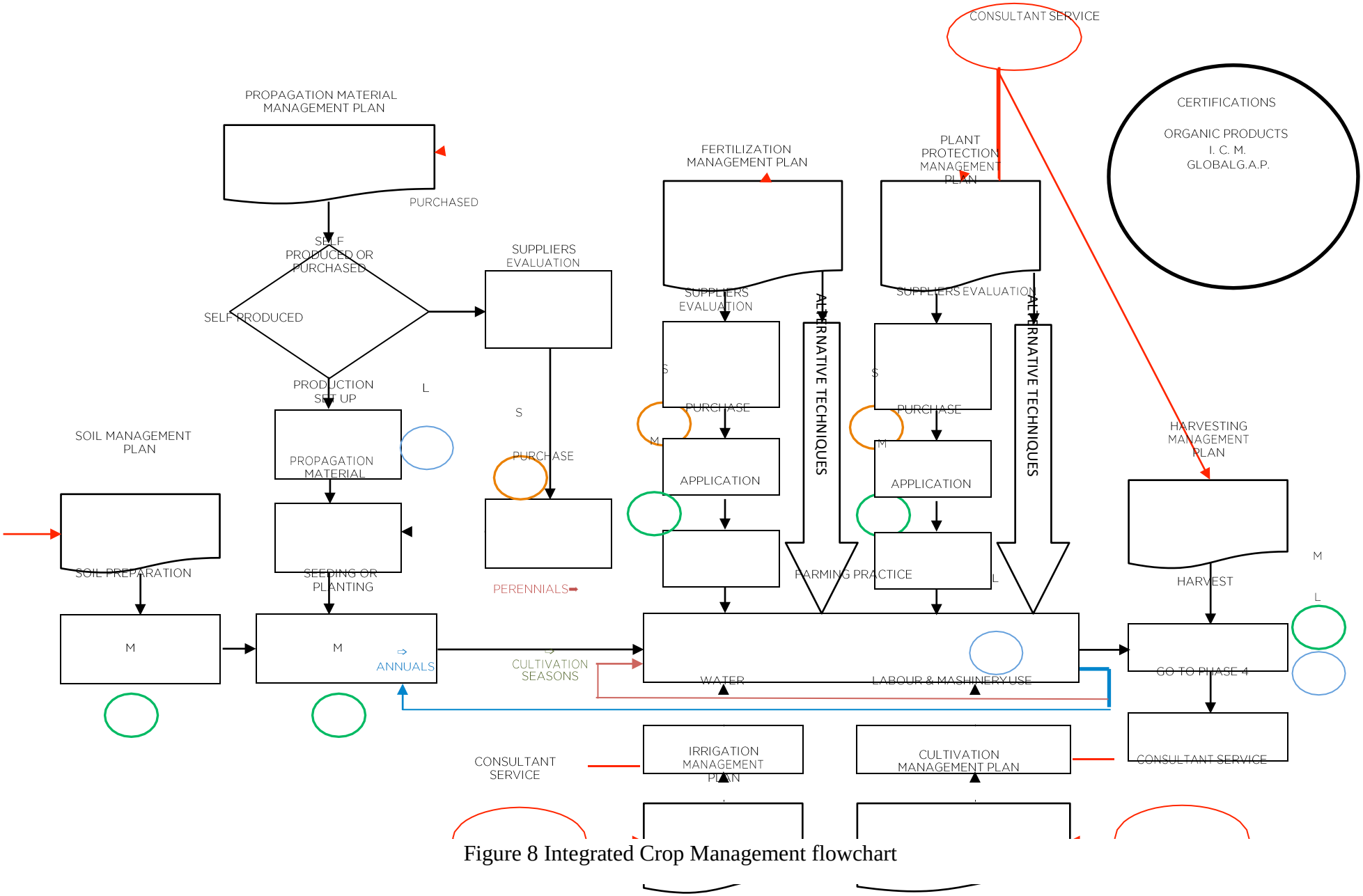


Figure 8 Integrated Crop Management flowchart

4. Phase 4: Past harvest product handling. This phase starts right after harvest and includes all the processing of the harvested plant materials and the production of semi-finished and final products. These can be as first materials in the industry or as ready to use products by the consumer.

5. Phase 5: Sales and distribution. This phase include all necessary actions that take place from the moment that a product is ready after processing to the final consumption by the customer.

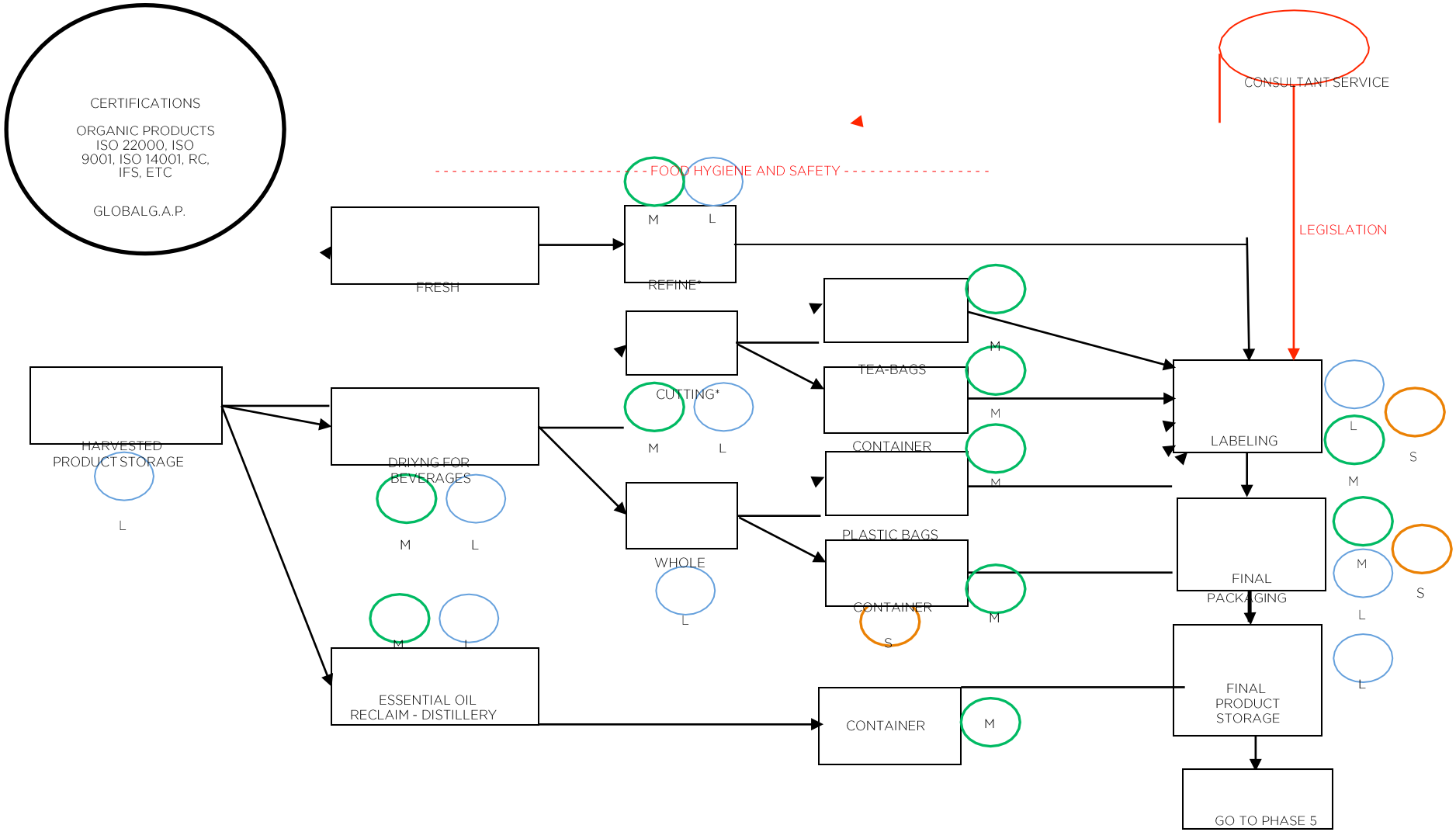


Figure 9 Post-harvest handling flow chart for MAPs

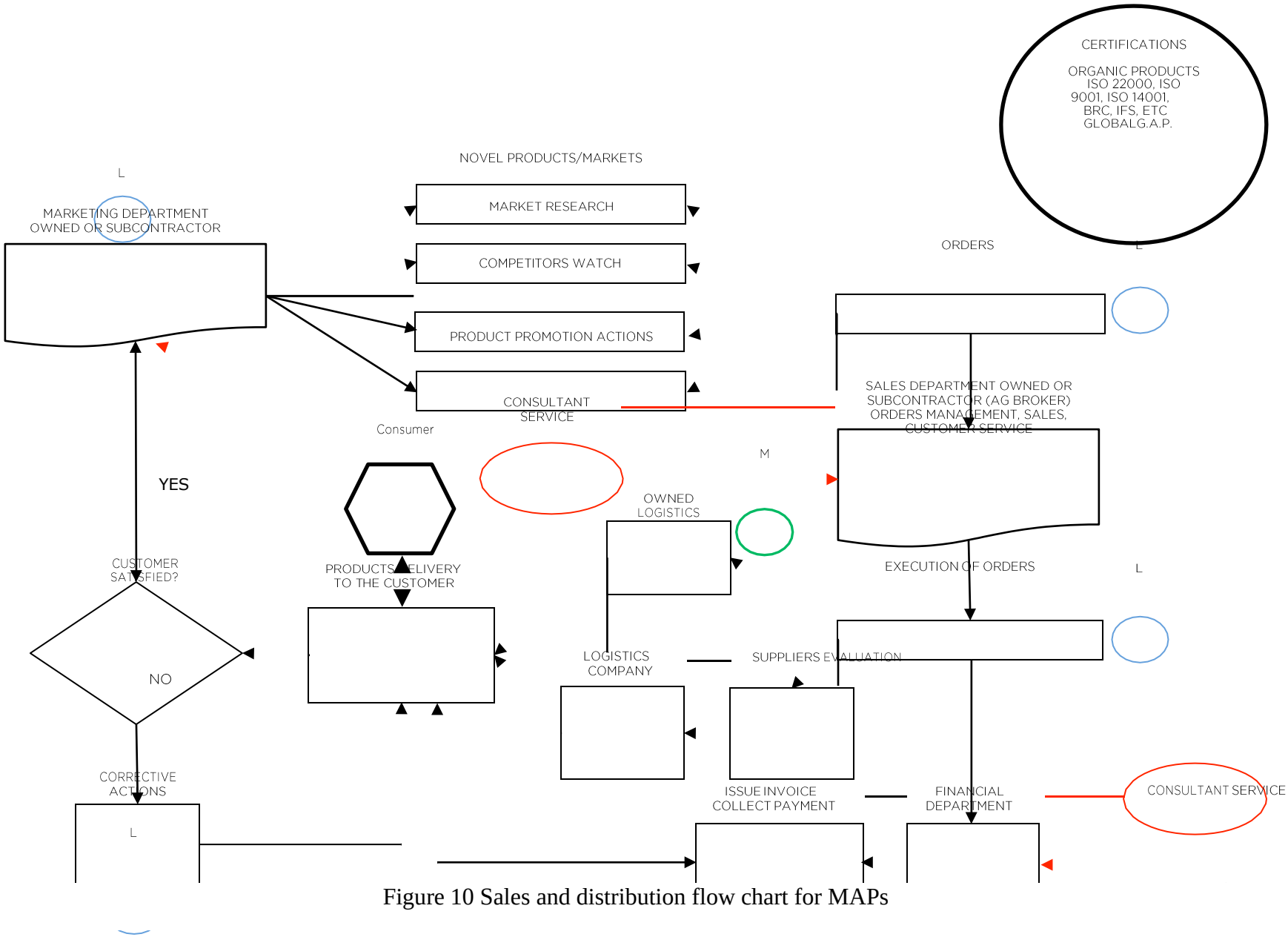


Figure 10 Sales and distribution flow chart for MAPs

2.5 Post-harvest treatment of MAPs

Medicinal and Aromatic plants in their majority are harvested either by hand, particularly with regard to cases of wild collection or by special harvesters in case of organized farms. After harvest the plant material needs to be taken care so that there will be no deterioration of its quality and to be maintained until consumption.

The most common method is the drying or dehydration. The drying must be done quickly and requires relatively high temperatures and appropriate handling for the effective removal of contained humidity. The main drying methods are:

a) drying by exposure to air, where harvested MAPs are spread in thin layers and ventilated to facilitate the drying process.

b) drying by heating using dryers, where several types of dryers are used. This equipment increases temperature and ventilates the plant material for the effective and quick removal of humidity.

c) The lyophilization is the an applied method where MAPs are frozen, so that water passes from liquid into solid state and is placed in a suitable apparatus that operates under vacuum, and very low temperature (about -60 to -70 °C). Then ice passes into the gaseous state without passing through the liquid.

Essential oils are delivered by distillation. Depending on used technology there are three types:

a) hydro-distillation or distillation with water and ethanol. The type of distillation has been widely used in the past but now it is not preferred because of side effects of the method, which facilitates the hydrolysis of several components of the essential oil and quite often leads to deterioration of quality with heating.

b) hydro-steam-distillation or distillation with water and steam. This type is better than previous one because plant material is distilled in pot and does not come into direct contact with the water, but it is instead placed in a grid, located just above the water surface.

c) steam distillation, is widely used by industries for large distillation volume. The difference from the hydro-steam-distillation is that there is no water in the bottom of the still to produce steam. The steam is produced in a special boiler or steam generator and

then inserted into the alembic wherein the plant material is typically under pressure above one atm.

For plant material that is susceptible to distillation such as flowers the method of extraction used. Depending on the extraction material used there are three types of extraction.

a) Extraction with volatile solvents. It is the most convenient method for the reception of essential oils from flowers. Ethyl alcohol is used as volatile. The product obtained by extraction after removal of the volatile solvent is called calculus and apart from the essential oil contains also various other substances (waxes, pigments, etc.). After treatment with alcohol, those substances are removed and the end product is pure essential oil.

b) Extraction with cold fat is simple and it is based on the property of fat to absorb volatile substances that are in contact with it. The used fat has to be semi-hard and clean, while plant material has to produce and disperse its fragrance after harvesting. After extraction that usually lasts 24 to 30 hours, the pomade (fat and essential oil) is treated with alcohol, whereby the fat is removed and pure essential oil is obtained.

c) Extraction with hot fat resembles the previous method and is applied in cases that of flowers do not continue production and dissemination of their aroma after harvesting. The extraction is at a temperature of around 80°C. When fat is saturated with essential oil, pure essential oil is obtained with special treatment.

d) Extraction with hydrophilic solvents where water-soluble solvents like ethylene glycol are used as extractants in or mixed with water, for receipt of more components of natural products which are used mainly in cosmetology (Polysiou, 2008).

2.6 Uses of MAPs

Medicinal and aromatic plants are used in several industries all over the world. Their qualities such as content of special substances, essential oils as well as the fact that can be used fresh, dry or processed has created a range of applications.

- Seasonings to improve food flavor (spices). Use of aromatic plants for food flavor has been applied from ancient ages. In Greece almost all meat recipes contain oregano while there are other herbs used like thyme, rosemary etc.
- Herbal teas for medical reasons. Most known species is mountain tea *Sideritis* sp., while a lot of Greek MAPs are used as herbal teas such as mint, wild mint, melissa etc.
- Food industry. MAPs are used in food industry for sensational reasons like special flavor they add to food or for functional reason like the antibacterial action they show due to high content of essential oils acting thus as preservatives.
- Pharmaceutical industry. MAPs are a rich source of chemical substances that are very active against pathogen and generally beneficial to human health. Their action has been noticed very early in human history and several well-known ancient doctors like Hippocrates or Dioscourides have left us a valuable legacy on knowledge about their use in medicine.
- Cosmetics industry. MAPs have been used in cosmetics as natural ingredients due to their positive contribution to cosmetic efficiency. Today, natural cosmetics industry is a continuously grown industrial sector and more and more consumers tend to use natural cosmetics for their personal care.
- Perfumery. Due to highly volatile content of MAPs and their pleasant aromas they are widely used as basic ingredients of perfumes, especially in the form of essential oils.
- Distillery. There are distilleries all over the world producing essential oils from MAPs. They sell those oils to several industries which use them as first materials for their products. Also there are spirits that their preparation demands the use of aromatic plants like ouzo or tsipouro that use anise as basic ingredient.

- Confectionery. MAPs are used in confectionary for their aromas.
- Beekeeping. MAPs are considered to be very valuable bee pasture flora. Their special aromas give the produced honey added value and the best example for this is thyme honey which has double price in market in relation to other flower honeys.
- Ornamental use (rock gardens, flower pots). MAPs are used by landscape architectures as ornamental and functional plants for their colors, their ability to overcome long dry seasons and their aromas.

3. Medicinal & Aromatic Plants in Greece

3.1 Current situation in farming

In Greece MAPs have been used since ancient times for medicinal and other uses. Main source of the plant material was always Greek nature. Other countries have started cultivation of MAPs like for example Bulgaria, Serbia, Hungary and other European countries many years ago. These countries are now the leaders having already been well established in world market. In our country organized MAPs cultivation except of some specific examples such as saffron in Kozani, mastic in Chios Island, mountain tea in Magnesia and oregano in Thessaloniki, is at its beginning. Unfortunately data availability via Ministry of Agriculture is limited while after 2012 is almost extinct. (Kounetas, 2014)

MAPs cultivation presents an increasing trend lately in terms of utilized area.

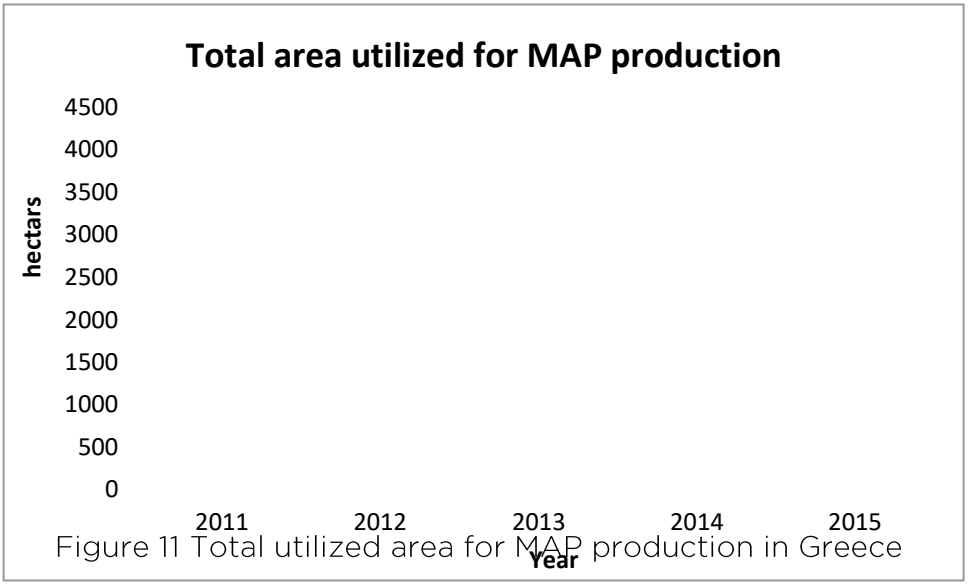


Figure 11 Total utilized area for MAP production in Greece

Detailed data from the official cultivated land registry (OSDE) are presented in the following Table for years 2011 up to 2015.

Table 16 Cultivated MAPs in Greece period 2011-2015 (Area in Hectares)

Plant species	Year				
	2011	2012	2013	2014	2015
Oregano	1039.56	974.81	961.48	1108.79	1366.99
Lavender	41.19	82.84	192.41	450.36	628.38
Anise	831.85	448.85	324.96	441.13	509.14
Saffron	232.48	222.31	260.19	331.68	390.43
Mountain tea	118.84	114.74	118.13	182.24	305.36
Mustard				8.96	97.63
Lemon balm					96.40
Chamomile				21.61	81.20
Sage	20.04	26.57	24.39	36.31	63.72
Thyme	17.92	14.07	16.64	24.10	57.88
Rosemary	7.62	12.29	16.65	25.75	46.80
Peppermint	5.66	7.17	9.55	15.39	25.15
Spearmint				2.53	24.47
St John wort				1.81	21.90
Coriander	4.29	1.92	3.85	3.42	18.65
California Bluebell			4.82	11.70	18.05
Lemon verbena				5.41	16.03
Fennel	22.86	4.18	5.00	5.07	14.26
Basil	6.82	4.69	3.26	7.35	10.40
Dittany	4.74	4.95	5.53	4.92	8.56
Marjoram	7.04	3.69	3.12	4.60	8.36
Critama				3.28	7.99
Ghee			2.20	2.44	3.65
Wild mint				0.09	2.03
Nettle				0.60	1.62
Cardamom	0.07	0.23	0.36	1.08	1.31
Hyssop	0.05	0.09	0.40	0.15	1.13
Licorice	0.15		0.21		0.67
Cumin		0.22	0.25	0.05	0.48
Curry			0.06	0.03	0.32
Clary sage	0.17	0.22	0.06	0.17	0.06
Jasmin		0.50		0.01	

As it can easily be seen the majority of MAPs show a tendency to increase cultivated area, while there are species that even if they occur in Greek flora, it is now that their production is starting to become more organized in terms of cultivation (i.e. mustard).

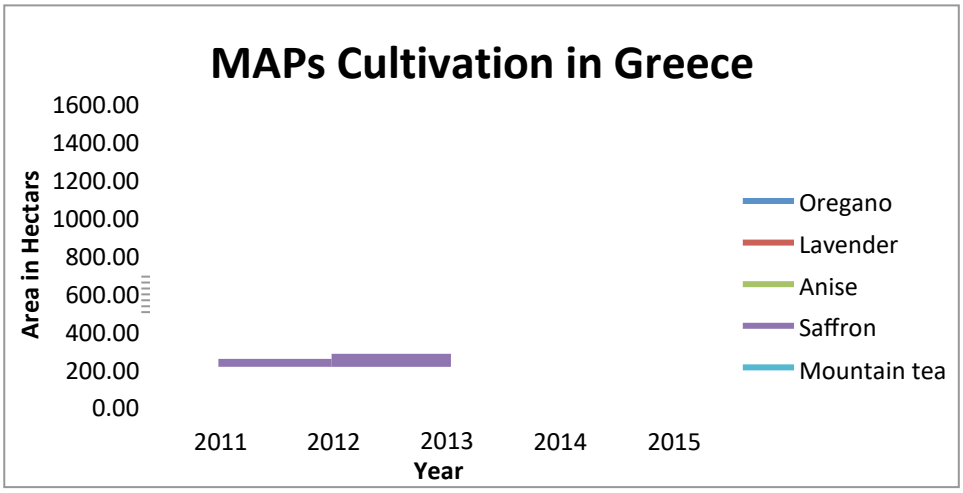


Figure 12 Area cultivated with Oregano, Lavender, Anise, Saffron, Mountain tea

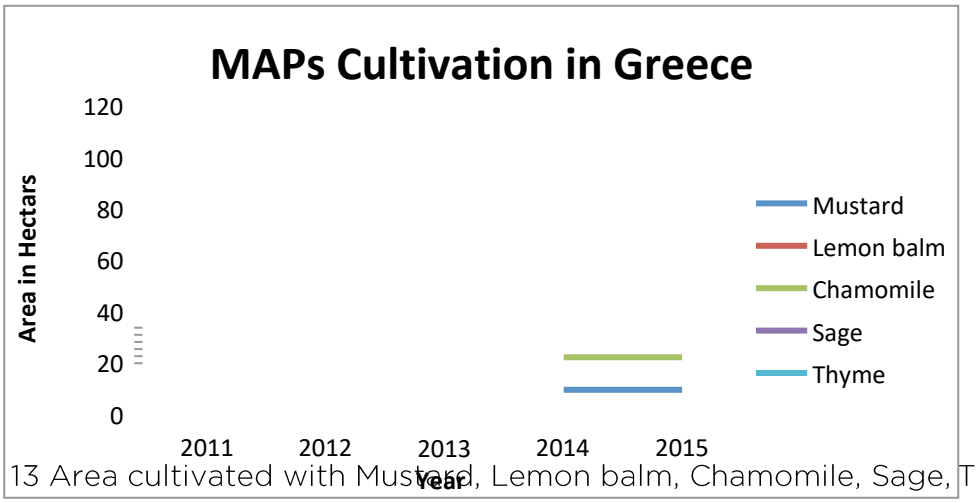


Figure 13 Area cultivated with Mustard, Lemon balm, Chamomile, Sage, Thyme

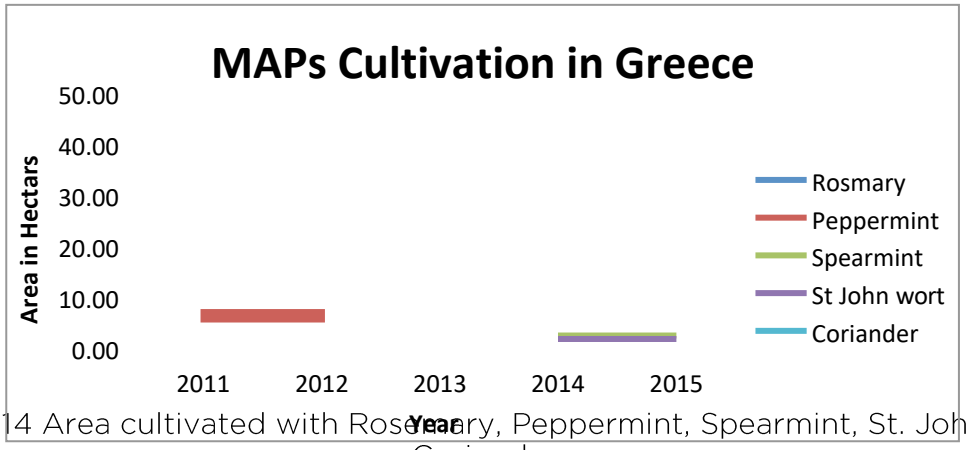


Figure 14 Area cultivated with Rosemary, Peppermint, Spearmint, St. John wort, Coriander

