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**THE WINE SECTOR IN GREECE:
NATIONAL TRENDS AND REGIONAL DISTRIBUTION**

Supporting paper submitted by the National Statistical Service of Greece*

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1. INTRODUCTION

The recent years it has been observed a downward trend to agricultural holdings and agricultural cultivated area in general. The continuing movement of farmers toward urban areas to find better working conditions in manufacturing and services is a considerable factor of this trend. Additionally, modern farming tends to substitute outdoor open field plantings with more profitable intensive plantings.

In this framework, wine sector following the introduction of a ban on new plantings and abandonment premia, European wine producing areas have gradually decreased since 1975/76. This reduction has accelerated annually since the 90's. From 1976 to 1996, the areas under vines in the EU decreased from 4,5 to 3,4 million ha, which represents an annual decrease rate of 1,4%, i.e. almost 56.000 ha/year. In last few years however, the rate of reduction has clearly slowed down. In addition, the vineyards within the Community have, in general, aged, as they have not been replanted at a sufficient rate, although there are exceptions in certain regions. (CAP 2000).

In the same line with EU is the Greek wine sector. Research in this field is very limited (Messini Ch., 1997) especially for the cultivated area under vines and wine production. The present study was designed to explore the national trends and regional distribution of the wine sector in Greece, applying a time series analysis of the area under vines, holdings and their production in total country and by regions (NUTS II) from 1989 to 2003. More specific, the study aims to examine the trend movement of the holdings with area under vines, the area under vines and the wine production from 1989 to 2003 in total country and by region in Greece.

The selection of this certain sector has to do with its importance to the European Agricultural Economy. Even if the wine sector is reduced in terms of cultivated areas, as mentioned above, it remains a dynamic activity in Greece and Europe. Wine makes a considerable contribution to the value of final agricultural output.

In fact, wine never has been just a product for Greeks. The numerous archeological discoveries have revealed that wine has been an important part of the Greek culture for over 4000 years. Ancient Greeks knew well the nutritional value of wine as well as its important role to the growth of the local economy. Dionyssus, one of the most worshiped Greek Gods, represents the culture of wine for the ancient Greeks. Every March a wine celebration known as "*Dionyssia*" took place in Athens. The ancient theater of Dionyssus, located below the Parthenon, is a clear testament to the strong influence of this God in the every day life of the Greeks. Wine was always diluted with water before drinking in a vase called "*kratiras*," derived from the Greek word *krasis*, meaning the mixture of wine and water. The word *Krasi* is now currently used in the Greek language as the term for wine. (<http://www.allaboutgreekwine.com>)

The most popular for their wines areas of Greece were the islands of Chios, Lemnos, Lesbos, Rhodes and Crete as well as Thrace and Macedonia to the mainland. Evidence from numerous shipwrecks has shown that Greek wine was traded throughout the known ancient world. The trade of Greek wine was organized in a way to become one of the methods Greeks used to spread their culture to the ancient world. The islands of the Aegean Sea were so famous for the quality of their wine that Homer referred to the Aegean as the "*Wine-dark Sea*".

In recent years, Greek wine industry has made great progress due to serious investments in modern wine making technology. The Greek wines receive the highest awards in international competitions and international recognition. What make the Greek wine so unique is the indigenous grape varieties (more than 300) grown in

Greece. The distinct flavors of the native grape varieties are a strong advantage for the marketing of the Greek wine industry. Another advantage of the Greek wine is the Greek climate. The plentiful sunshine combined to the low average rainfall and soils of moderate fertility provide an excellent environment for the production of high quality wines.

- **The map of Greek Quality Wines**

To facilitate the following analysis and to make the paper more informative, we present the map of Greek Quality Wines in this introductory section. According to article 2, paragraph 2 of Regulation Council Regulation (EEC) No 357/79 of 5 February 1979 on statistical surveys of areas under vines, the area under wine grape varieties, further broken down into quality wines produced in specific regions (psr) and other wines.