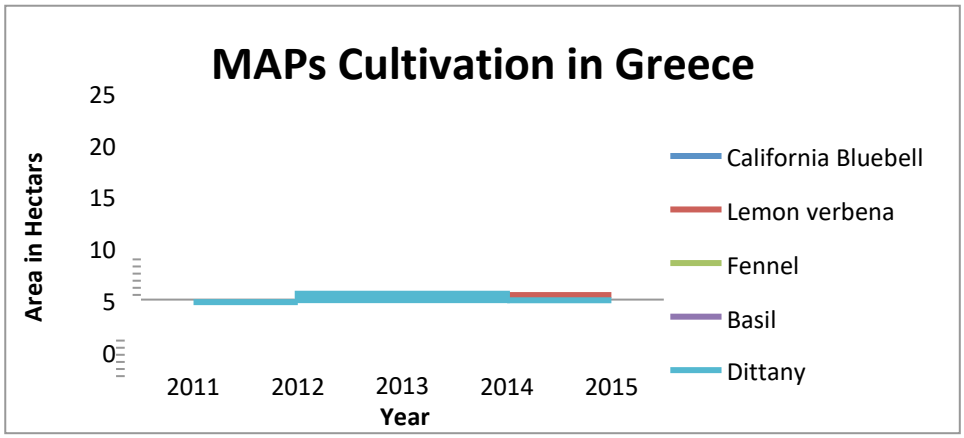


Figure 15 Area cultivated with California bluebell, Lemon verbena, Fennel, Basil, Dittany

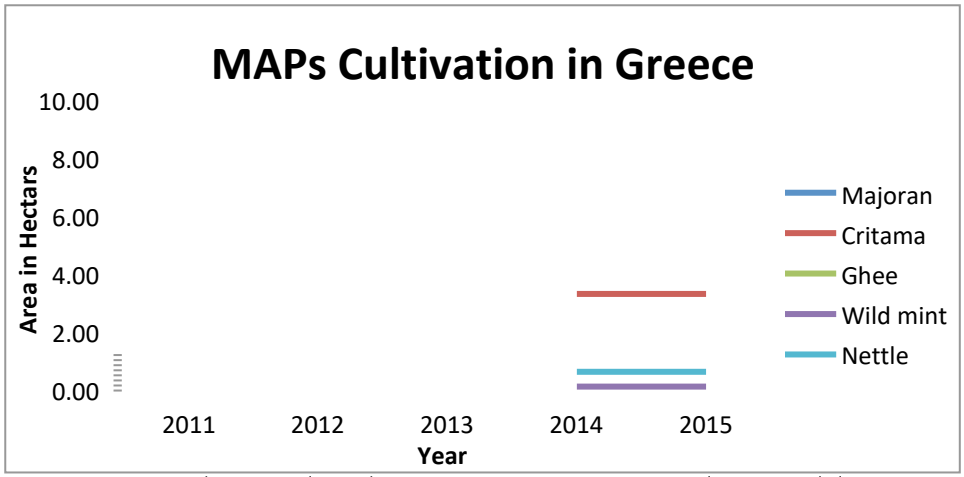


Figure 16 Area cultivated with Marjoram, Critama, Ghee, Wild mint, Nettle

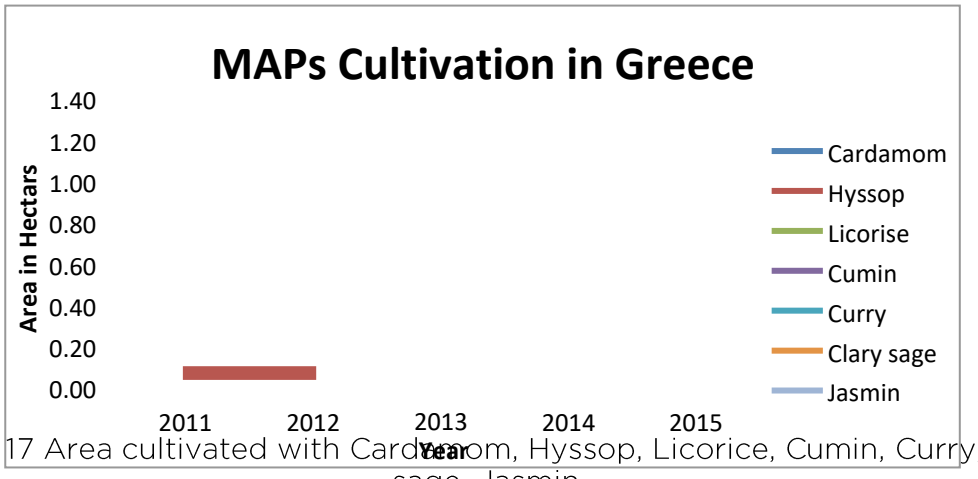


Figure 17 Area cultivated with Cardamom, Hyssop, Licorice, Cumin, Curry, Clary sage, Jasmin

3.2 Current situation in processing of MAPs by domestic industries

In Greece the most common form of used of MAPs is the utilization of dry one as food seasoning or herbal teas. There are some small family based companies that usually have their own cultivations and by products also from other farmers. They cultivate area about five hectares and prefer to have perennial species in order to minimize works like seeding. They are found all over the country. Such companies are Tea Odyssey, Holomon, Phytosophia, Organic Islands, Arogaia, Drogi, Iliostasio etc.

Another type of relative industry is MAPs distillery facilities. They are found mainly in Northern Greece and produce essential oils mainly from lavender but also from oregano and in smaller quantities from other MAPs such as rose. Such distilleries are HERBS & OILS, Vessel essential oils, Alpha lavender, PANAROMA LTD, Dioscourides, Coop of Medicinal and Aromatic plants of Voio, Eth-oil etc.

KORRES S.A. NATURAL PRODUCTS and APIVITA SA are two companies based in Attika, and they are specialized to produce natural cosmetics and fragrances from MAPs in Greece. They have invested for years in development of knowhow for natural formulations and presently they offer a wide range of products. Their presence in foreign countries is remarkable as they are exporting the biggest part of their production.

There is only one industry Vergina Brewery based in Komotini industrial area which produces ready to drink cold tea named “TUVUNU” which in Greek means Mountain tea. They are selling to all over the country and they export the product to Western Europe while they have created a daughter company in the USA for exporting the product to N. American market.

3.3 Stakeholder Brief description

An analysis will be presented containing the stakeholders (who are they, where they are located, roles and functions). Emphasis will be focused on the potential and capacity of creating added value after harvest (processing and sales).

Stakeholders of MAPs sector are all involved parts that have operational role, interests or by any means affect the sector. Following the product flow from production to consumption they could be categorized in three main categories: a) those related to farms, b) those related to processors and c) those related to sellers and consumers, d) Consumers, and e) Governments, Universities, colleges, research centers and scientific community.

a) This category includes farmers, propagation materials suppliers, pesticides and fertilizers suppliers, equipment and machinery suppliers and farm consultants. All the above stakeholders collaborate in order to realize primary production. They are suppliers of material and services and help farmers produce MAPs. Farmers associations are umbrella organizations of farmers that protect farmers' interests, inform and represent them when events or matters of high significance occur.

b) This category includes processors, constructors of processing facilities, equipment suppliers, packaging materials suppliers, consultants. These stakeholders contribute to the processing of MAPs in order to have end products ready to be bought by consumers. They collaborate with processors and this collaboration may be multileveled. Processors associations are umbrella organizations that protect processors' interests, represent them and negotiate on behalf of them with other parts, governments etc. They inform their members about recent developments, news, technical advances etc.

c) The third category includes agents, importers, exporters, wholesalers, distributors, SM chains, small retailers (including agrotourism sales), e-shops and consumers. They are all stakeholders which collaborate so that processed MAPs reach the vast majority of consumers. They are trading the products in internal market, they export them they

distribute and sell them. Their associations operate the same way as the associations of category b.

d) Consumers are the moving power of the whole system. They are the ones who buy the products supporting the rest of the stakeholders. Consumer organizations are protecting consumer's rights represents and informs them for all important issues that arise relevant to the MAPs.

e) Governments play important role are as they the legislative mechanisms that define the rules of the system, while they supervise the implementation of the rules by all parts. Universities, colleges, research centers and scientific community are the knowledge production mechanisms. By their activity they are in position to affect the performance, the behavior and the choices of all other stakeholders including governments.

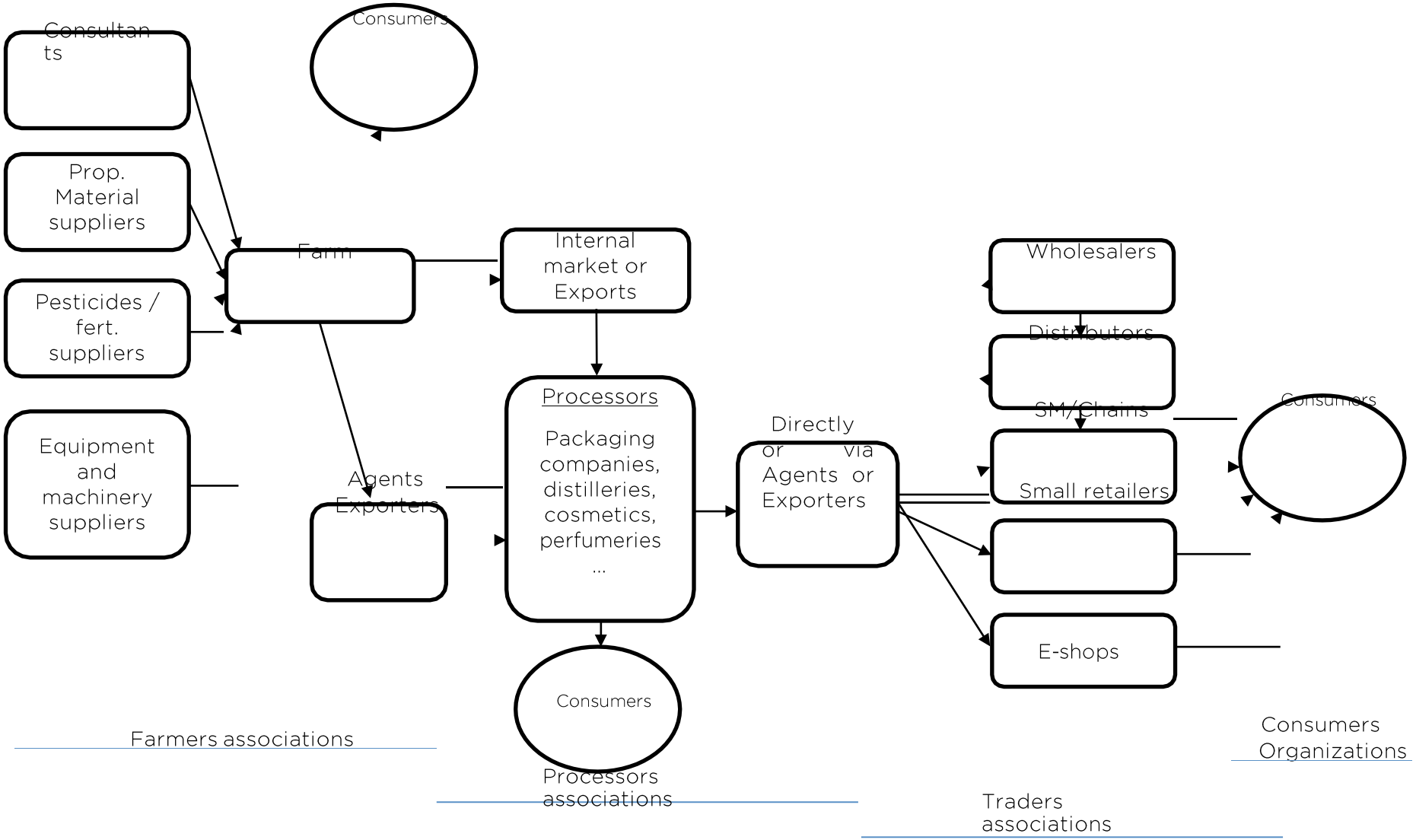


Figure 18 Flow diagram of MAPs from production to consumers where main stakeholders are presented

4. Market Analysis

4.1 Domestic market

Description of customs and trends in consumption of MAPs in Greece (Consumer habits and requirements, consumer profile)

The domestic market has been extensively researched. However there is limited availability of data especially since the financial crisis began in about 2008. From that year on there is a decrease in quantity and quality of available data by the Hellenic Statistics Authority. Based on earlier data that clearly show what the trends are there were two analyses made, one for tea and one for seasoning material from dried MAPs.

4.1.1 Domestic consumption of MAPs as herbal tea

Regarding tea consumption the Hellenic Statistics Authority has made available information on household consumption. The data present separately consumption of imported tea and native herbal teas.

Table 17 Household consumption of imported and native herbal tea in Greek Regions

	All Regional Development Services (PDS)	*1st PDS* Evros, Xanthi, Rhodope, Drama, Kavala	*2nd PDS* Thessaloniki, Imathia, Kilkis, Pella, Pieria, Serres, Halkidiki,	*3rd PDS* Grevena, Kastoria, Kozani, Florina	*4th PDS* Arta, Thesprotia, Ioannina, Preveza	*5th PDS* Karditsa, Larisa, Magnesia, Trikala	*6th PDS* Zakynthos, Kefallinia, Kerkira, Lefkada	*7th PDS* Aitolo-akarnania, Achaia, Ilia	*8th PDS* Boeotia, Evvoia, Evritania, Fthiotida, Fokida	*9th PDS* Attiki	*10th PDS* Argolida, Arcadia, Corinthia, Laconia, Messinia	*11th PDS* Lesbos, Samos, Chios	*12th PDS* Cyclades, Dodecanese	*13th PDS* Heraklion, Lasithi, Rethymno, Chania
Total number of households	3.992.964	214.408	665.301	101.524	111.256	263.222	58.945	242.341	177.168	1.581.107	196.314	75.417	99.110	206.851
Tea	0,25	0,24	0,27	0,24	0,00	0,12	0,19	0,13	0,16	0,33	0,17	0,16	0,38	0,26
Herbal tea, imported tea, European tea	0,15	0,08	0,17	0,16	0,00	0,07	0,10	0,07	0,10	0,19	0,12	0,16	0,25	0,19
Mountain tea, chamomile, dictamus, sage etc.	0,10	0,16	0,10	0,08	0,00	0,05	0,09	0,06	0,06	0,14	0,05	0,00	0,13	0,08

Figure 19 Total expenses per household for tea (imported και domestic)

Households in Aegean region and Athens followed by those of Thessaloniki spend more on tea. Thessaly and Western Greece spend less. Epirus region has not provided data however it is expected to be low since in those areas there are not big cities and there is a developed wild collection activity followed by direct sales that would not normally be recorded.

Figure 20 Yearly tea market size per region for household consumption

In terms of market size we observe that Athens market is above 6 million euros while Thessaloniki exceeds 2 million euros followed by Crete and Evros with market of 670 and 617 thousand euros respectively.

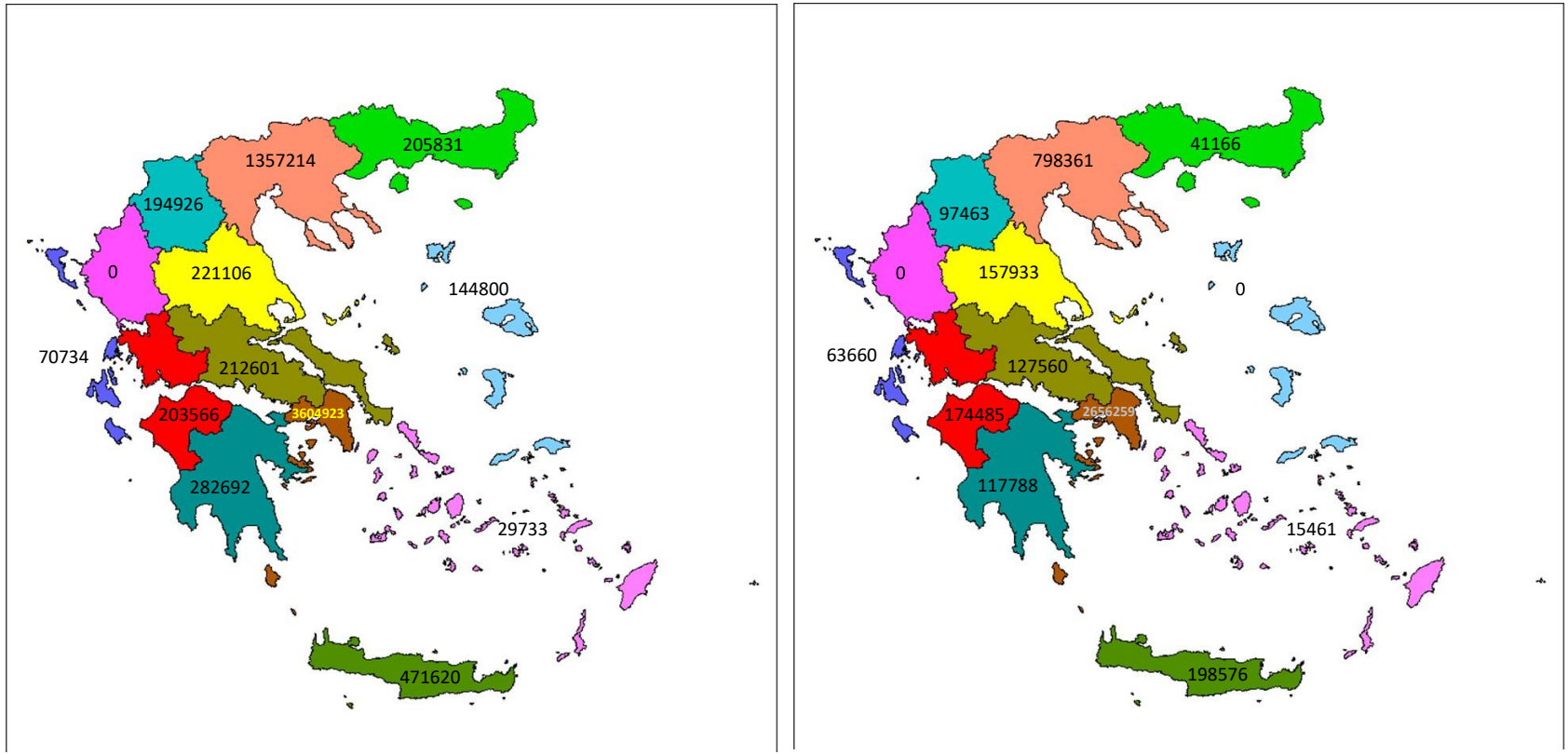


Figure 21 Yearly imported (left) and domestic (right) tea market size per region

When markets of imported tea and native herbal teas are separately plotted we observe that in all regions of the country imported tea is the type with biggest market (Greeks spend at least double money on imported than native herbal tea).

Figure 22 Percentage of the total consumption of tea per region

In terms of the percentage of money spent on tea in the country about 53 % is spent in Athens and 18% is spent in Thessaloniki followed by Crete (5.7%) and Evros (5.2%) with all other regions to cover very small percentages.

4.1.2 Domestic consumption of MAPs as food seasonings

Regarding food seasoning materials from dry MAPs information on household consumption has been made available by the Hellenic Statistics Authority. The data present separately consumption for each the regions.

Table 18 Household consumption of food seasoning from dry MAPs in Greek Regions

	All Regional Development Services (PDS)	*1st PDS* Evros, Xanthi, Rhodope, Drama, Kavala	*2nd PDS* Thessaloniki, Imathia, Kilkis, Pella, Pieria, Serres, Halkidiki,	*3rd PDS* Grevena, Kastoria, Kozani, Florina	*4th PDS* Arta, Thesprotia, Ioannina, Preveza	*5th PDS* Karditsa, Larisa, Magnesia, Trikala	*6th PDS* Zakynthos, Kefallinia, Kerkira, Lefkada	*7th PDS* Aitolo-akarnania, Achaia, Ilia	*8th PDS* Boeotia, Evvoia, Evritania, Fthiotida, Fokida	*9th PDS* Attiki	*10th PDS* Argolida, Arcadia, Corinthia, Laconia, Messinia	*11th PDS* Lesbos, Samos, Chios	*12th PDS* Cyclades, Dodecanese	*13th PDS* Heraklion, Lasithi, Rethymno, Chania
Total number of households	3.992.964	214.408	665.301	101.524	111.256	263.222	58.945	242.341	177.168	1.581.107	196.314	75.417	99.110	206.851
Food seasoning from dry MAPs		0.47	0.77	0.68	0.72	0.73	1.01	0.83	0.82	1.39	0.82	0.42	0.81	0.79
		5.64	9.24	8.16	8.64	8.76	12.12	9.96	9.84	16.68	9.84	5.04	9.72	9.48
%		2.6	13.1	1.8	2.0	4.9	1.5	5.1	3.7	56.0	4.1	0.8	0.2	4.2
Total	47065596.2	1209261.1	6147381.2	828435.8	961251.8	2305824.7	714413.4	2413716.4	1743333.1	26372864.8	1931729.8	380101.7	96334.9	1960947.5

Athens households spent about 17 euros for food seasoning materials from MAPs, followed by Ionian Islands with 12 euros per household while the rest of the regions are about the same spending from 9 to 10 euros per household.

A possible explanation for that could be the fact that most seasoning materials in Greece are imported while eating preferences are not so different

Figure 23 Average yearly expenses per household for food seasoning

between regions and there is not big difference on the total amount spent for seasoning material. In the case of tea consumption there was a significant quantity of tea that was wild collected or purchased directly from farmers and the fact that this consumed quantity could not be recorded was falsely reflected like difference in the preference of the populations living in different regions of the country.

On the other hand there are wild herbs like oregano that are collected by people. One more explanation could be the fact that people from Asia that use more spices in their food are mostly habitants of Athens and they are enough that they make a significant difference to the relevant statistics.

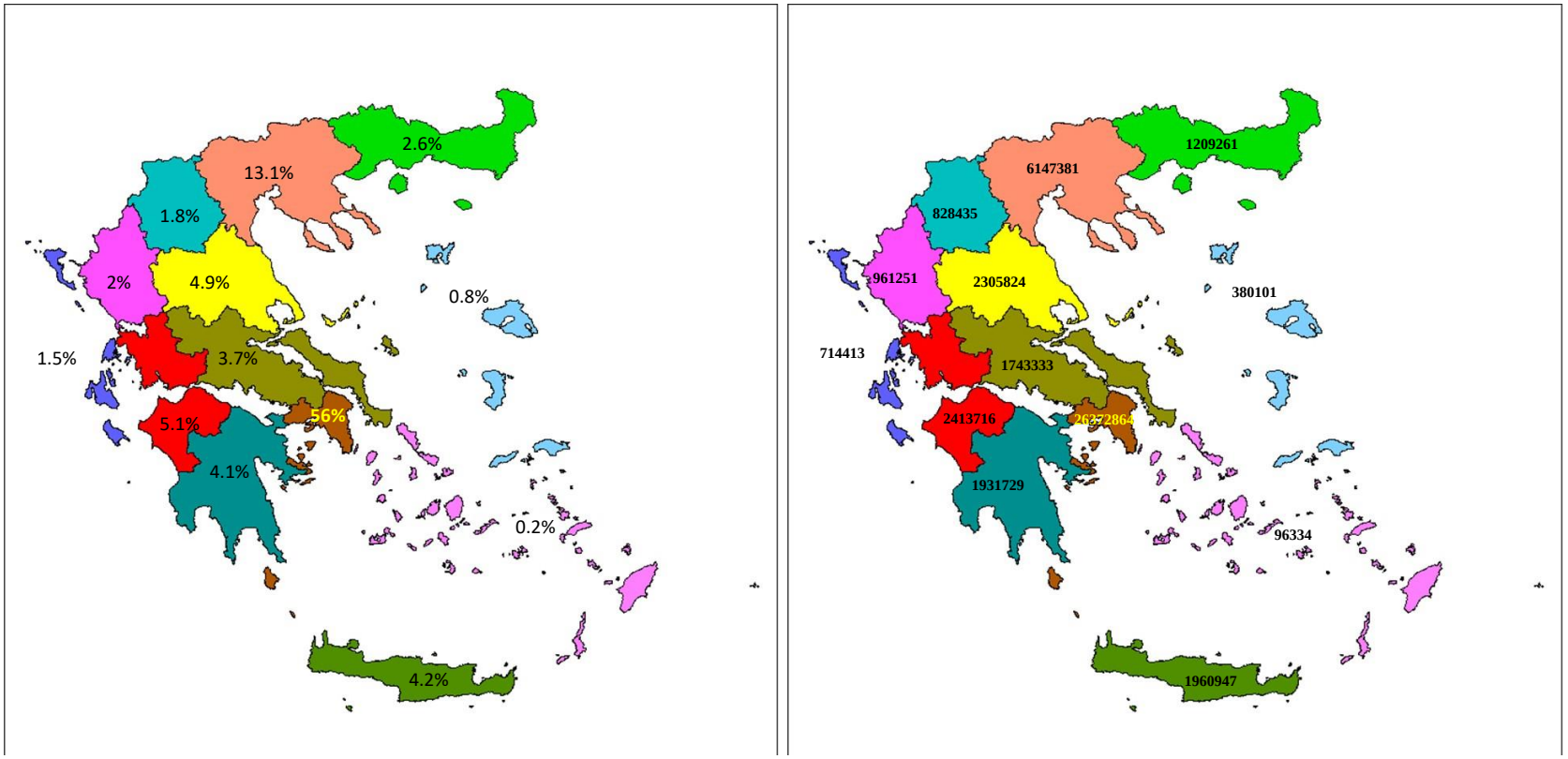


Figure 24 Percentage of consumption and total market size (in euros) for seasoning in households in Greek regions

As we can easily see the 56% of total household consumption of MAPs (26.37 million euros) as food seasoning materials is realized in Attika. This is expected since almost half of country's population lives in the area. However it is not only that but also we can see that each household in the area spends more for buying food seasoning that all the other regions in the country. Taking under consideration that the cuisine of the area is not more spicy we can attribute this difference to the fact that in Attika all food seasoning is bought in stores and thus it is recorded while in other provincial areas the collection of wild MAPs although is contributes to household

seasoning use it cannot be recorded or estimated.

Oregano production and sales in Greece

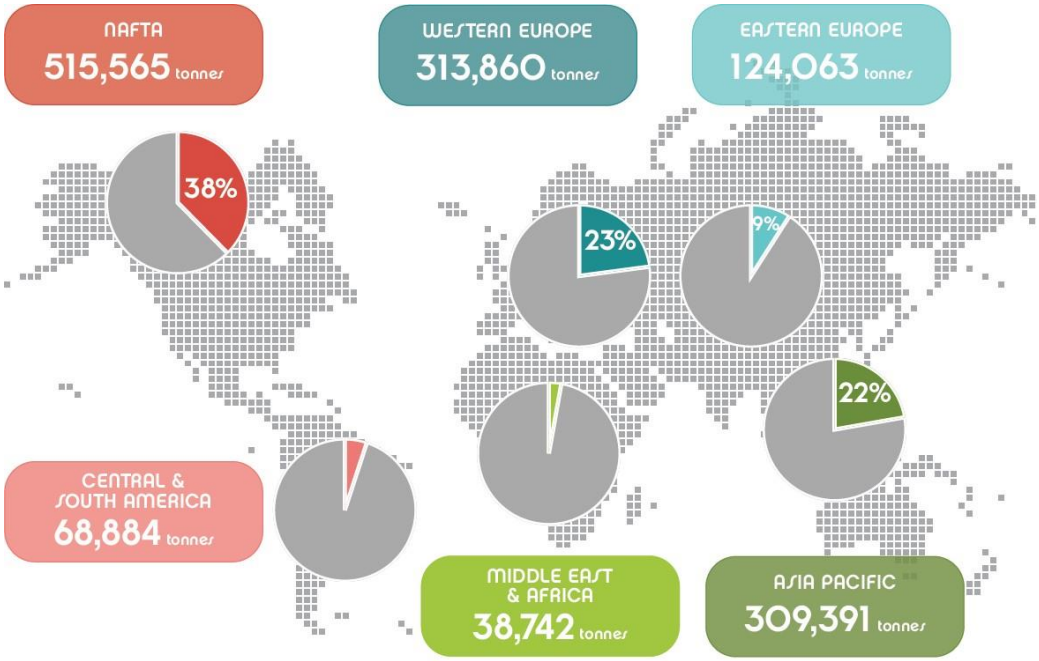
According to Hellenic Statistical Authority in recent years the oregano production in Greece has increased from 85 tons in 2010 to 113 tons in 2013. Similarly sales from 80 tons in 2010 increased to 110 tons in 2013. Price of oregano has though decreased from 10 euros per kilogram in 2010 to 6 euros/Kg in 2013.

Table 19 Production and sales of oregano in Greece (period 2010-2013)

Year	Production (Kg)	Sales (Kg)	Value	Price (Euros)/Kg
2010	85,319	79,500	775,038	10
2011	108,530	106,830	728,831	7
2012	172,607	193,542	956,482	5
2013	113,214	109,318	685,656	6

4.2 Global Markets

Demand for natural ingredients increases globally. This is mainly based on the implementation of good sourcing practices in primary health care and traditional medicine. In addition, UN organizations, such as WHO and FAO, have developed several Good Practices in the last 15 years related to the industry. Global market in 2008 for herbs and spices was about 1.5 million tons or 6 billion dollars with main markets to be North America, Western Europe and Asia Pacific. (RTS resource, 2011)



	WESTERN EUROPE	EASTERN EUROPE	NAFTA	CENTRAL & SOUTH AMERICA	ASIA PACIFIC	MIDDLE EAST & AFRICA
Volume usage	313,860 tonnes	124,063 tonnes	515,565 tonnes	68,884 tonnes	309,391 tonnes	38,742 tonnes
Volume growth rate 2004 to 2009	1.5%	4.0%	1.8%	4.3%	3.2%	2.5%
Market value	$1.3 billion	$0.5 billion	$2.0 billion	$0.4 billion	$1.4 billion	$0.2 billion
Forecast value growth rate 2009 to 2014	1.7%	2.9%	1.6%	3.4%	2.9%	2.1%
Key Markets	UK Germany France Spain Italy	Russia Ukraine Poland	USA	Brazil	China Japan India	Turkey
Highlights	> **UK** is the largest market by volume > Usage in **Spain** is forecast to grow by 4.9% > **Meat & savoury** products is the largest sector	> **Russia** is the largest market > **Snacks** is one of the fastest growing sectors for seasonings > The market in **Ukraine** is forecast to be worth $115m by 2014	> **USA** accounts for 87% share of the market by volume > **Snacks** is the largest sector > Usage in **Mexico** is forecast to grow by 4.9%	> **Meat & savoury** products is the largest sector > **Brazil** is the fastest growing market	> **China** is the largest market > Usage in **India** is forecast to grow at a rate of 5.2% > **Sauces & dressings** accounts for 25% of seasonings usage	> **Meat & savoury** products accounts for almost half total usage of seasonings > **Turkey** is the largest market

Figure 25 World market for spices and herbs, year 2009. (Modified from RTS resource, 2011)

Available data concerning the main MAPs form FAO (FAOSTAT 2015) recover that top five production countries for tea are China, India, Kenya, Sri Lanka and Viet Nam.

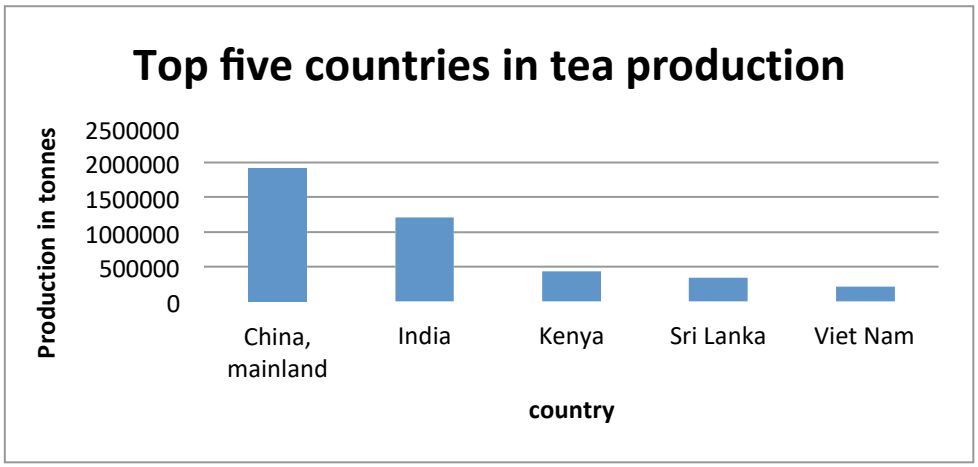


Figure 26 Top five tea producer countries

In terms of productivity (quantity per unit of area) these are Malaysia. Iran, Bolivia, Burundi and Equator.

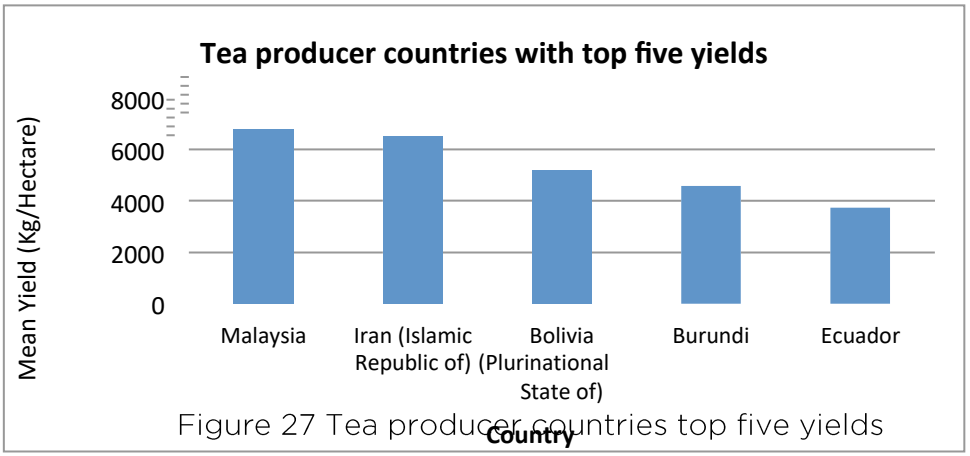


Figure 27 Tea producer countries top five yields

Spice production in terms of achieved volume is concentrated in Asia. More specifically the top five countries are India, Bangladesh, Turkey, China and Pakistan.

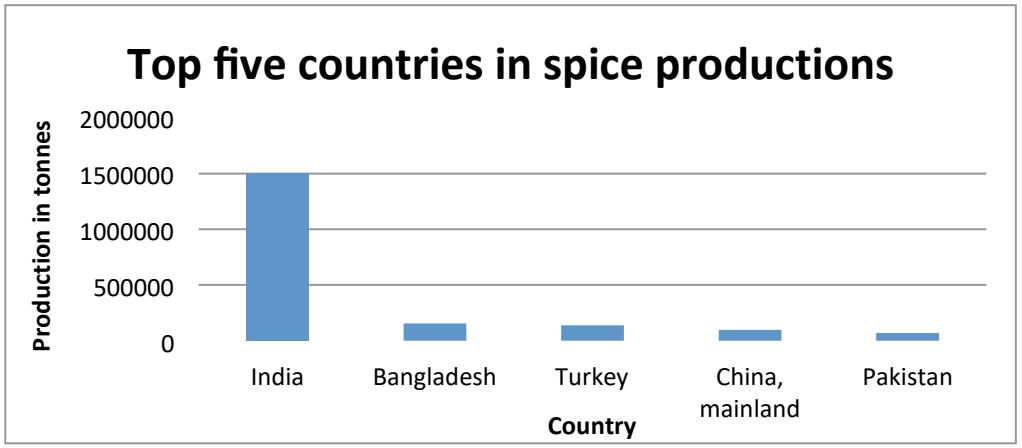


Figure 28 Top five spice producer countries

In terms of productivity (quantity per unit of area) these are Mauritius, Vanuatu, Colombia, Malaysia and Kuwait.

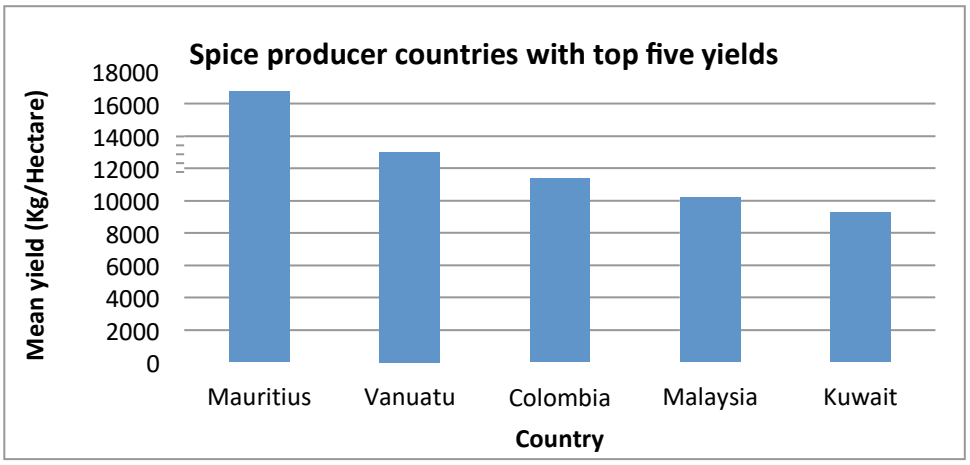


Figure 29 Spice producer countries top five yields

For ginger the top five production countries are India, China, Nepal, Indonesia and Nigeria.

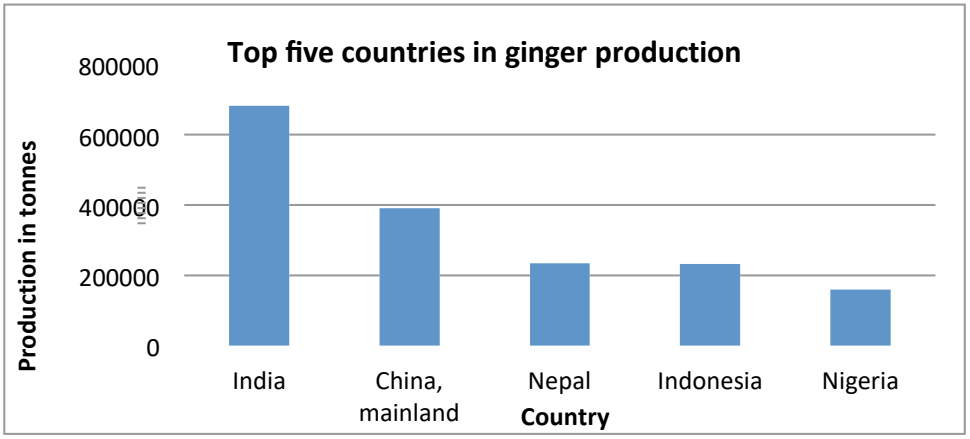


Figure 30 Top five ginger producer countries

In terms of productivity they are Fiji islands, USA, Nepal, Indonesia and Nigeria.

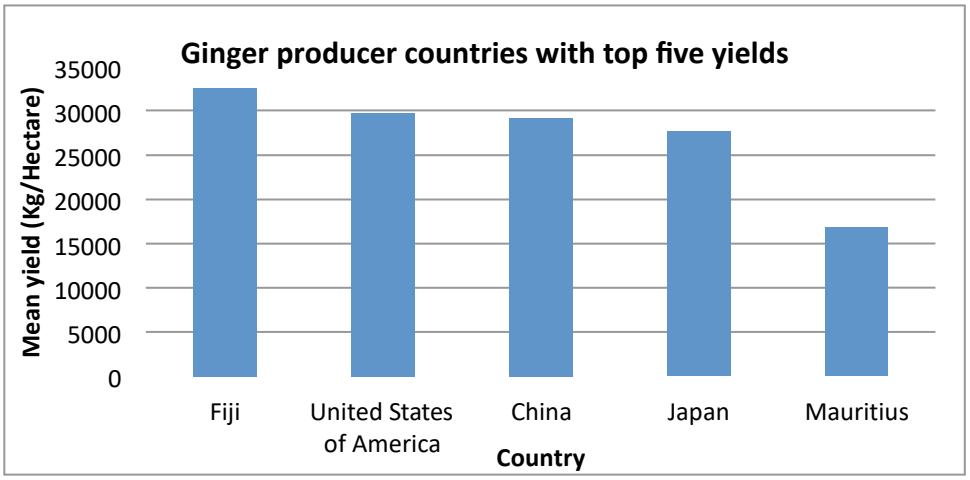


Figure 31 Ginger producer countries top five yields

Top five producer countries for nutmeg, mace and cardamoms are Guatemala, Indonesia, India, Nepal and Lao.

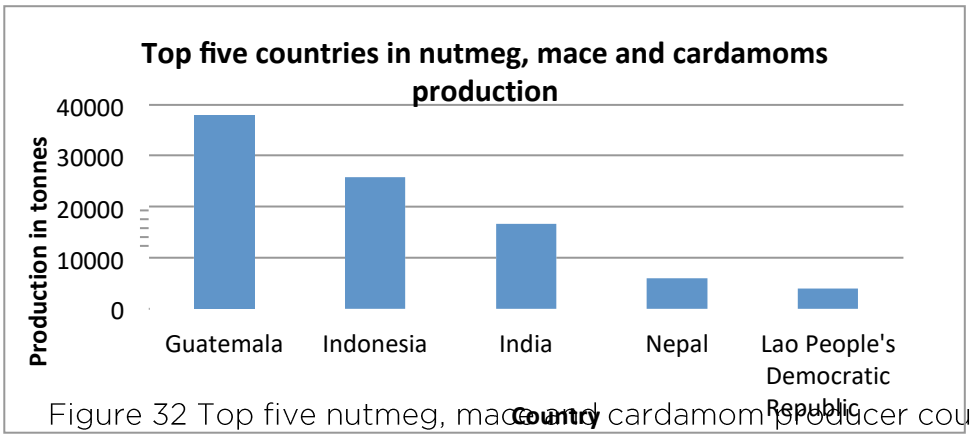


Figure 32 Top five nutmeg, mace and cardamom producer countries

In terms of productivity the biggest one is achieved in Malaysia, Dominica, Madagascar, Togo and Malawi.

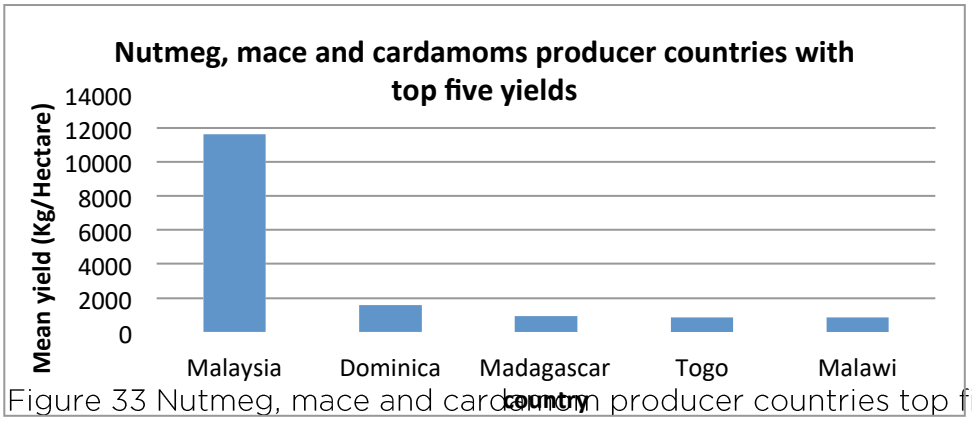


Figure 33 Nutmeg, mace and cardamom producer countries top five yields

As far as cloves are concerned top five producers are Indonesia, Madagascar, Tanzania, Sri Lanca and Comoros.

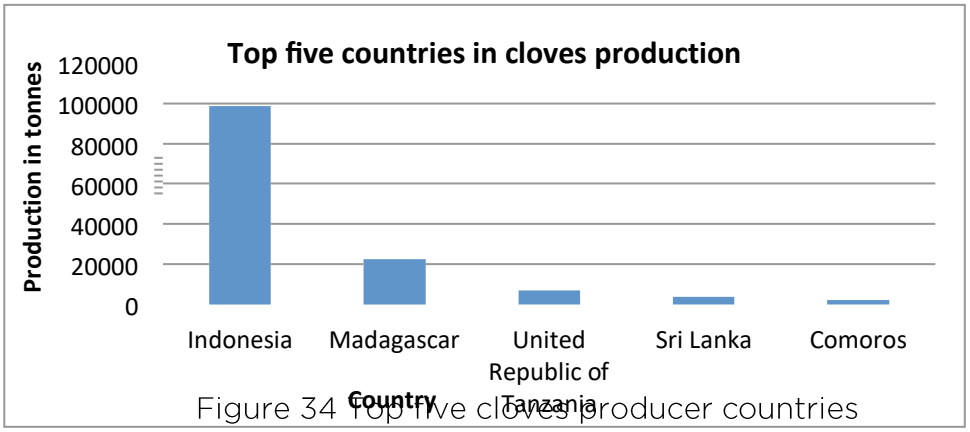


Figure 34 Top five cloves producer countries

Biggest productivity is achieved in China, Tanzania, Kenya and Sri Lanca

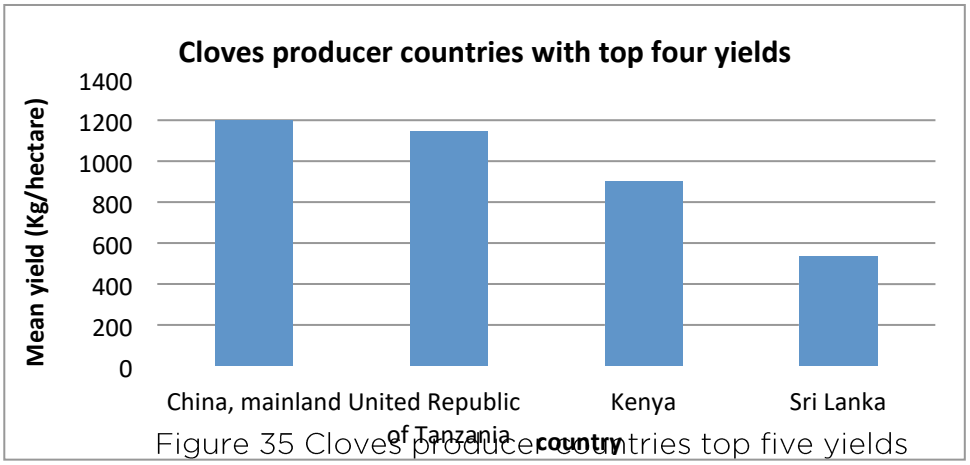


Figure 35 Cloves producer countries top five yields

For anise, badian, fennel and coriander top five producers are India, Mexico, Syria, China and Iran

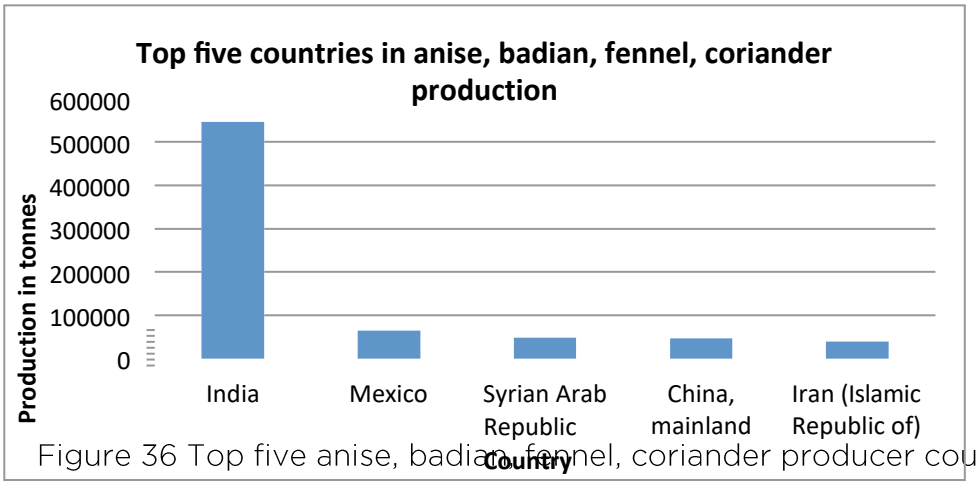


Figure 36 Top five anise, badian, fennel, coriander producer countries

The biggest productivity is achieved in Palestinian Territory followed by Mexico, Netherlands, Australia and Guatemala.

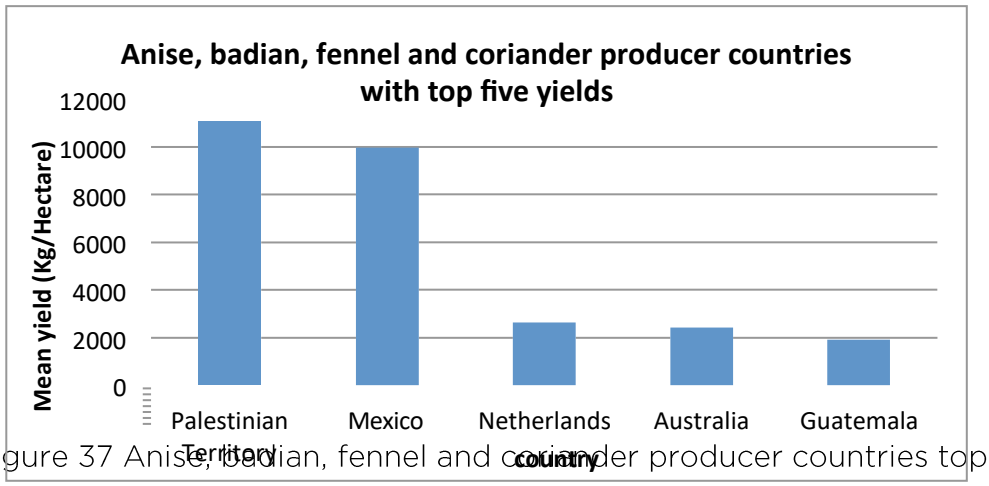


Figure 37 Anise, badian, fennel and coriander producer countries top five yields

4.3 Import-exports analysis

Imports and exports of tea

Imports of tea in Greece are about 1300 tons costing about 7,260,000 euros per year. Exports of Tea are 46 tons costing 545000 euros. Export price is 11.7 and import one is 5.6 euros/Kg.

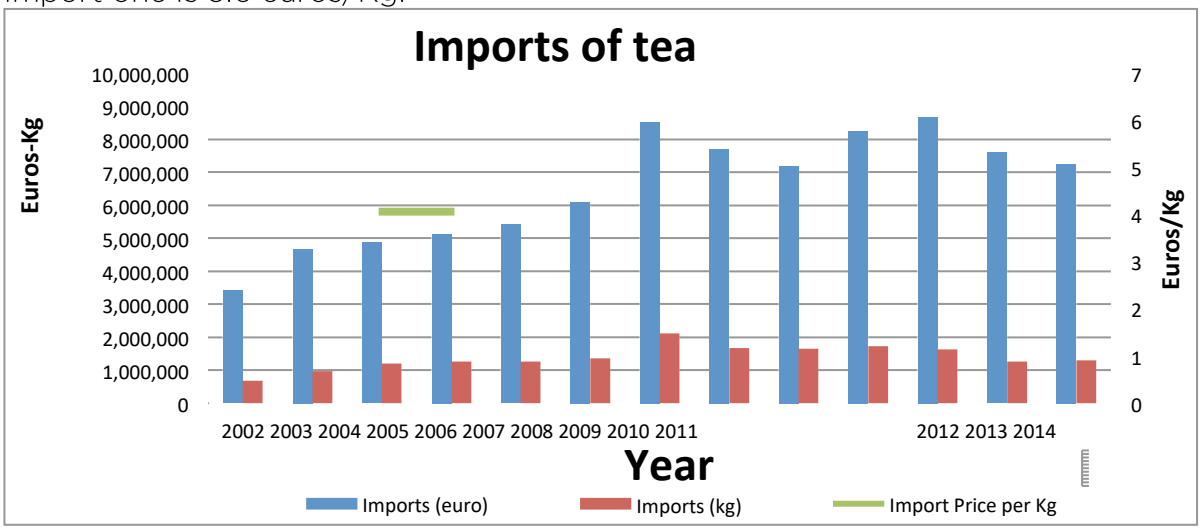


Figure 38 Imports of tea in Greece

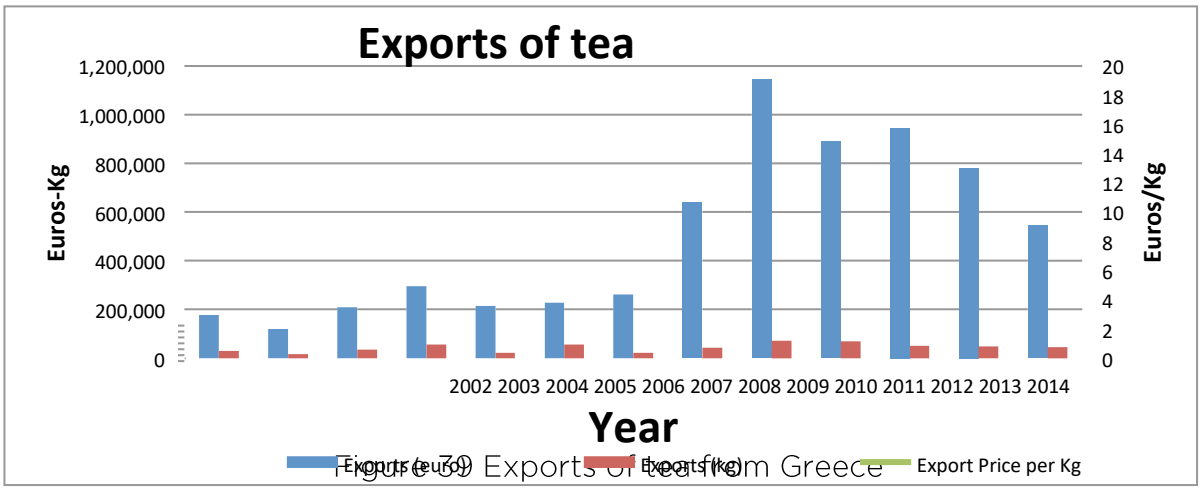


Figure 39 Exports of tea from Greece

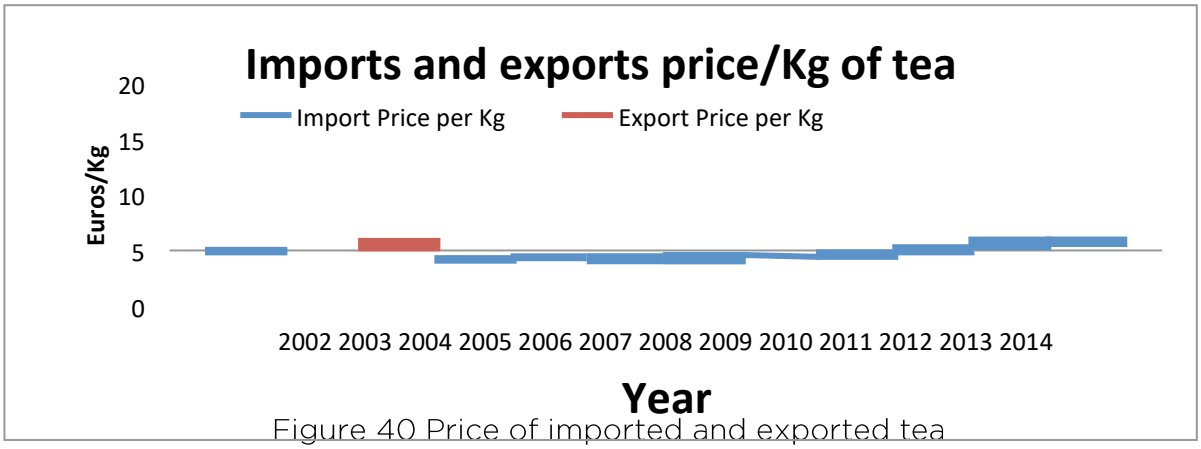


Figure 40 Price of imported and exported tea

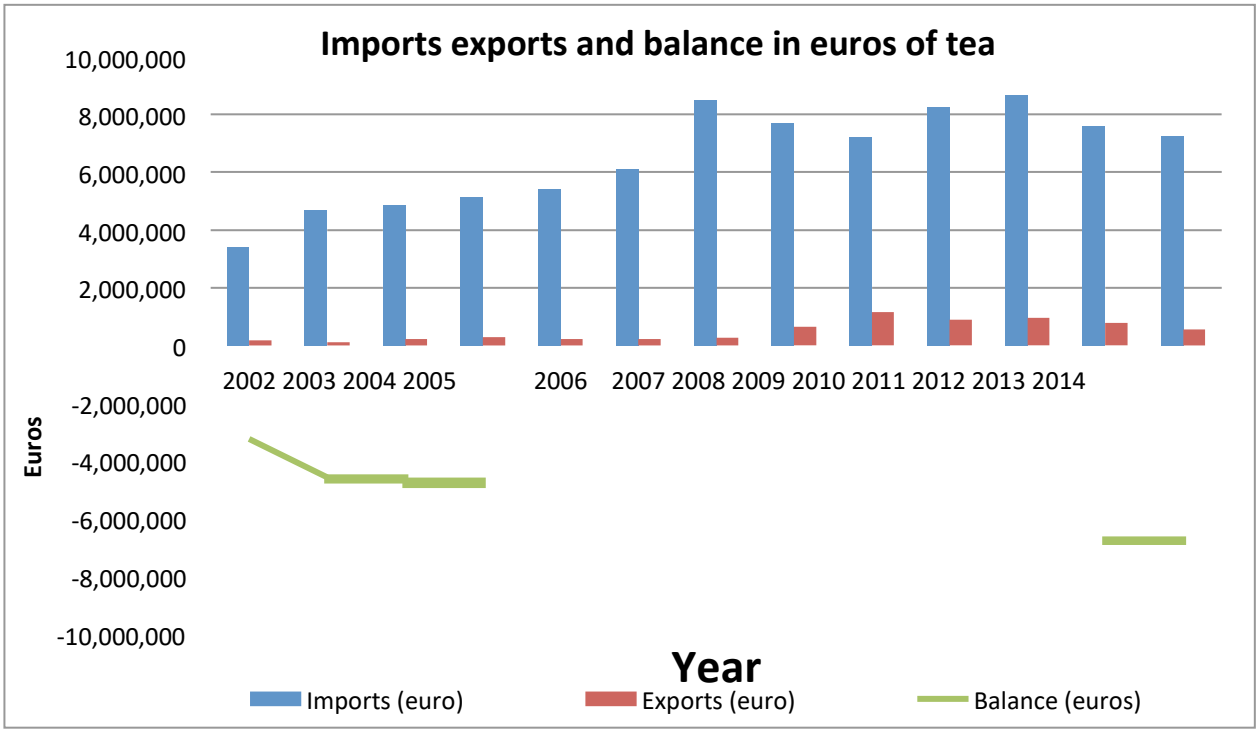


Figure 41 Tea imports exports balance in Euros

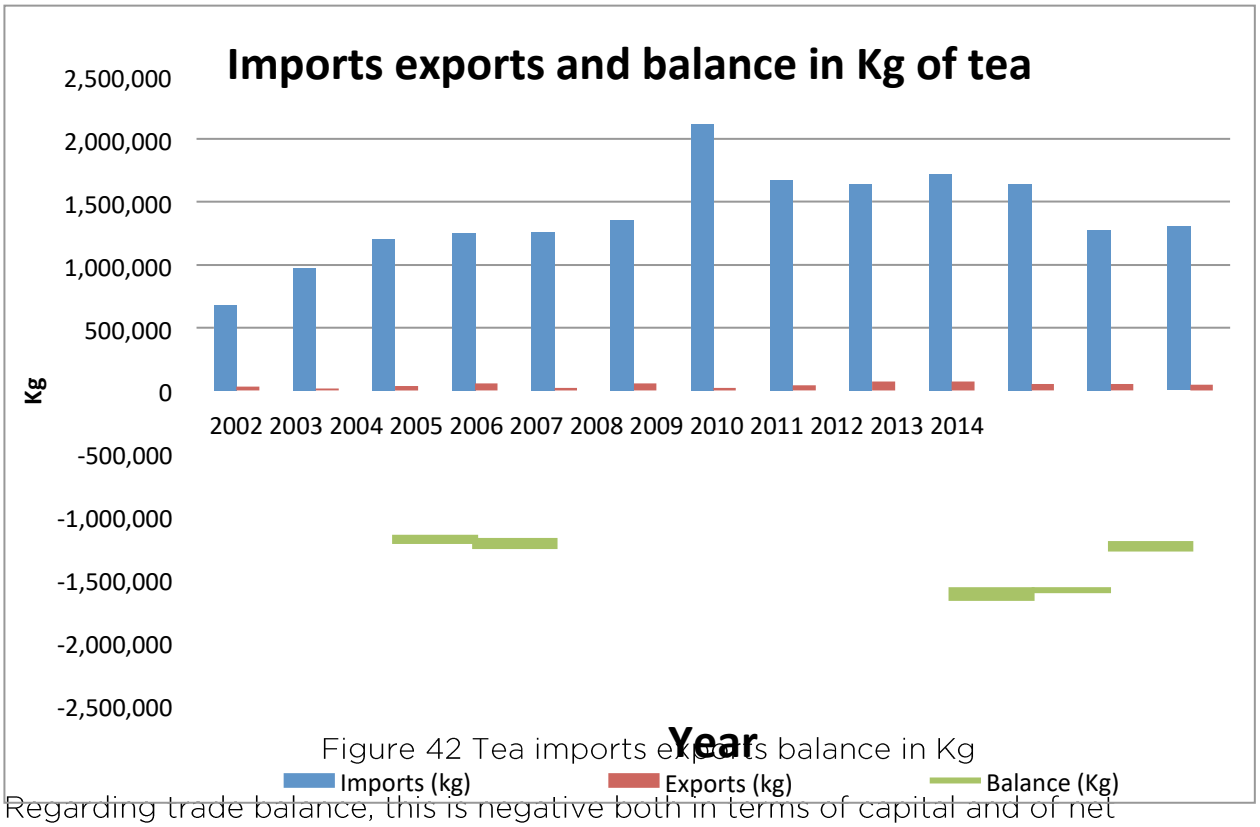


Figure 42 Tea imports exports balance in Kg

Regarding trade balance, this is negative both in terms of capital and of net weight (Kg of product). (MINAGRIC, 2015)

Imports and exports of Pepper

Imports of pepper in Greece are about 1740 tons costing about 8.6 million euros a year. Exports are 84 tons costing 225,000 euros. Import and export price are 4.9 and 2.7 euros per Kg respectively.

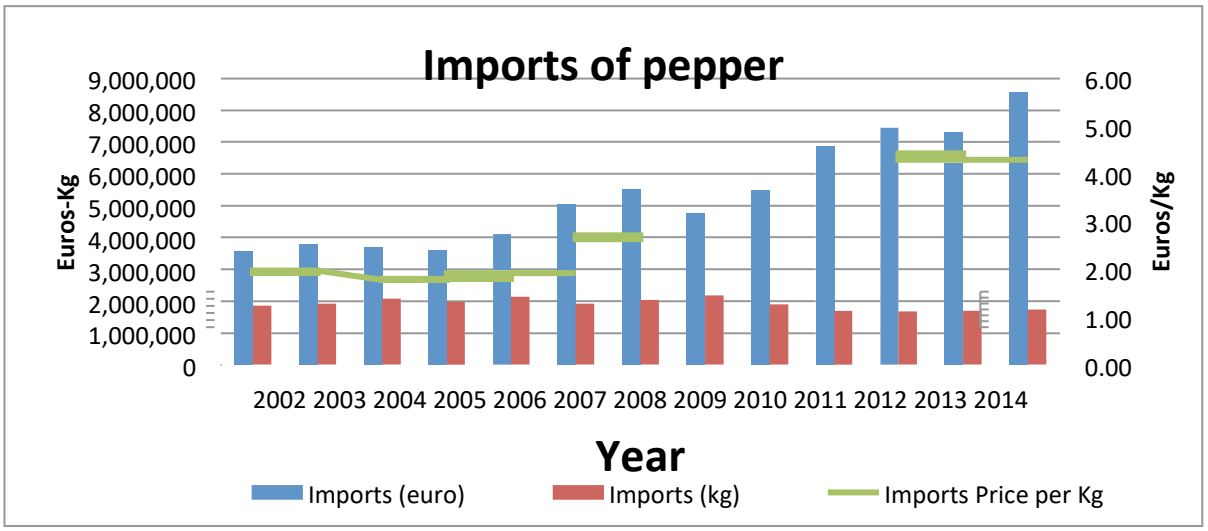


Figure 43 Imports of pepper in Greece

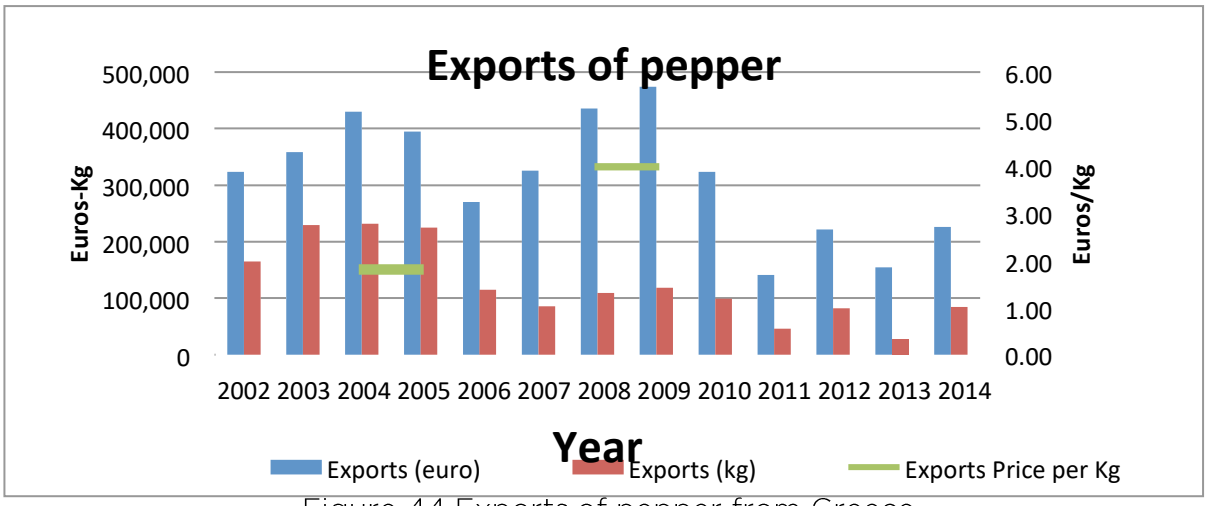


Figure 44 Exports of pepper from Greece

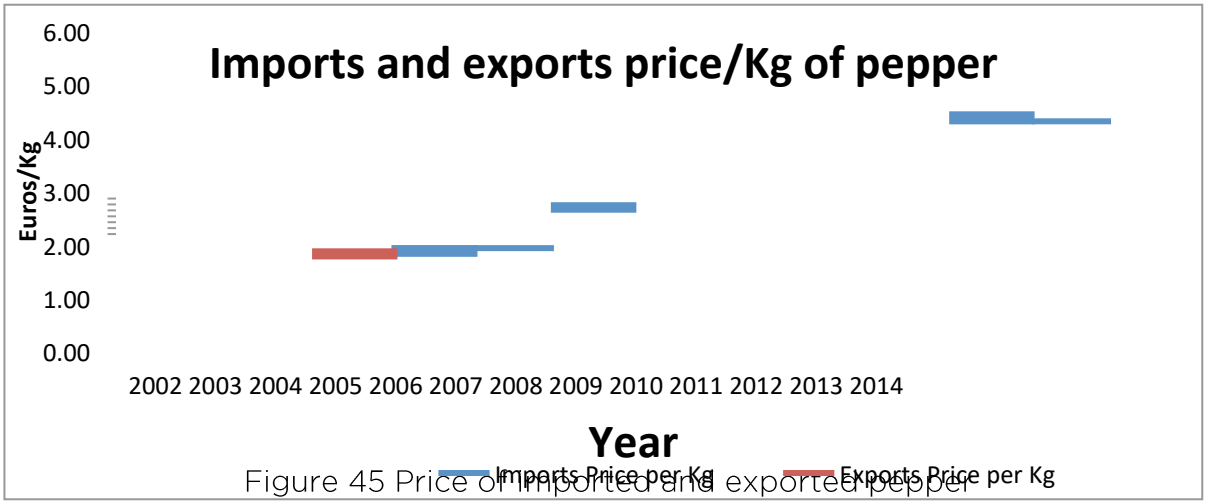


Figure 45 Price of imported and exported pepper

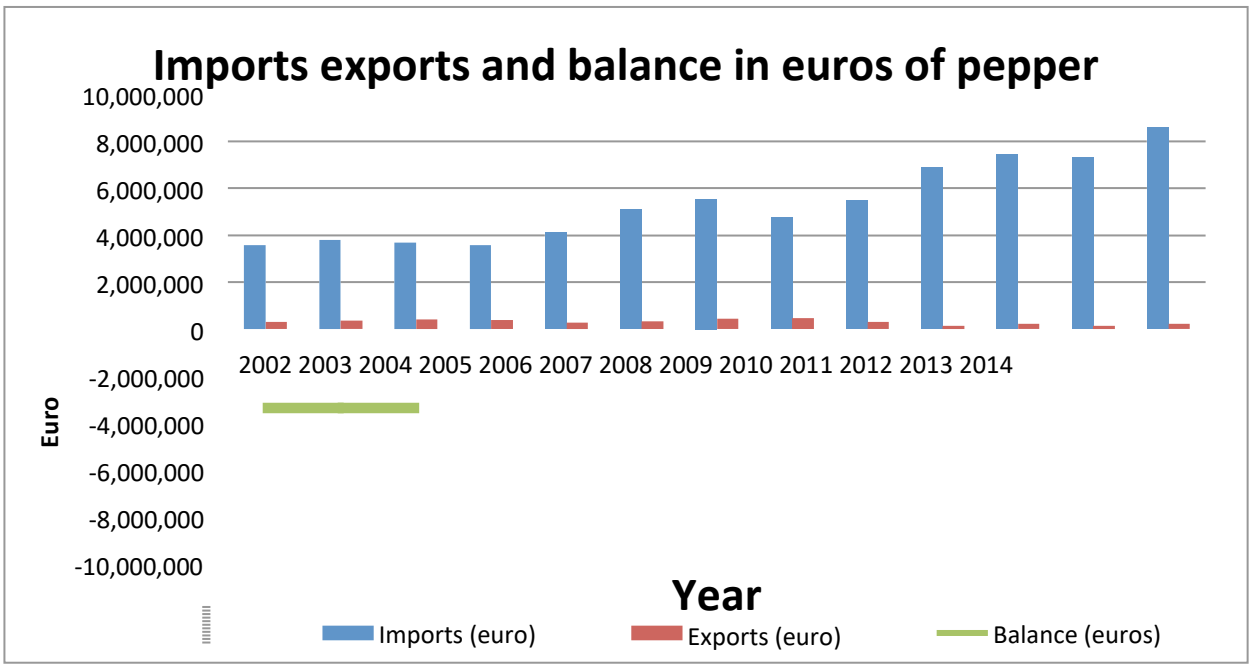


Figure 46 Pepper Imports Exports balance in euros

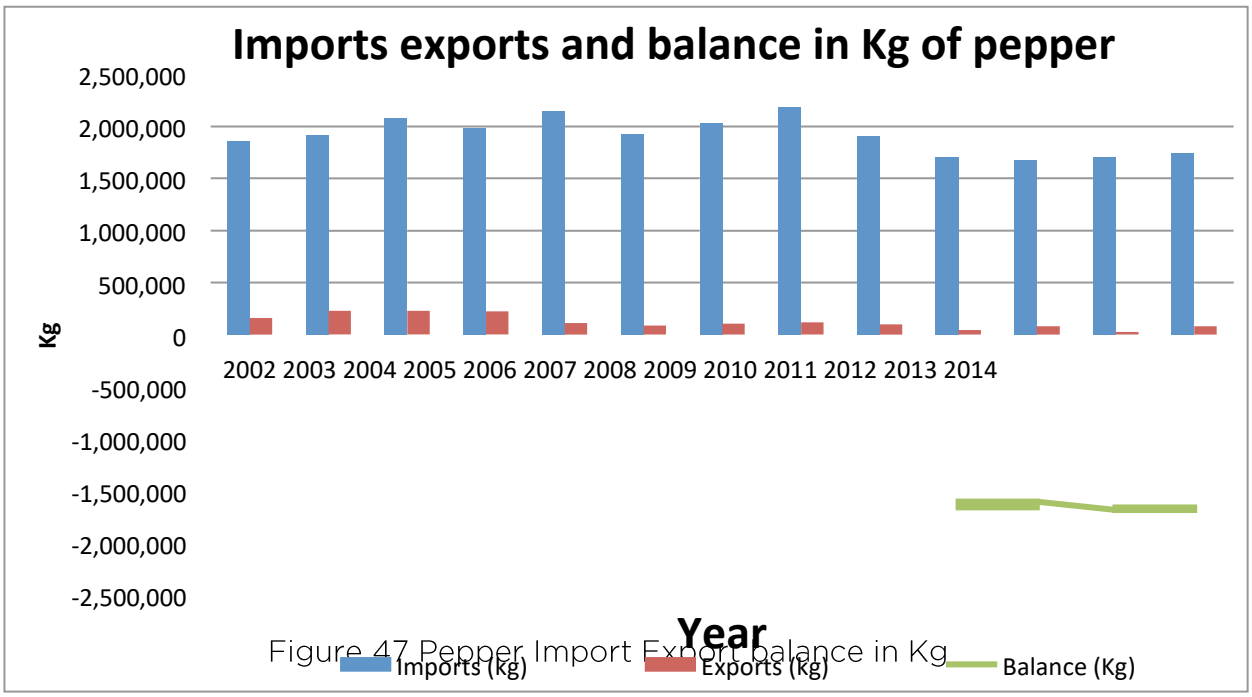


Figure 47 Pepper Import Export balance in Kg

Regarding trade balance this is negative both in terms of capital and of net weight (Kg). (MINAGRIC, 2015)

Imports and exports of Matte

Imports of mate in Greece are about 3.5 tons at 2.2 euros per Kg, costing about 8.000 euros a year. Exports are practically nonexistent.

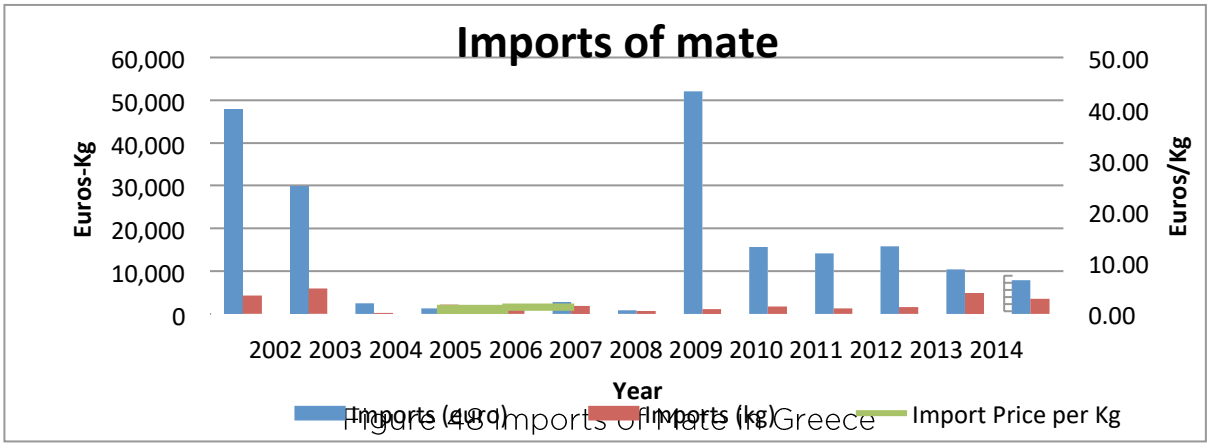


Figure 48 Imports of Mate in Greece

Figure 49 Exports of Mate from Greece

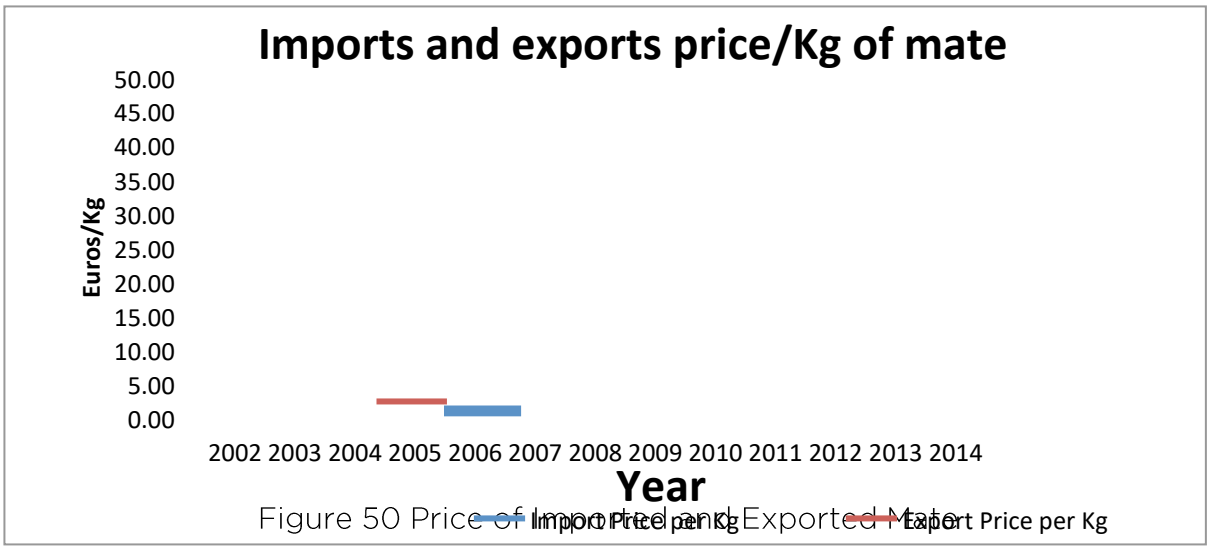


Figure 50 Price of Imported and Exported Mate

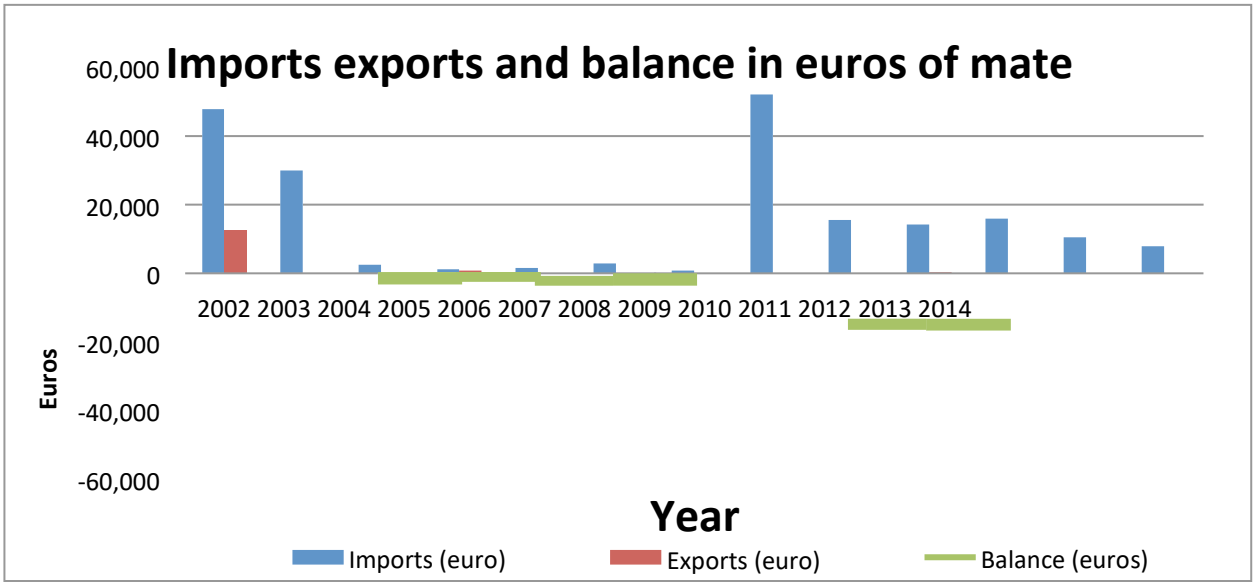


Figure 51 Mate Imports Exports balance in euros

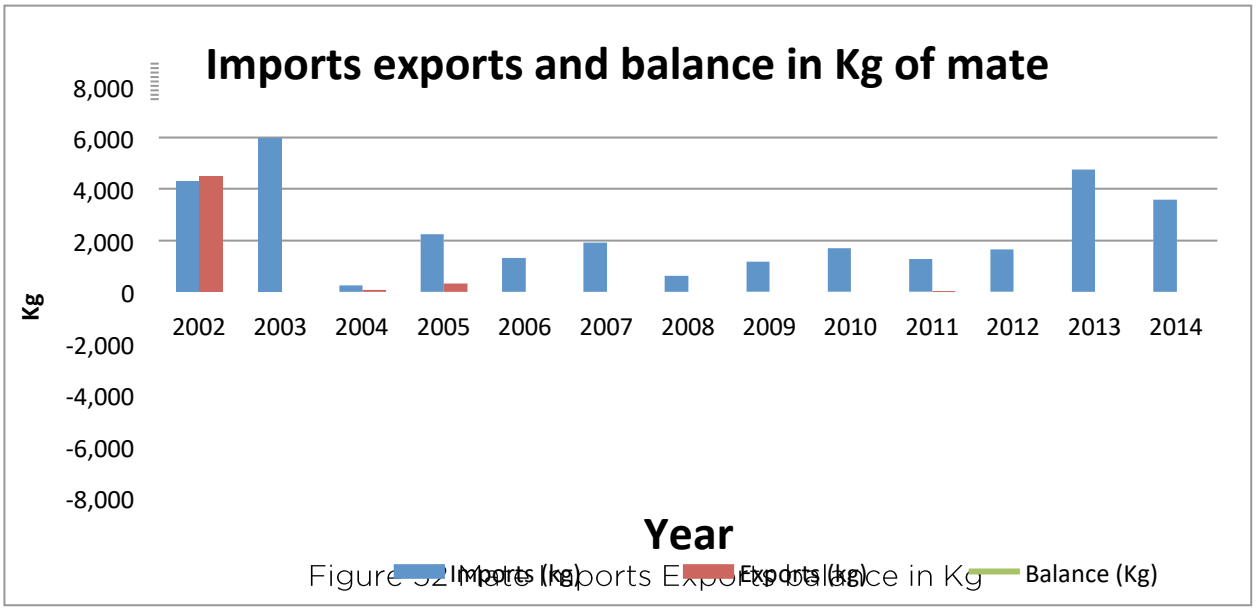


Figure 52 Mate Imports Exports balance in Kg

Regarding trade balance this is negative because Greece is only importing small quantities of mate (MINAGRIC, 2015).

Imports and exports of Saffron

Imports of saffron in Greece are about 29 kilograms costing about 18,000 euros a year. Exports are 831 Kg costing 1,083,000 euros. Import and export price are 620 and 1304 euros per Kg respectively

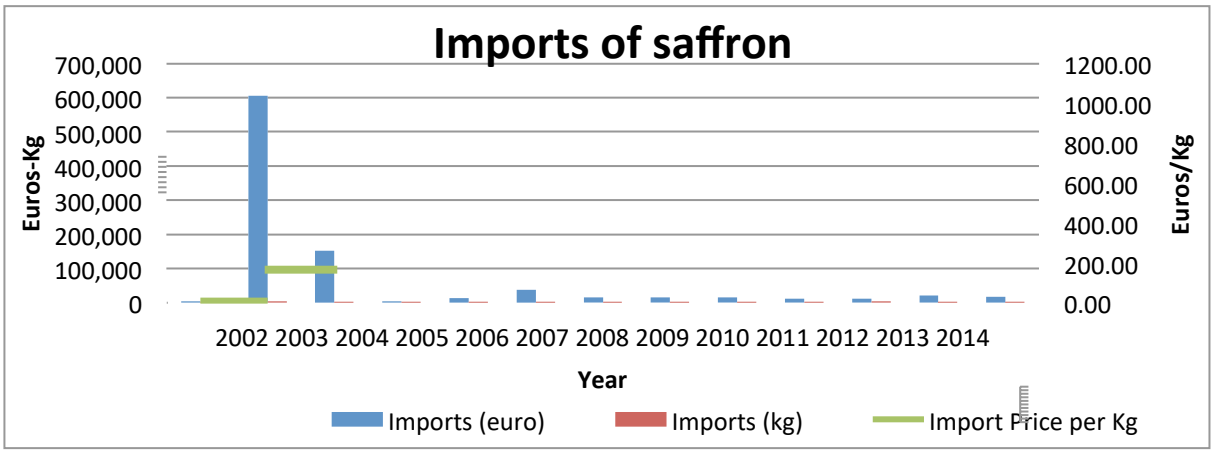


Figure 53 Imports of saffron in Greece

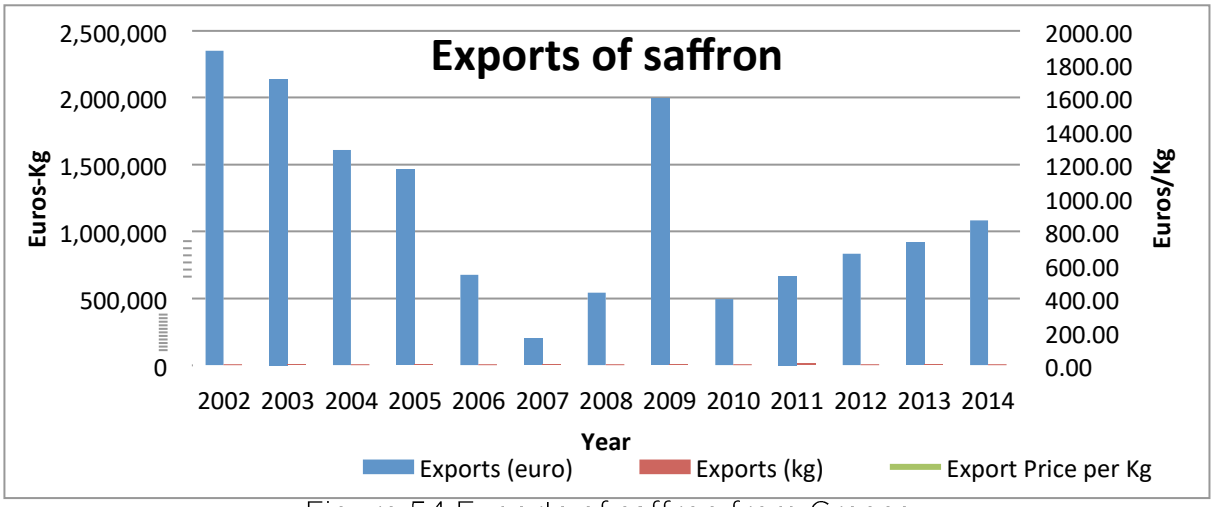


Figure 54 Exports of saffron from Greece

Figure 55 Price of imported and exported saffron

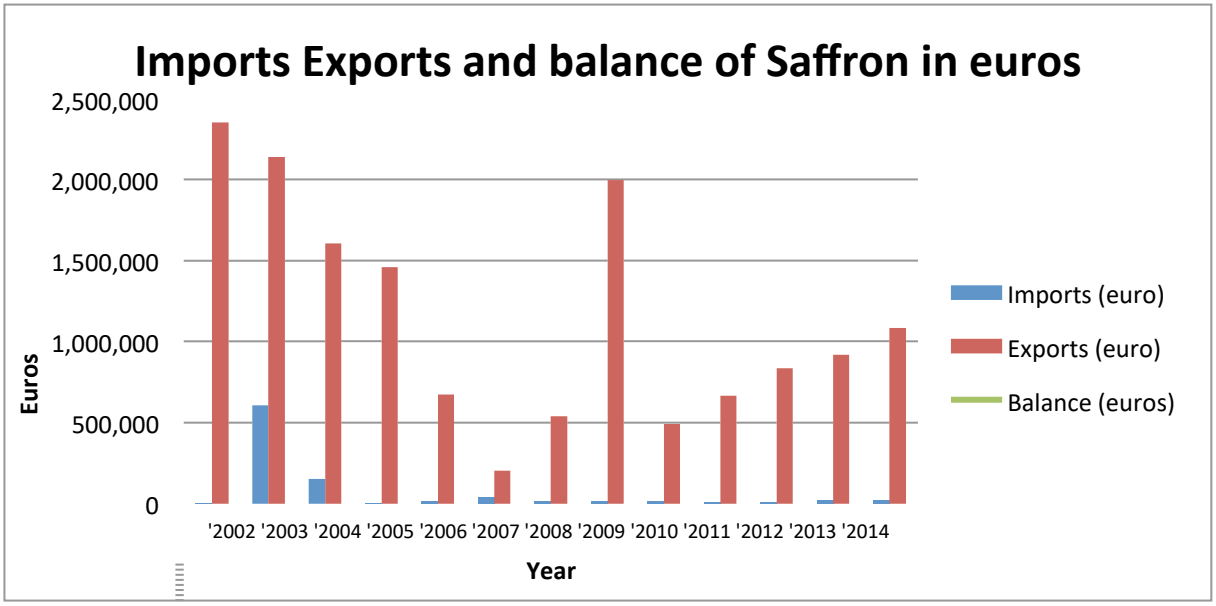


Figure 56 Saffron imports exports and balance in euros

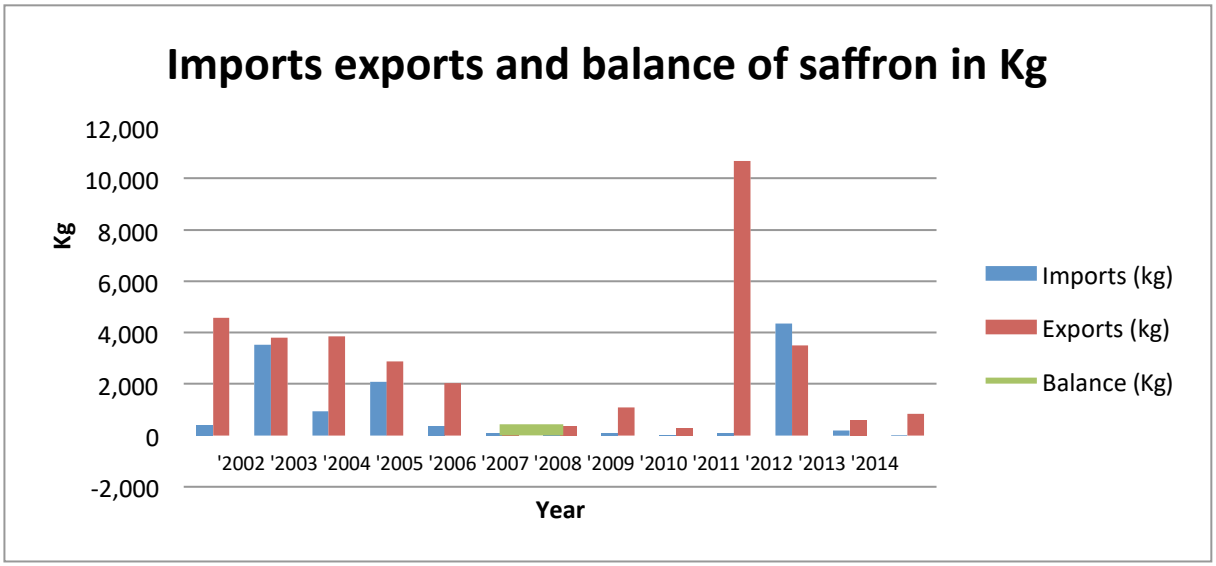


Figure 57 Saffron imports exports and balance in Kg

Regarding trade balance this is highly positive because Greece has a good production of saffron in Kozani area. The production is managed by the cooperative of Crocus and it has always been a premium exported product (MINAGRIC, 2015).

Imports and exports of Anise, Fennel, Coriander, Cumin, Caraway and Cedrus

Imports of the above products in Greece are about 380 tons costing about 800,000 euros a year. Exports are 13 tons costing 37,000 euros. Import and export price are 2.1 and 2.9 euros per Kg respectively

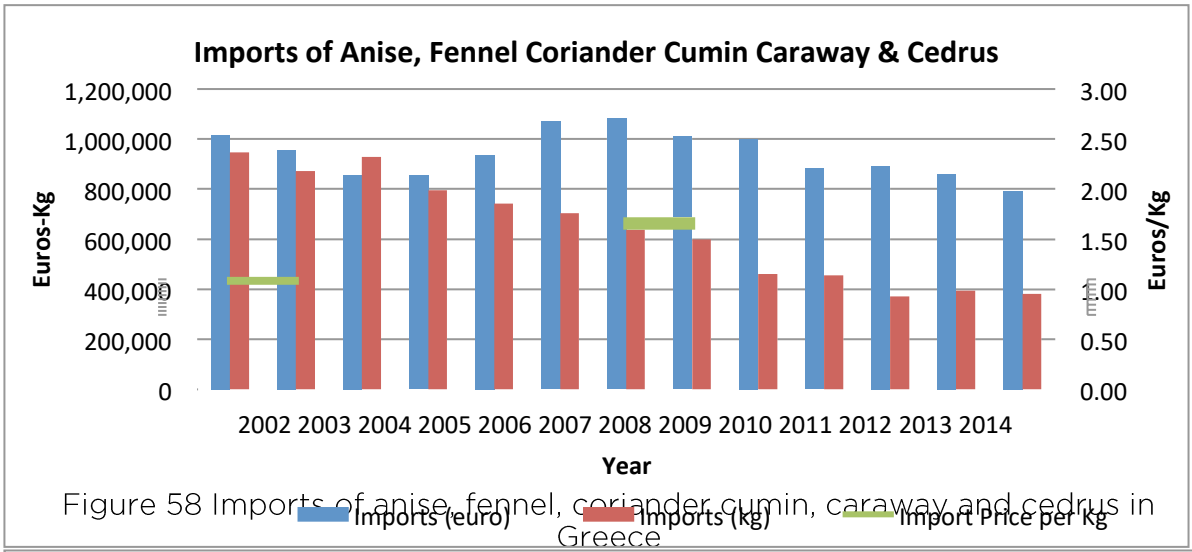


Figure 58 Imports of anise, fennel, coriander cumin, caraway and cedrus in Greece

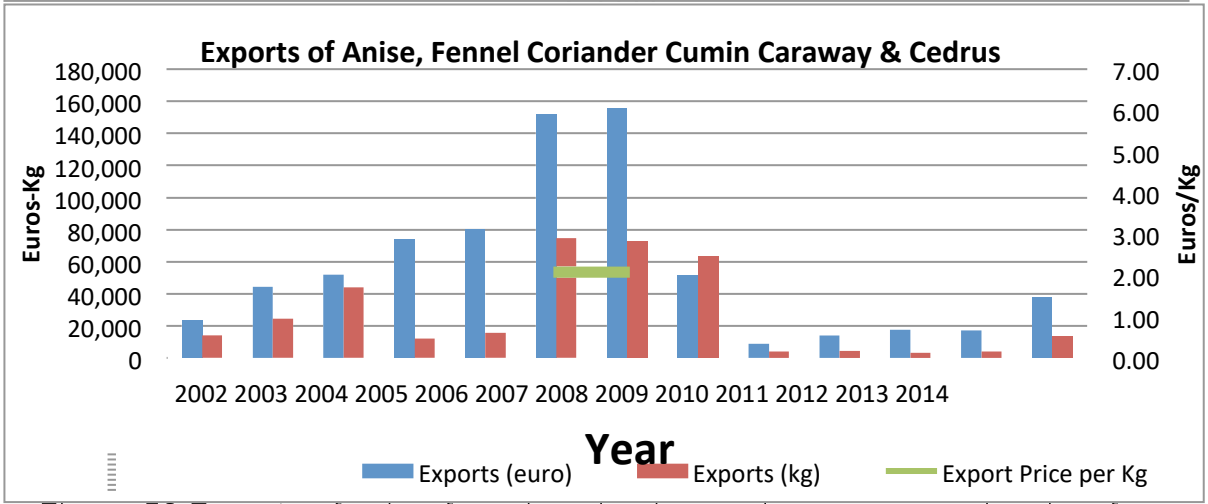


Figure 59 Exports of anise, fennel, coriander cumin, caraway and cedrus from Greece

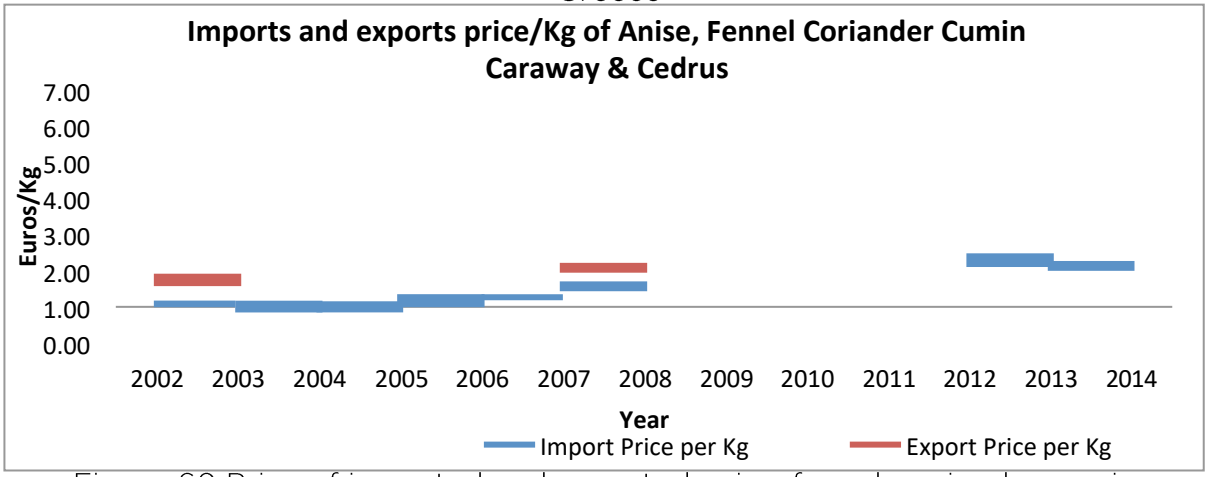


Figure 60 Price of imported and exported anise, fennel, coriander cumin, caraway and cedrus

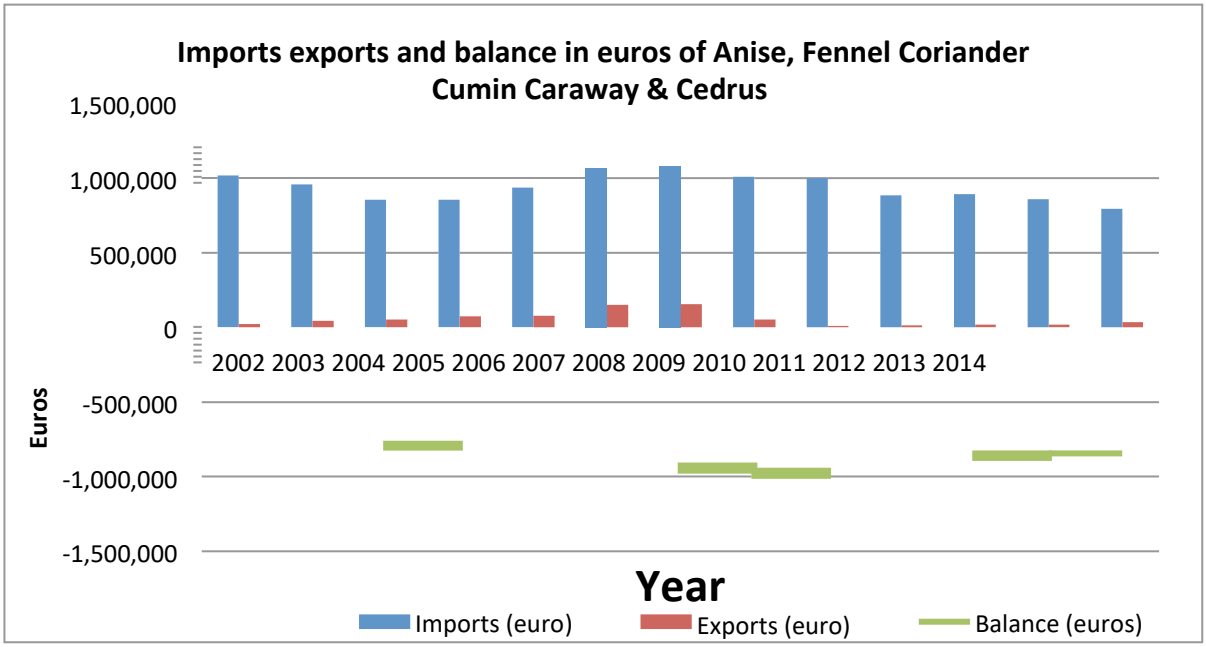


Figure 61 Anise, fennel, coriander cumin, caraway and cedrus imports exports and balance in euros

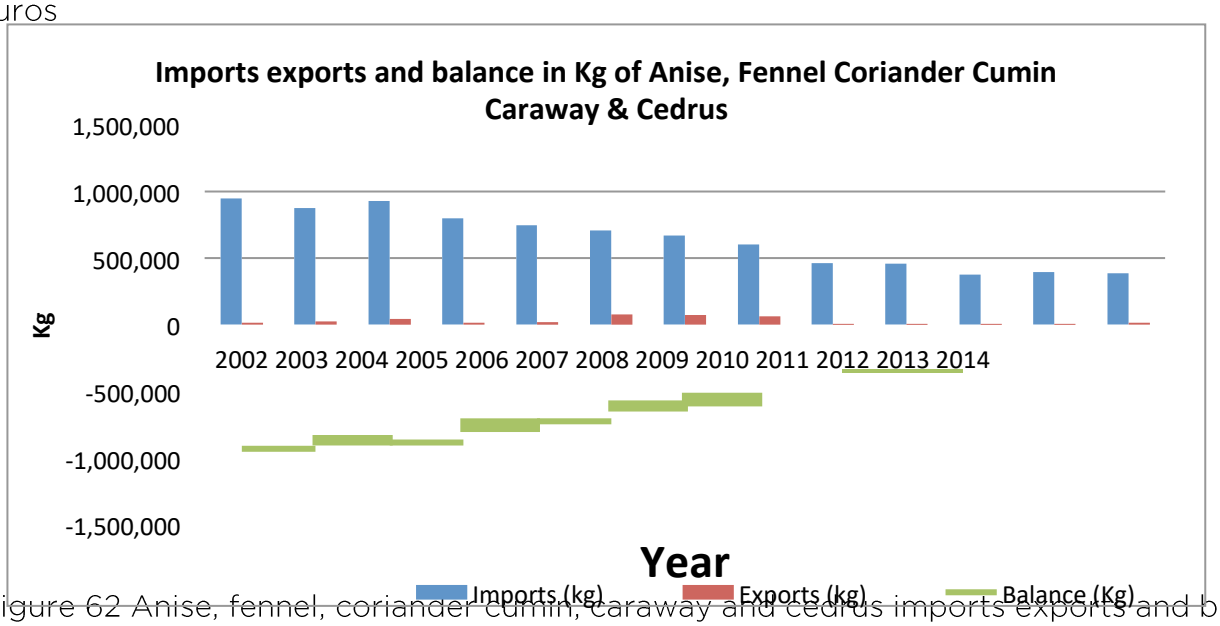


Figure 62 Anise, fennel, coriander cumin, caraway and cedrus imports exports and balance in Kg

Regarding trade balance this is negative both in terms of capital and of net weight (Kg).This happens because only for anise there is a significant production in Greece while for the rest crops practically imports cover the domestic needs (MINAGRIC, 2015).

Imports and exports of Nutmeg, Amonum and Garden cress

Imports of Nutmeg, Amonum and Garden cress in Greece are about 75 tons costing about 676,000 euros a year. Exports are 2 tons costing 24.000 euros. Import and export price are 9 and 11.5 euros per Kg respectively

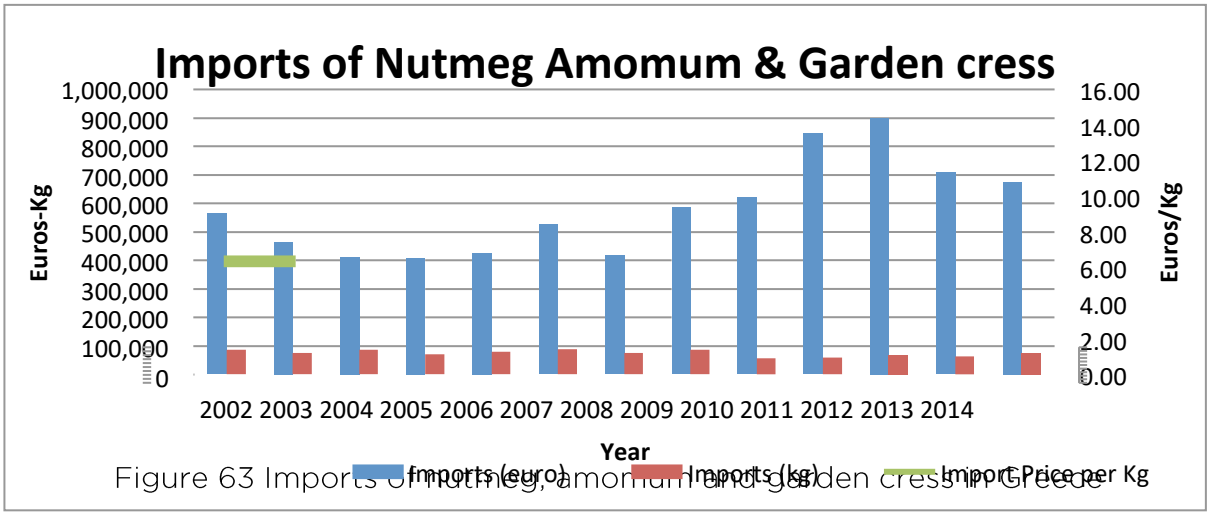


Figure 63 Imports of nutmeg, amomum and garden cress in Greece

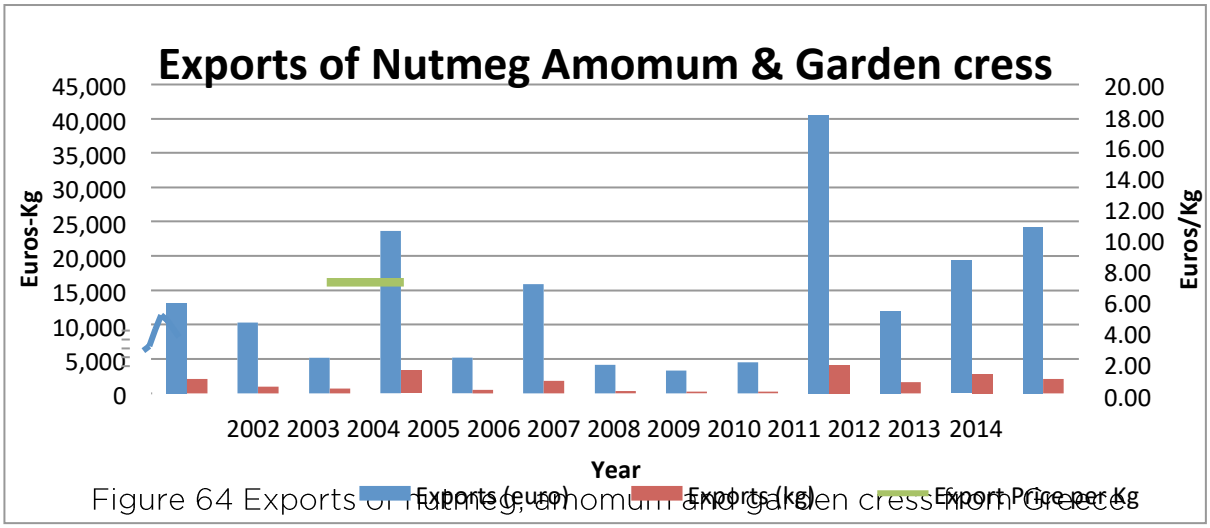


Figure 64 Exports of nutmeg, amomum and garden cress from Greece

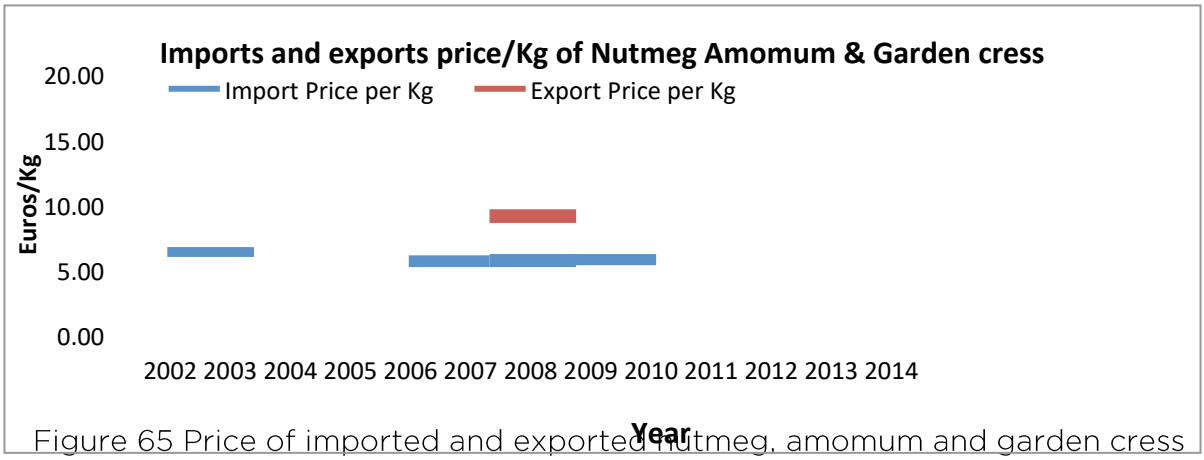


Figure 65 Price of imported and exported nutmeg, amomum and garden cress

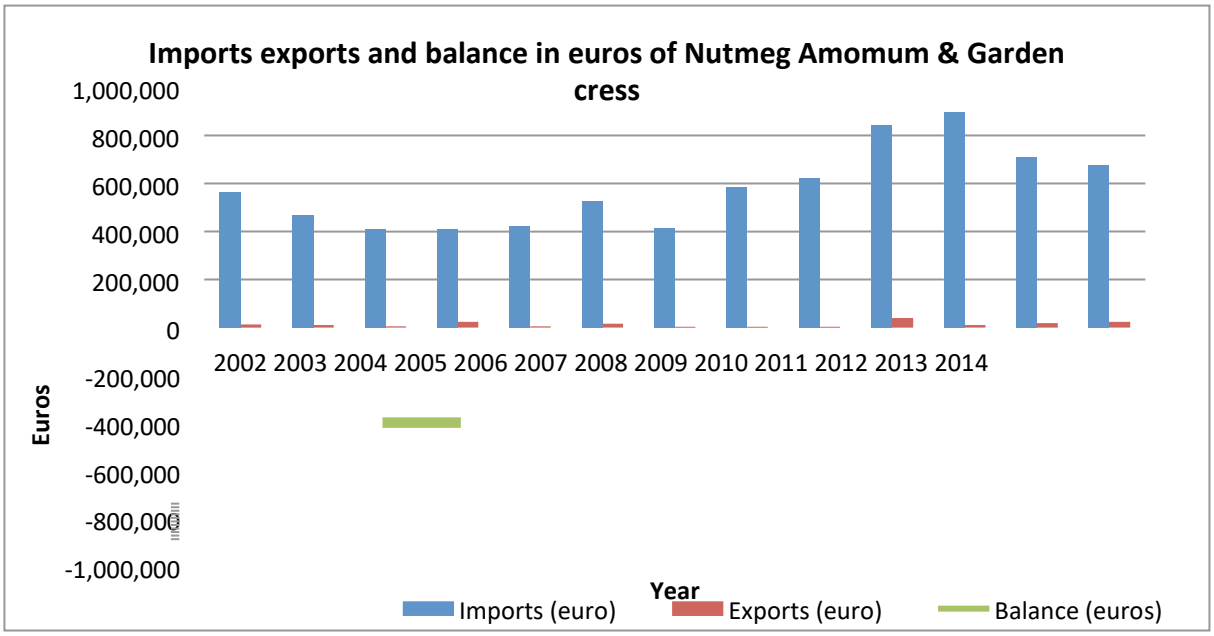


Figure 66 Nutmeg, amomum and garden cress imports exports and balance in euros

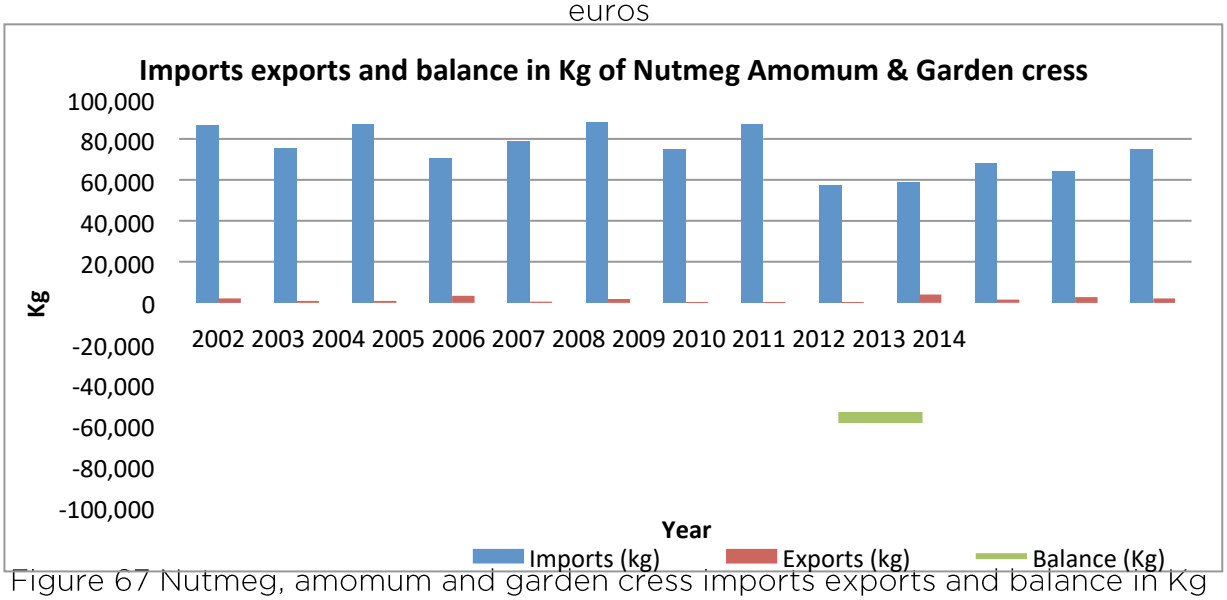


Figure 67 Nutmeg, amomum and garden cress imports exports and balance in Kg

Regarding trade balance this is negative both in terms of capital and of net weight (Kg) since there is not a significant production in Greece (MINAGRIC, 2015).

Imports and exports of cloves

Imports of pepper in Greece are about 95 tons costing about 877,000 euros a year. Exports are 12 tons costing 108,000 euros. Import and export price are 8.8 euros per Kg.

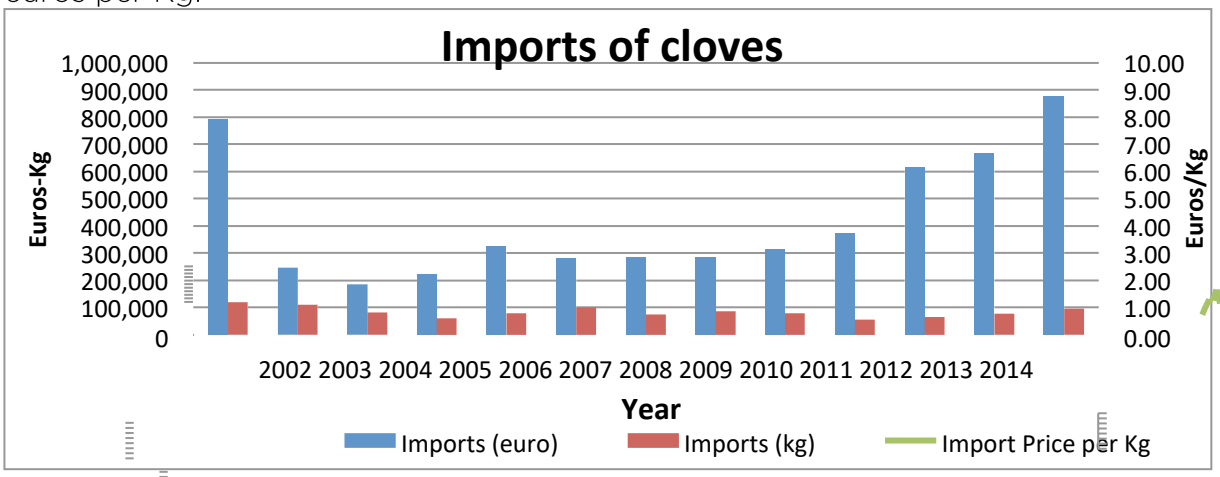


Figure 68 Imports of cloves in Greece

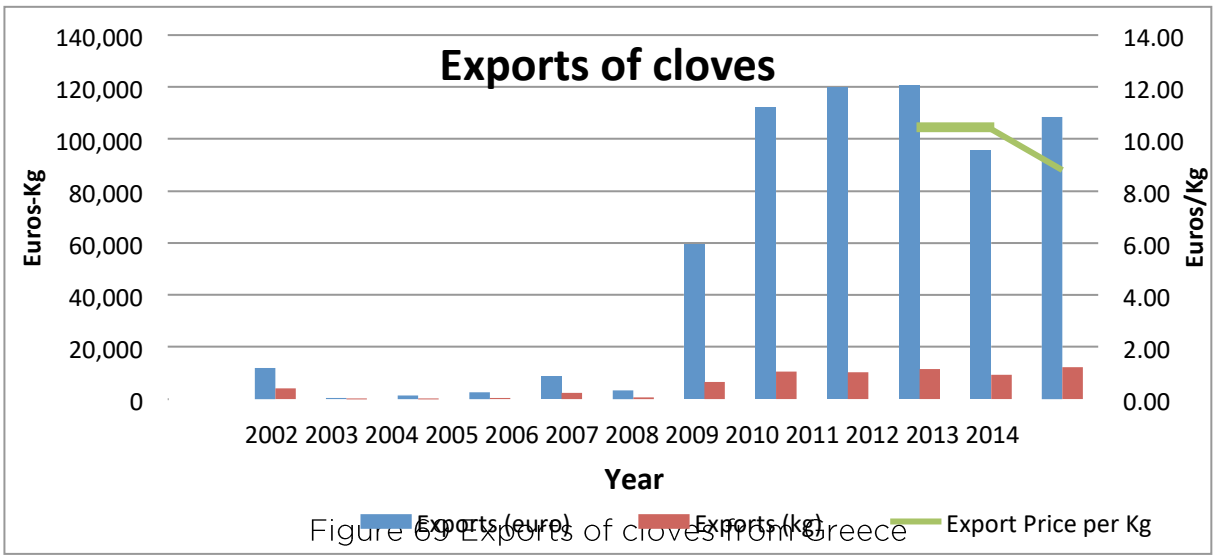


Figure 69 Exports of cloves from Greece

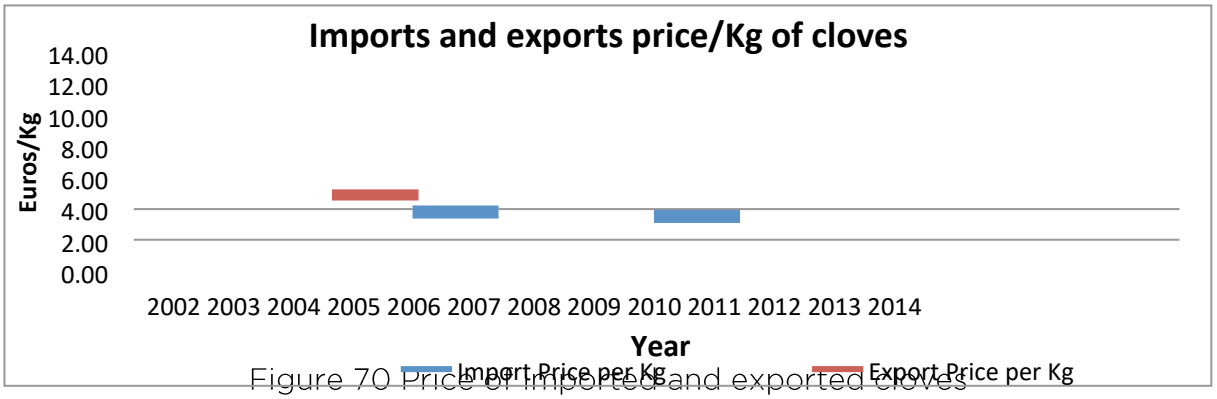


Figure 70 Price of imported and exported cloves

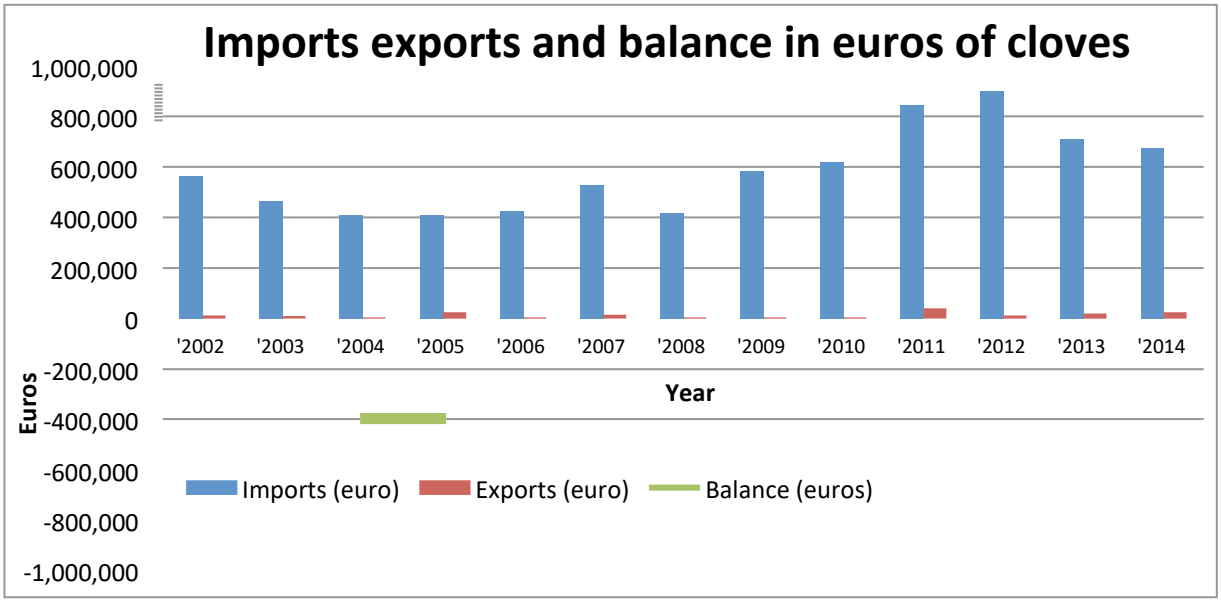


Figure 71 Cloves imports exports and balance in euros

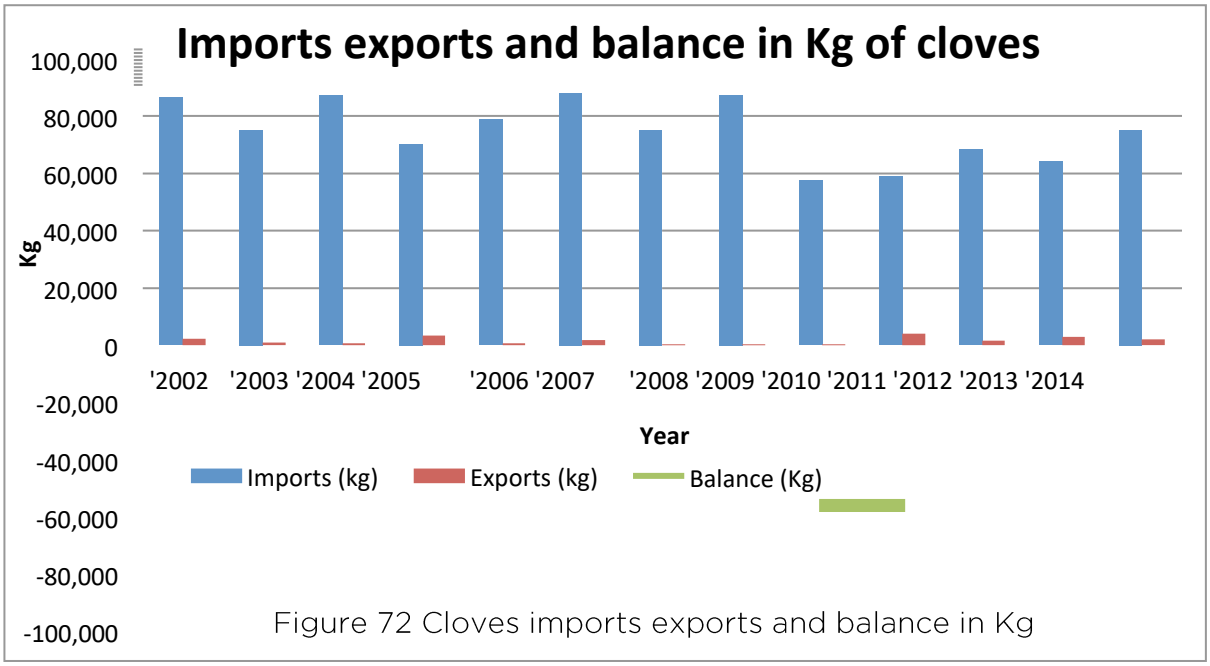


Figure 72 Cloves imports exports and balance in Kg

Regarding trade balance this is negative both in terms of capital and of net weight (Kg) since there is not production in Greece (MINAGRIC, 2015).

Imports and exports of cinnamon

Imports of cinnamon in Greece are about 740 tons costing about 2.4 million euros a year. Exports are 64 tons costing 90,000 euros. Import and export price are 3.2 and 1.4 euros per Kg respectively.

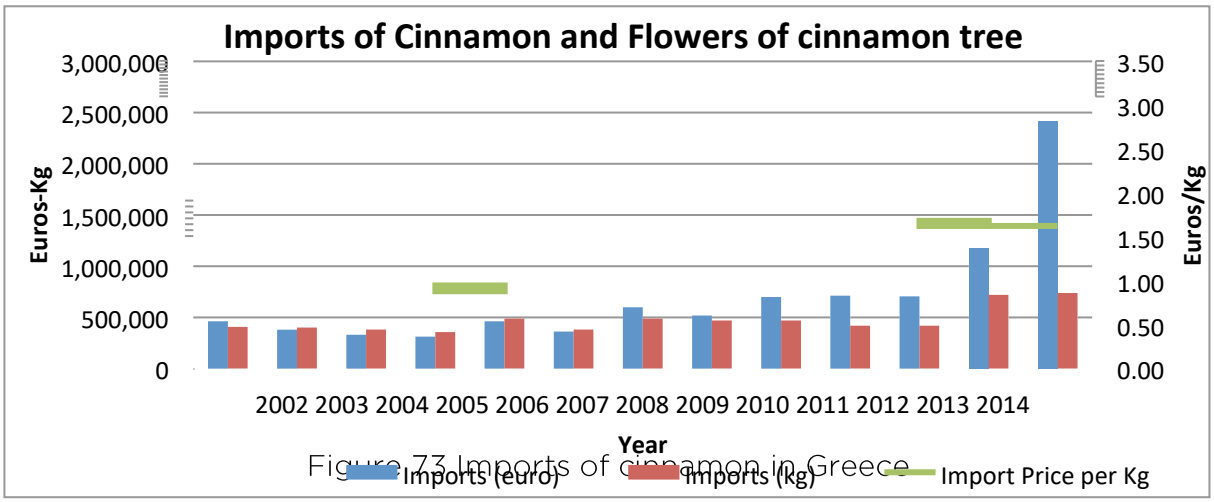


Figure 73 Imports of cinnamon in Greece

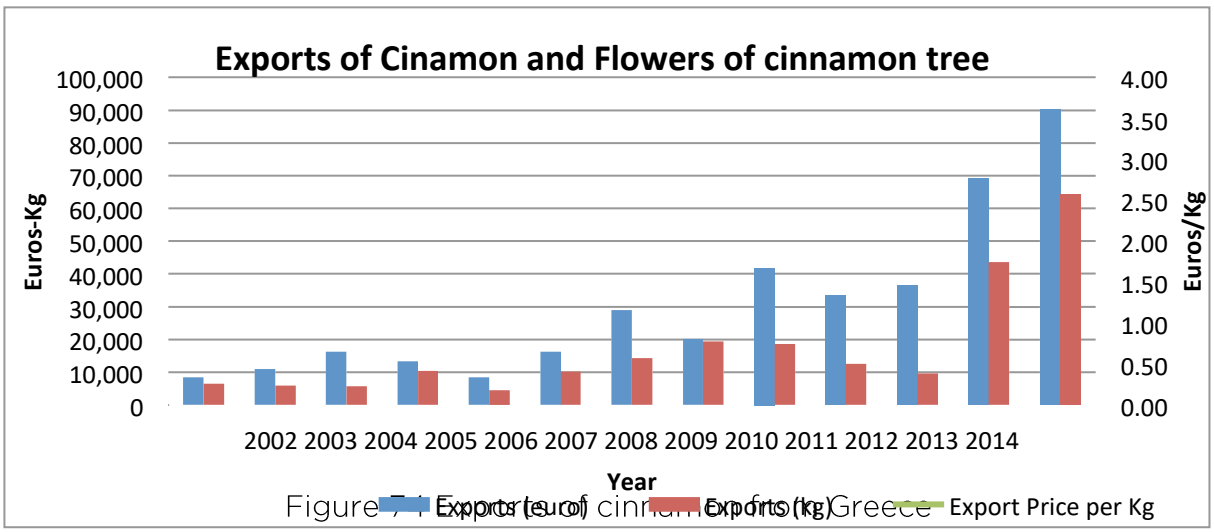


Figure 74 Exports of cinnamon in Greece

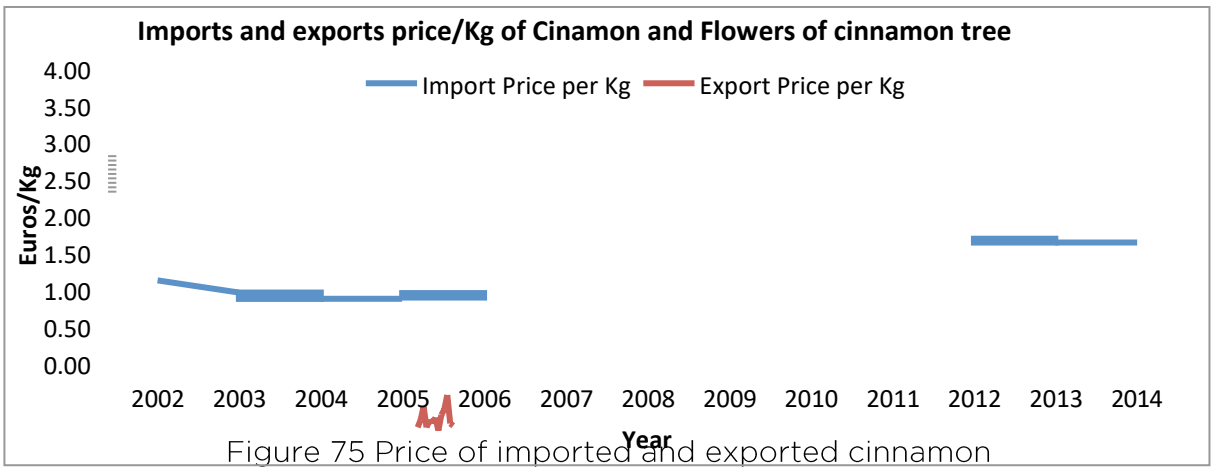


Figure 75 Price of imported and exported cinnamon

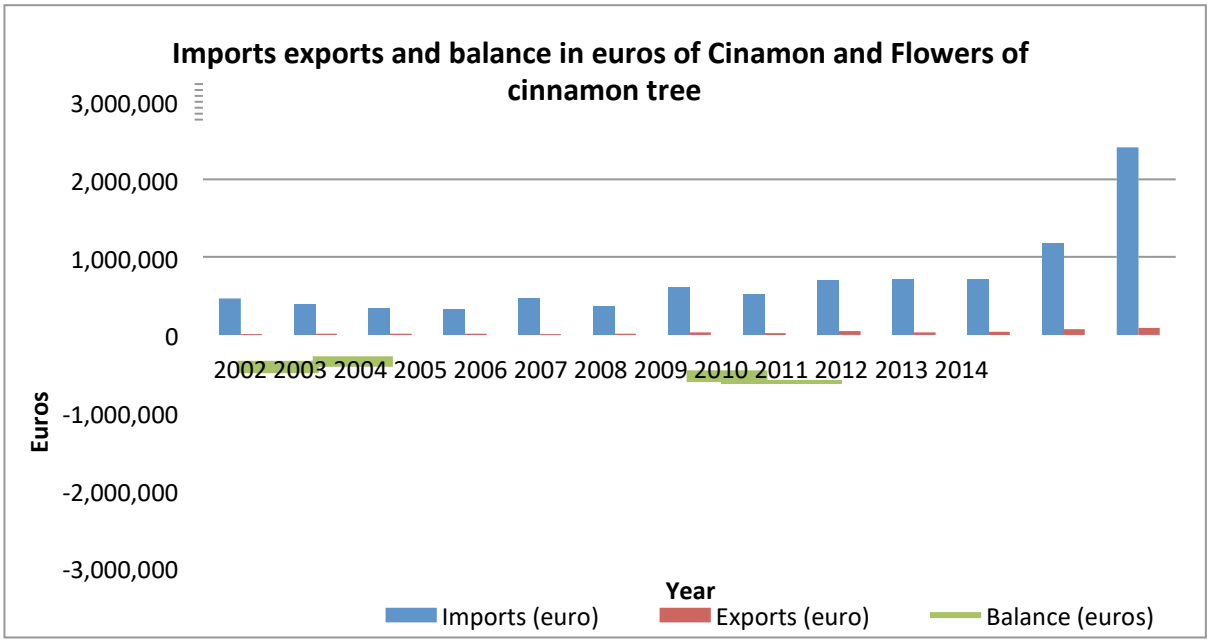


Figure 76 Cinnamon imports exports and balance in euros

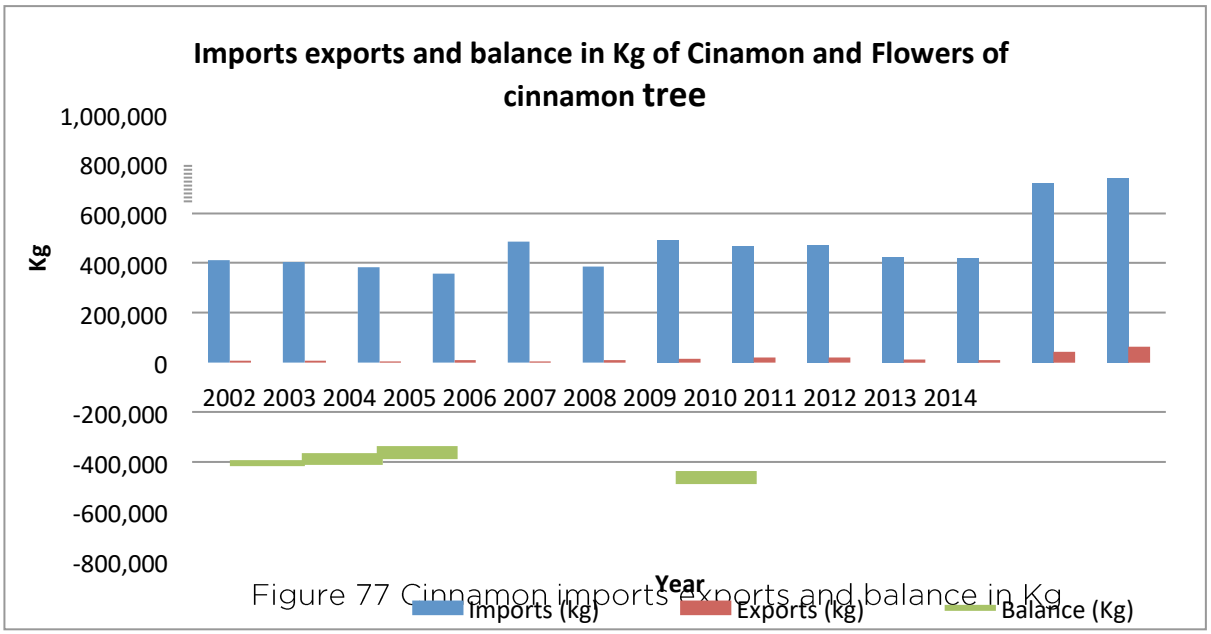


Figure 77 Cinnamon imports exports and balance in Kg

Regarding trade balance this is negative both in terms of capital and of net weight (Kg) since there is not production in Greece (MINAGRIC, 2015).

Imports and exports of curcuma

Imports of pepper in Greece are about 76 tons costing about 111,000 euros a year. Exports are 3 tons costing 5,600 euros. Import and export price are about 1.7 euros per Kg.

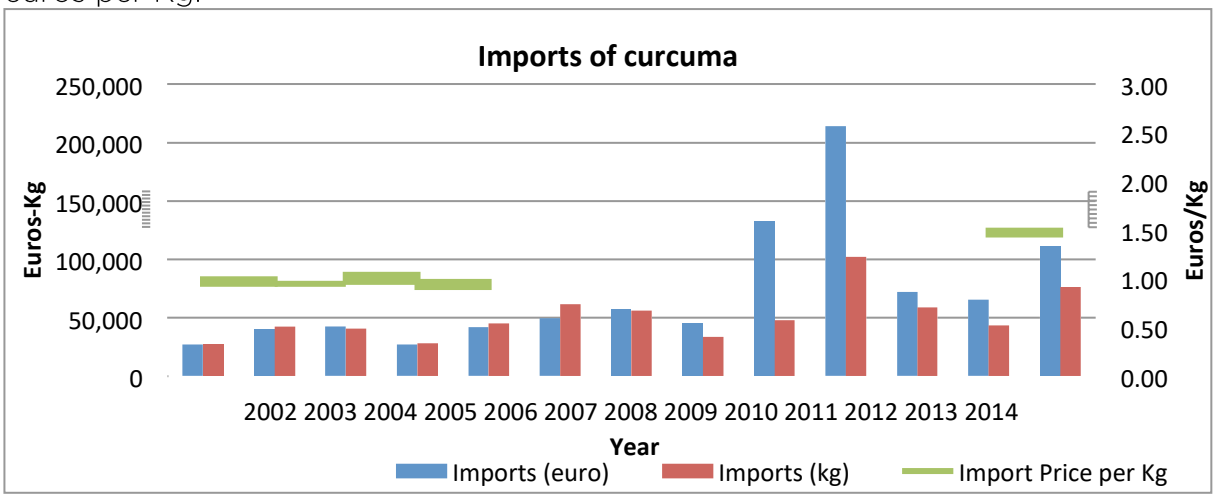


Figure 78 Imports of curcuma in Greece

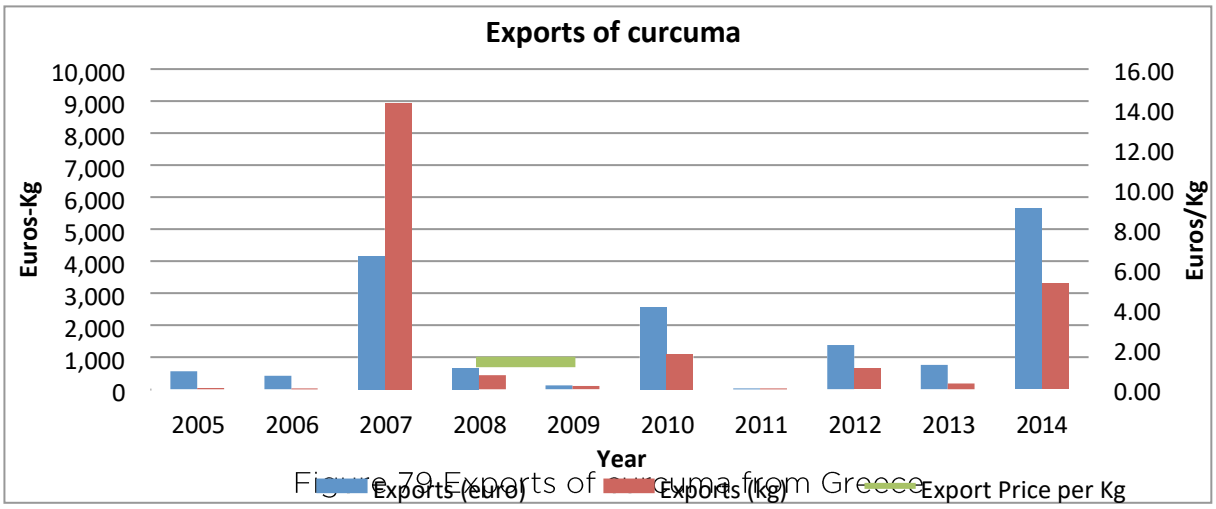


Figure 79 Exports of curcuma from Greece

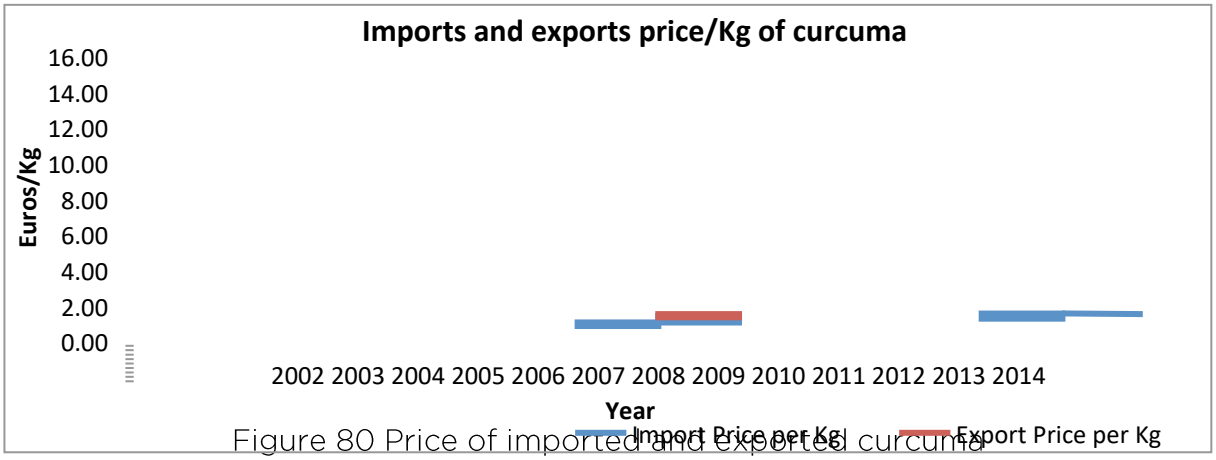


Figure 80 Price of imported and exported curcuma

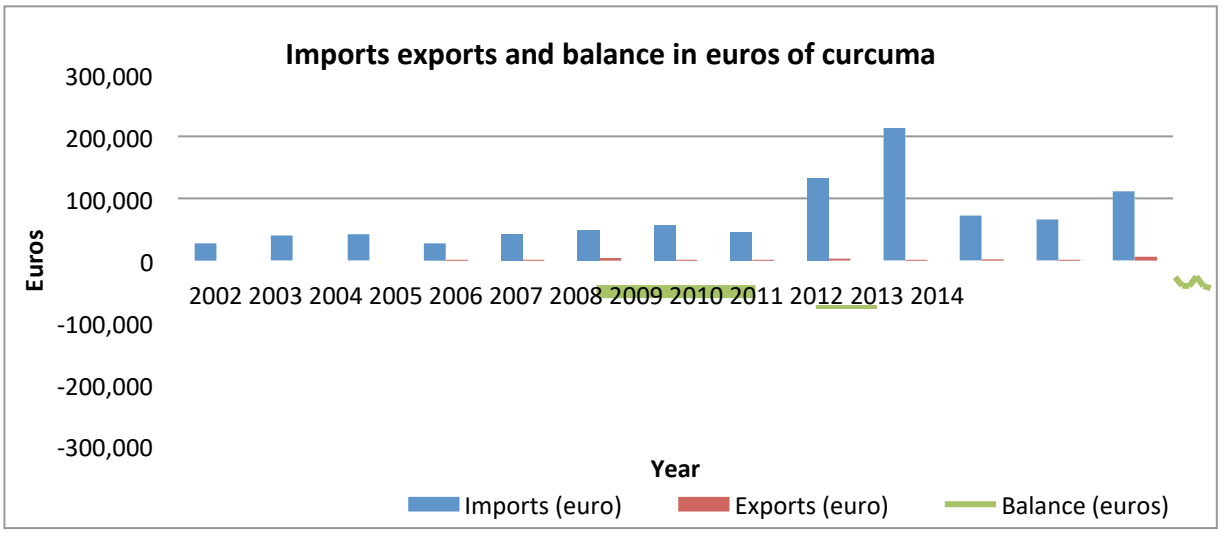


Figure 81 Curcuma imports exports and balance in euros

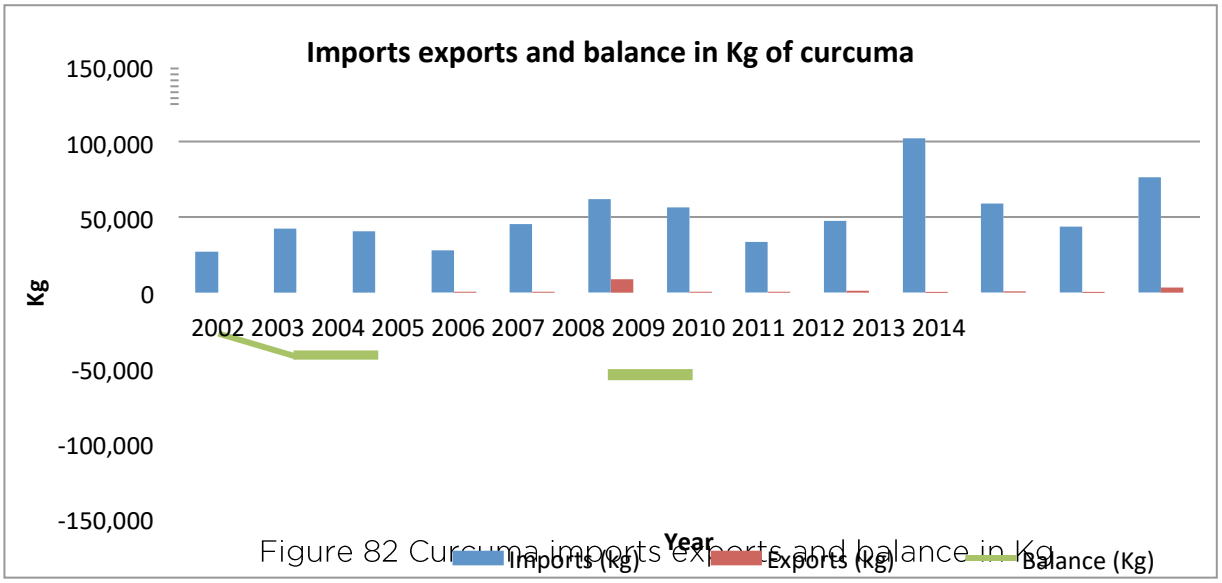


Figure 82 Curcuma imports exports and balance in Kg

Regarding trade balance this is negative both in terms of capital and of net weight (Kg) since there is not production in Greece (MINAGRIC, 2015).

Imports and exports of ginger

Imports of pepper in Greece are about 303 tons costing about 790,000 euros a year. Exports are about 2700 Kg costing about 14,000 euros. Import and export price are 2.6 and 5.1 euros per Kg respectively.

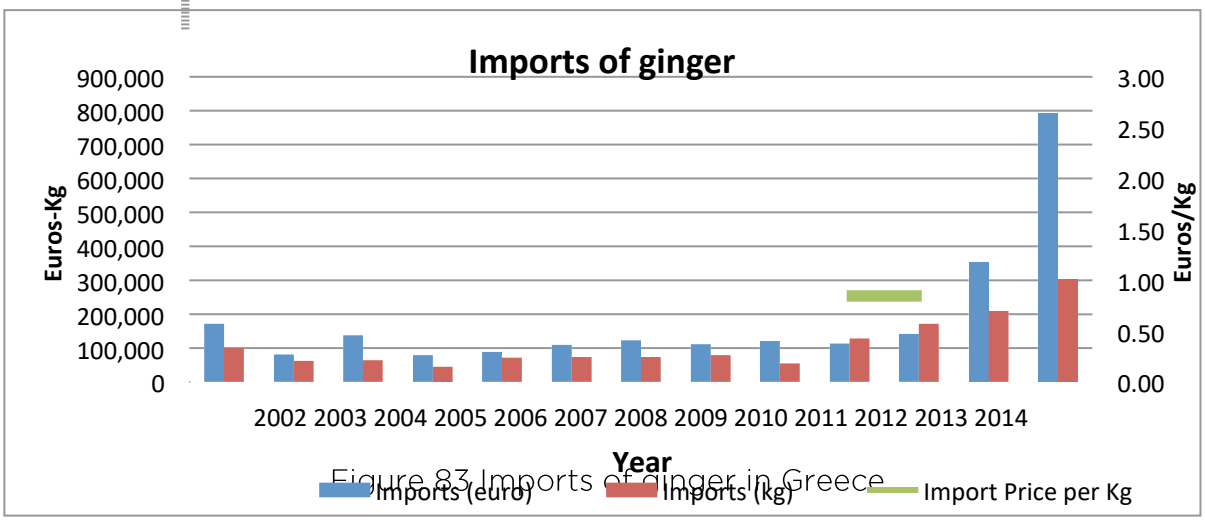


Figure 83 Imports of ginger in Greece

Figure 84 Exports of ginger from Greece

Figure 85 Price of imported and exported ginger

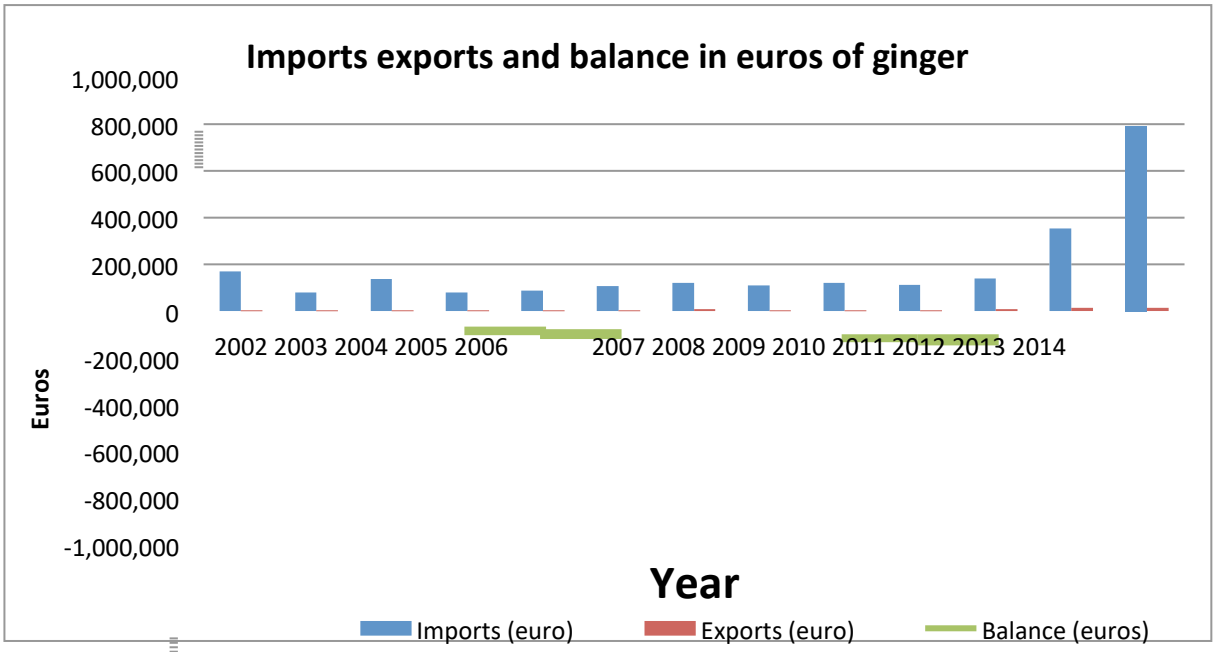


Figure 86 Ginger imports exports and balance in euros

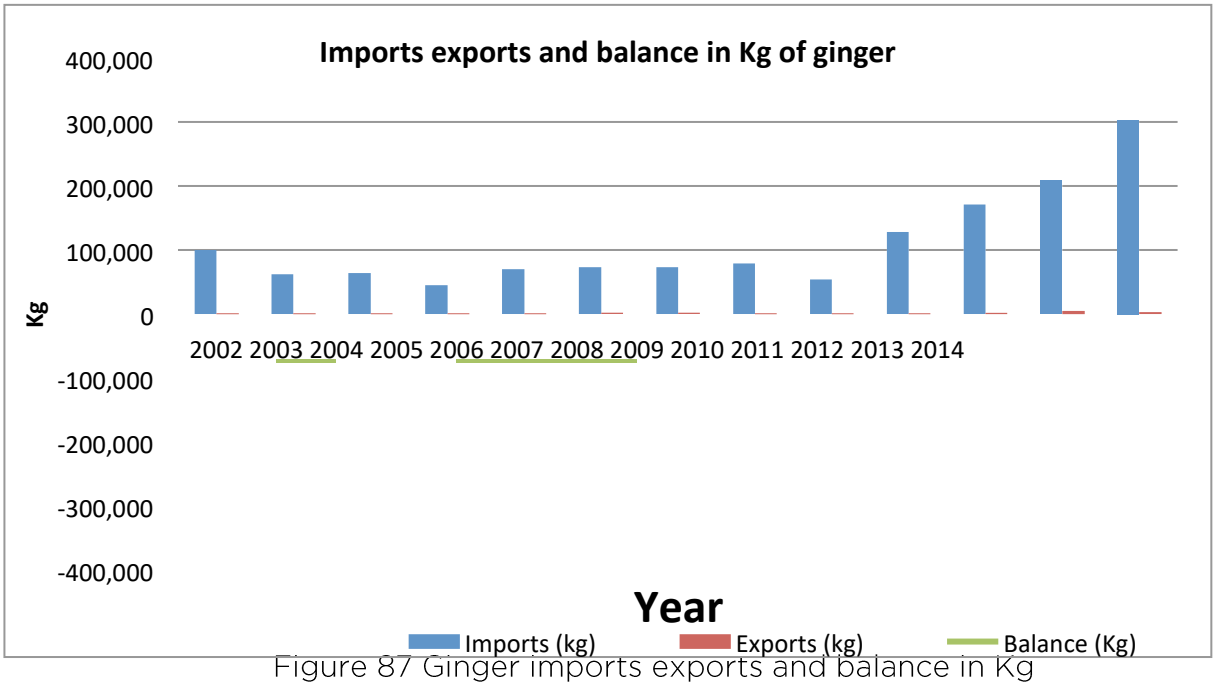


Figure 87 Ginger imports exports and balance in Kg

Regarding trade balance, this is negative both in terms of capital and of net weight (Kg of product). However, it should be noted that there are native ginger biotypes that are growing in mountain slopes of N. Greece, especially Epirus. The domestication and systematic cultivation of those populations are challenges for the scientific and agricultural community of the country. In such case this could contribute to reverse trade balance, while that would be a totally new crop for this country (MINAGRIC, 2015).

Imports and exports of Thyme

Imports of pepper in Greece are about 57 tons costing about 142,000 euros a year. Exports are

2.7 tons costing 16,500 euros. Import and export price are 2.5 and 6.6 euros per

Kg respectively.

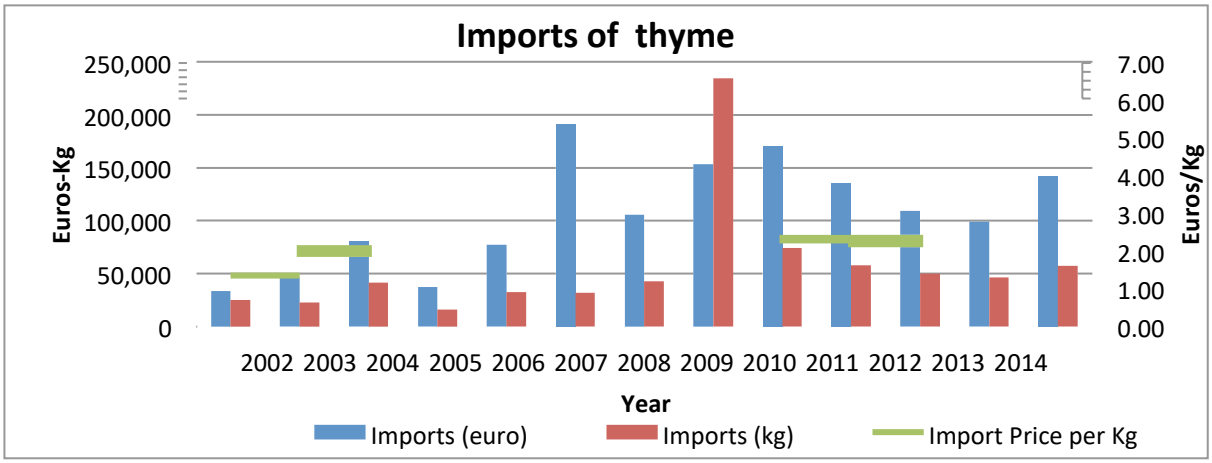


Figure 88 Imports of thyme in Greece

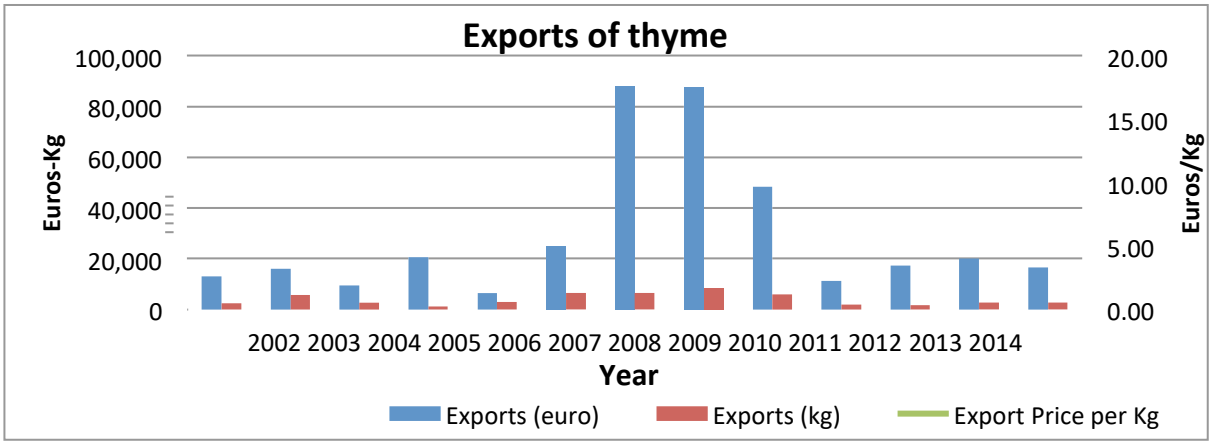


Figure 89 Exports of thyme from Greece

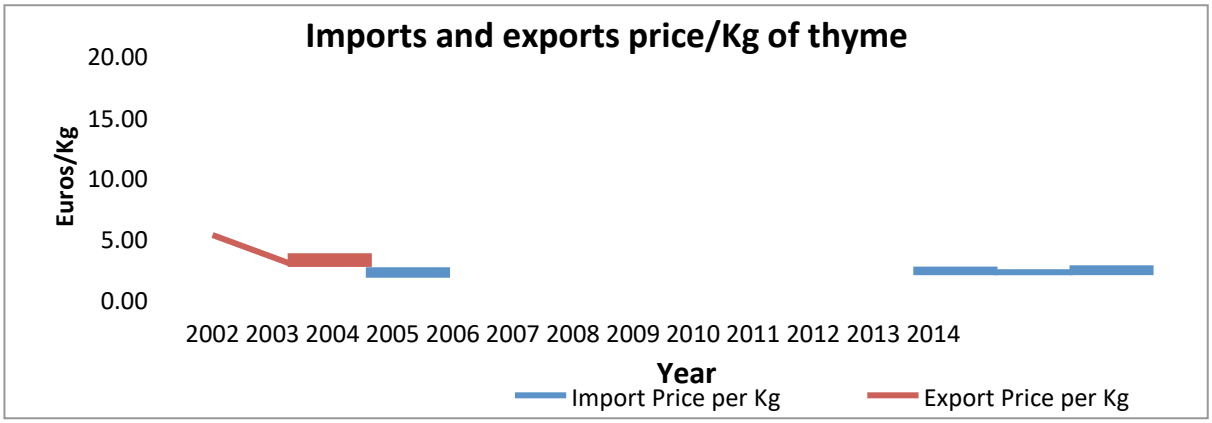


Figure 90 Price of imported and exported thyme

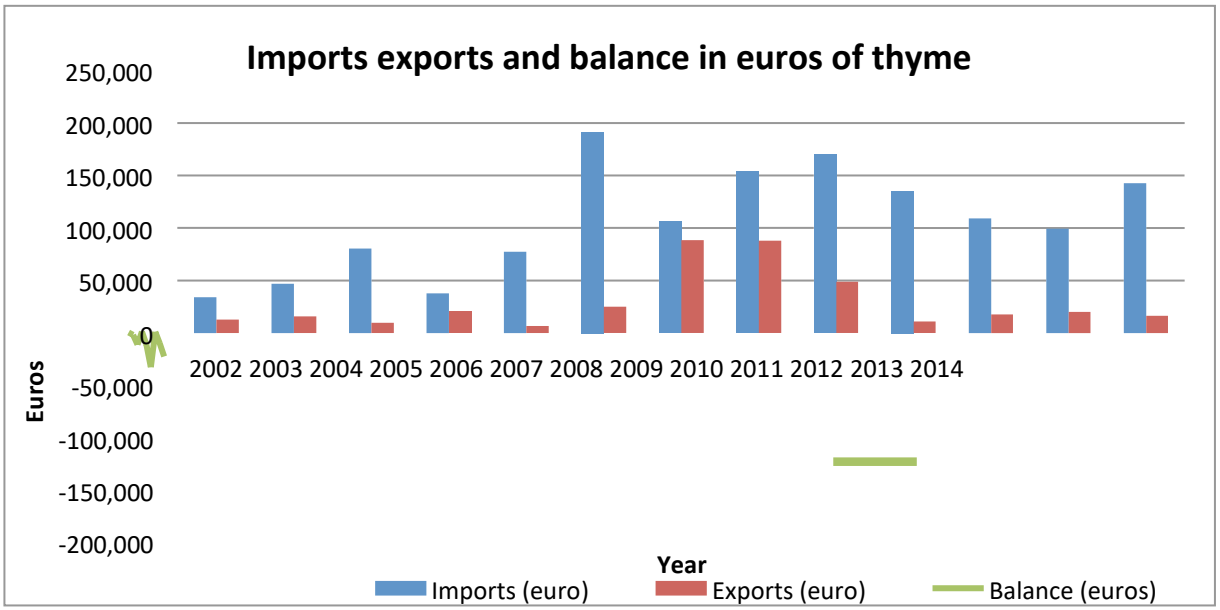


Figure 91 Thyme imports exports and balance in euros

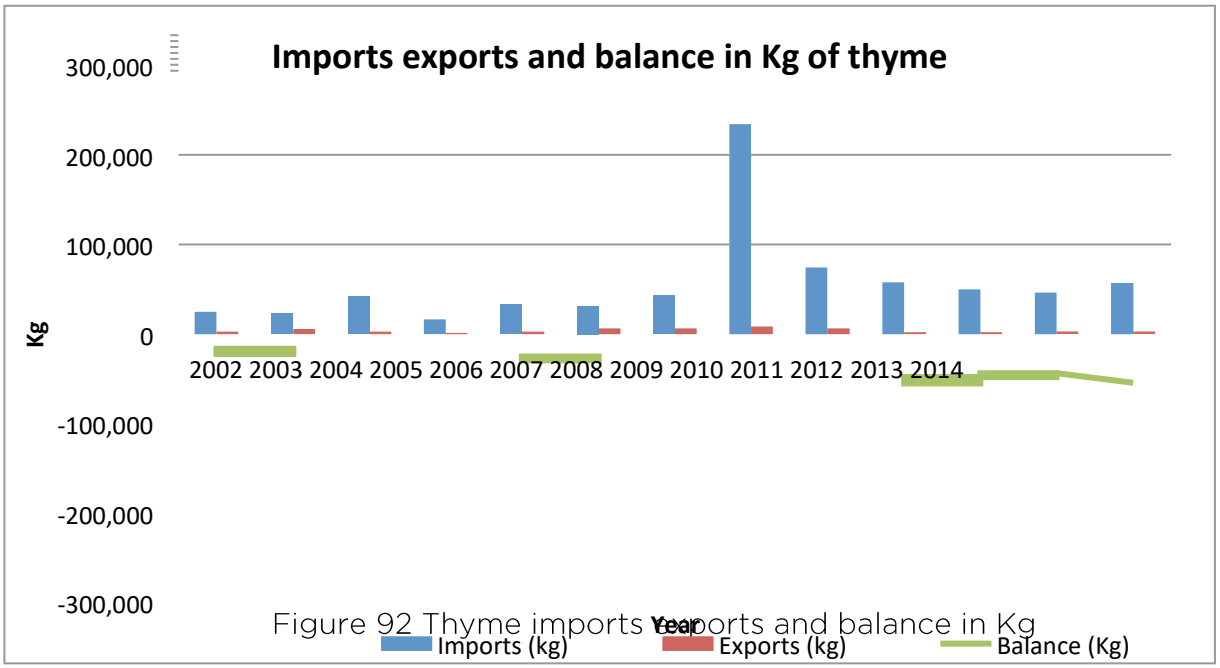


Figure 92 Thyme imports exports and balance in Kg

Regarding trade balance, this is negative both in terms of capital and of net weight (Kg of product). Greece produces excellent quality of thyme. Moreover, the climate in the biggest part of the country is absolutely suitable for thyme production. Thyme is a herb that is well appreciated in markets of western Europe and Greek thyme has best credentials in terms of quality, which is reflected in its gross export price that overcome double of that of imported one (MINAGRIC, 2015).

Imports and exports of laurel leaves

Imports of laurel leaves in Greece are about 10.4 tons costing about 25,000 euros a year. Exports are 120 Kg costing 2,140 euros. Import and export price are 2.4 and 18 euros per Kg respectively.

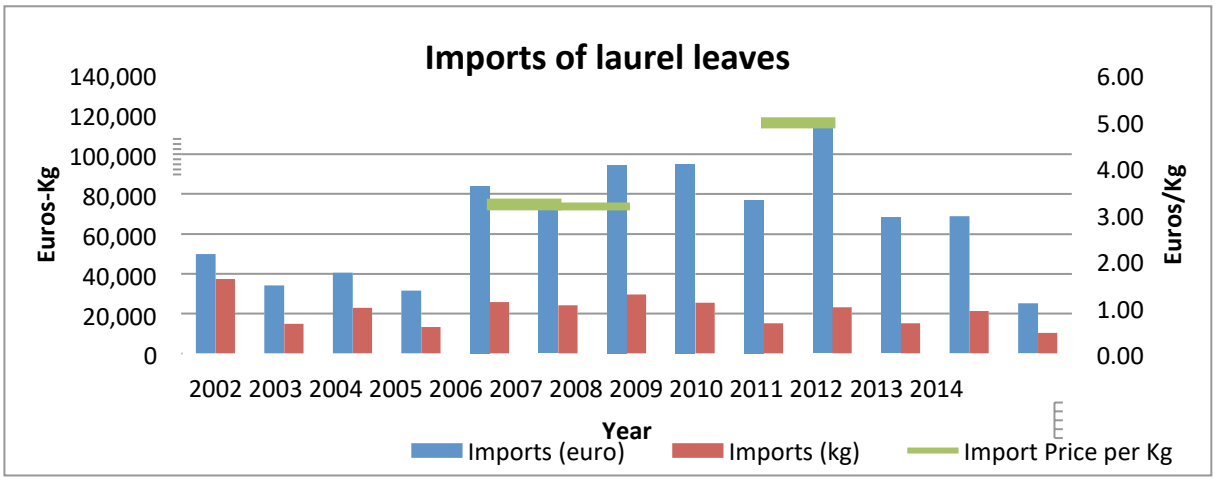


Figure 93 Imports of laurel leaves in Greece

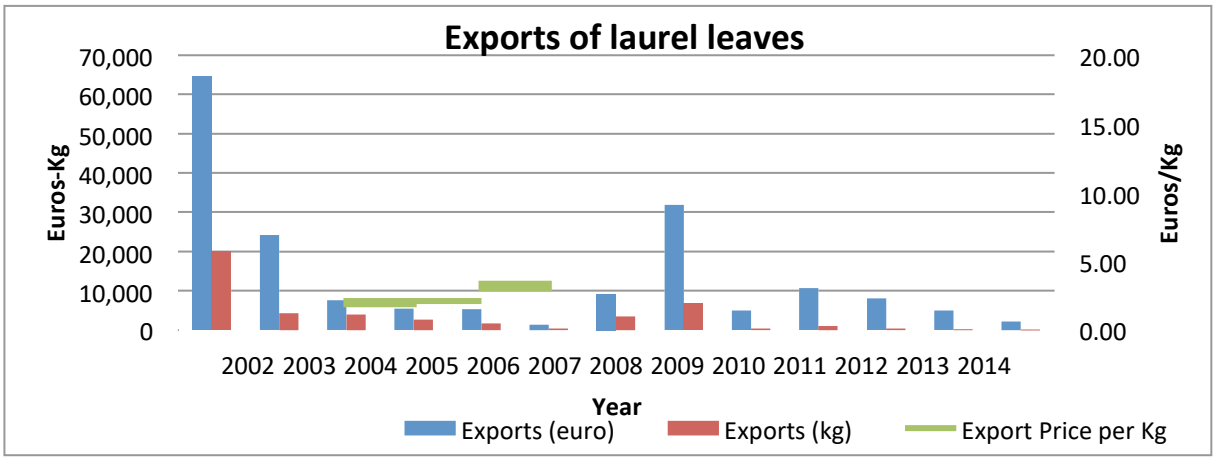


Figure 94 Exports of laurel leaves from Greece

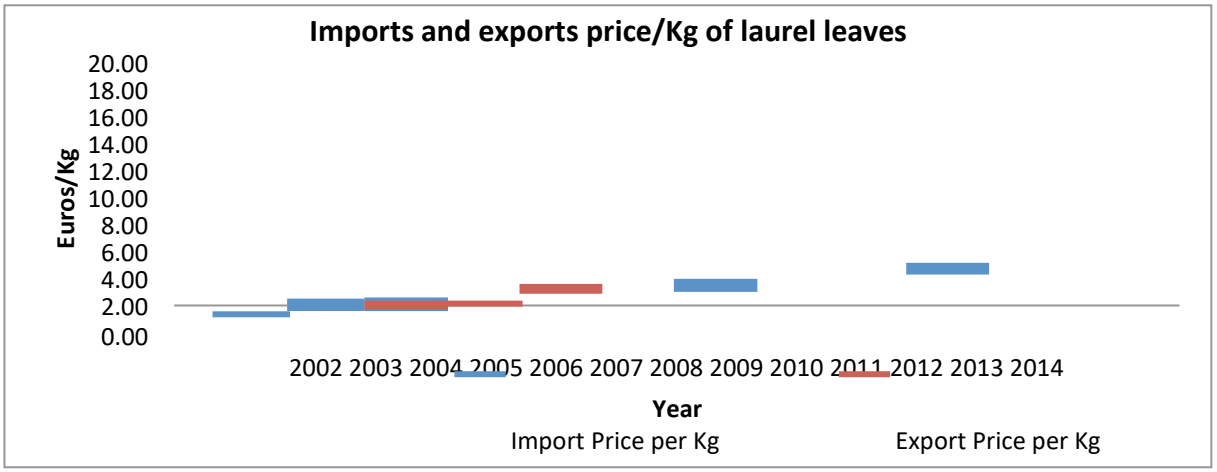


Figure 95 Prices of imported and exported laurel leaves

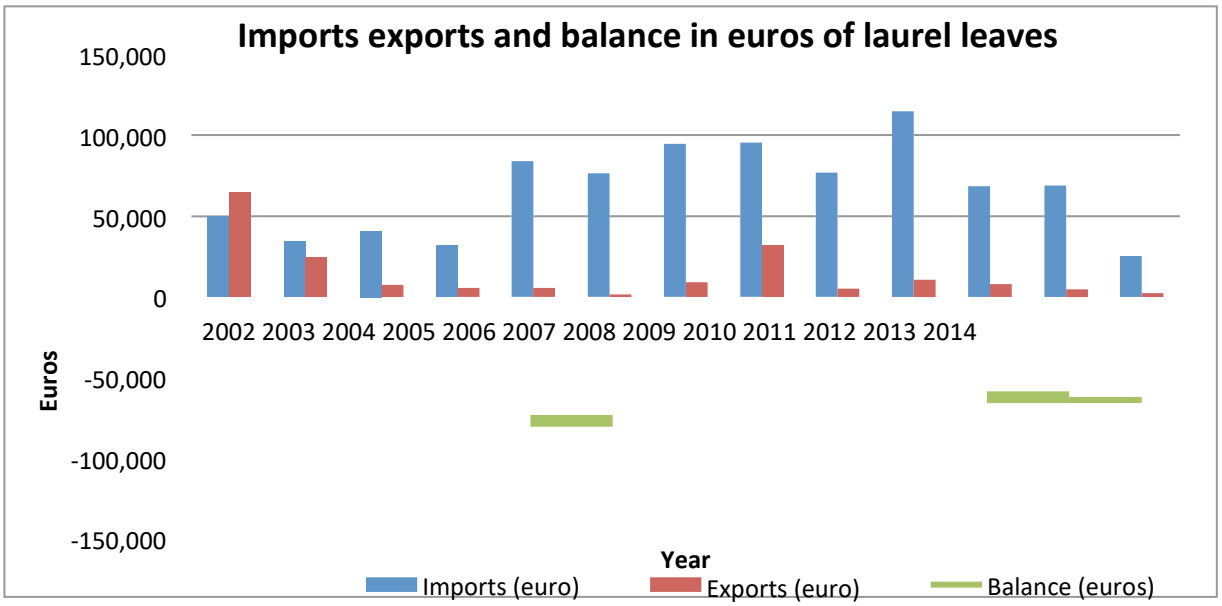


Figure 96 Laurel leaves imports exports and balance in euros

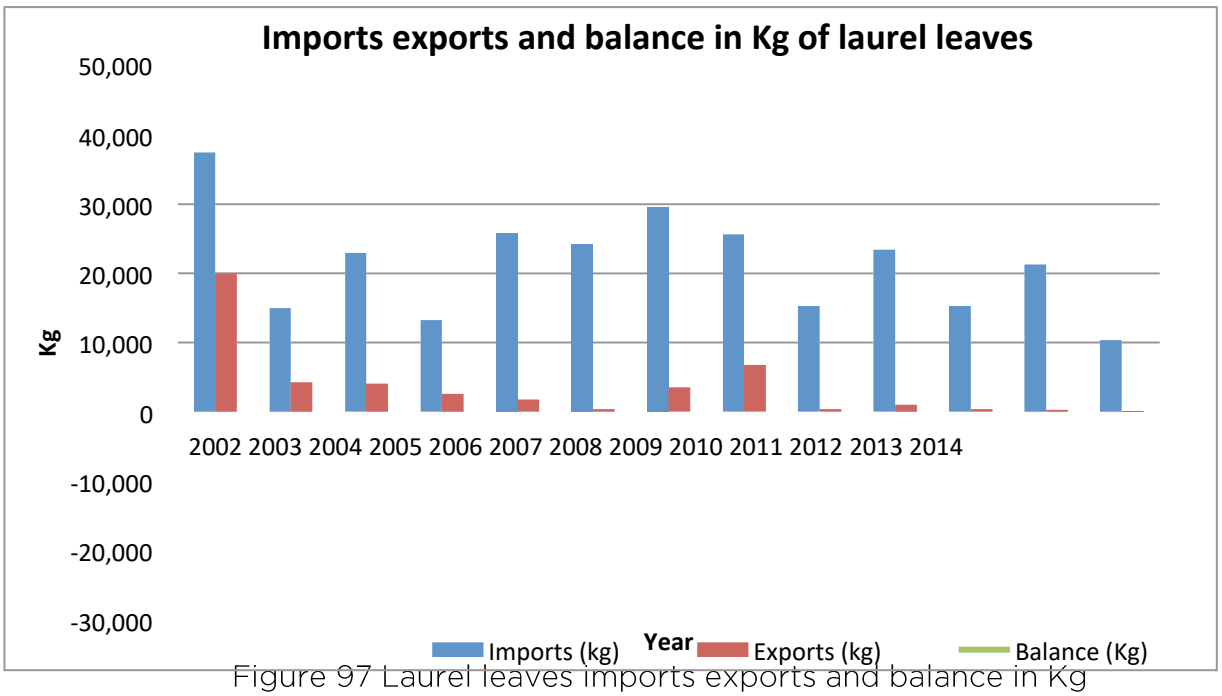


Figure 97 Laurel leaves imports exports and balance in Kg

Regarding trade balance, this is negative both in terms of capital and of net weight (Kg of product). However laurel tree, or else Daphne of Apollo, has always been in Greece and it produces good quality aromatic leaves that are essential ingredient of many traditional recipes. Also there is a big abundance of that tree which is in most cases self-grown and it can be found in all regions and all microclimates. There are not any serious pests or diseases and generally it is very easy species for cultivation. With an export price 7 times that of import this crop could contribute very much in MAPs sector sustainability. It should be of high priority for near future to organize big scale laurel farms and focus on exports of the crop (MINAGRIC, 2015).