The EU legislation for vine varieties are the Council Regulations (EEC) No 3800/81 determining the classification of vine varieties and No 3801/81 laying down transitional provisions for the classification of authorized wine varieties for cultivation in Greece.

The main Greek quality wines produced in specified regions are presented bellow, sorted by regions (NUTS II).

Kentriki Makedonia

One of the oldest and finest wine-making regions in Greece is Kentriki Macedonia. ‘*Naoussa*’ is one of the delicious quality wines (psr) made from the native grape, *Xinomavro*. Another full-bodied quality wine (prs) produced in Kentriki Macedonia is ‘*Goumenissa*’, made from grapes *Xinomavro* and *Negkoska*.

In Epanomi, only few miles away from Thessaloniki, the mild local climate in combination to sandy clay soils bring out the best qualities in the grapes, which produce a range of world class wines. One of the largest and most picturesque vineyards in Europe is located on the western coast of Halkidiki, at the slopes of Mount Meliton. Two of the most delicious quality wines (psr) are the ‘*Plages Melitona*’ (white) (Côtes de Meliton) made from a combination of indigenous white grapes *Athiri*, *Asirtiko* and *Roditis* and ‘*Plages Melitona*’ (red) (Côtes de Meliton) made from the distinctive grapes *Limnio*, *Kamberne Fran* (Black) and *Kamberne Sovinion* (Black).

Dytiki Makedonia

In Dytiki Macedonia, in the remote region of Amyntaio, a delicious quality wines (psr) “*Amyntaio*” has been produced from the native grape, *Xinomavro*.

Ipeiros

In Ipeiros there are some of the most mountainous vineyards in Greece, hidden between the slopes of Mt. Pindos. In this region, despite the difficult growing conditions, some excellent wines are being produced. The quality wines (psr) ‘*Zitsa*’ has been produced from *Dembina* grapes.

Thessalia

In Rapsani the peaks of Mount Olympus and the neighboring Aegean sea form a unique microclimate that provide a positive effect on the production of the distinct Rapsani red wines made from a combination of indigenous *Xinomavro*, *Krassato* and *Stavroto* grapes. The soil, rich in iron schist, the vineyards' close proximity to the sea and the ideal adaptation of the 3 native grapes to the environment have created perfect conditions for the production of the outstanding quality wines (psr) '*Rapsani*'. Another two quality wines (psr) are '*Messenikola*' made from *Messenikola (Black)*, *Carignan & Syrah* and '*Aghialos*' made from a combination of *Roditis* and *Savvatiano* grapes.

Ionian islands

The beautifully green and mountainous island of Cephalonia is recognized as the most important of the Ionian islands for the production of new style Greek wines. The native *Rombola* grapes are the local viticultural treasure together with *Mavrodaphne* and *Moschato (white)*. '*Rombola of Cephalonia*' is one of the three quality wines (psr) produced here from *Rombola* grapes. The other two quality wines (psr) are '*Moschatos of Cephalonia*' made from *Moschato (white)* grapes and '*Mavrodaphne of Cephalonia*' made from a combination of *Mavrodaphne* and *Black Korinthiaki* grapes.

Dytiki Ellada

The vineyards, located south of Patras on the slopes of the Achaia mountains, consist of unique indigenous varieties which produce wines that continue to receive the international recognition and acclaim they deserve. There are produced four quality wines (psr): the popular '*Mavrodaphne Patron*', a fortified red wine made from the *Mavrodaphne* and *Korinthiaki* grapes, two delicious aromatic white dessert wines, '*Moschato Patron*' and '*Moschato Rio of Patras*' made from the *Moschato (white)* grape and a savory dry white named '*Patra*', made from the *Roditis* grape.

Peloponnisos

One of the most historic wine regions of Greece is Peloponnisos. The vineyards of the Peloponnisos are known for their diversity and complexity, spread throughout hillsides, plains and plateaus. One of the most important regions in southern Greece for the production of red wines is Nemea. It is used the *Agiorgitiko* grape which produces the quality wine (psr) '*Nemea*' famous for their deep red color, complex aroma and long, velvety palate. Another important region is Mantinea where the noble *Moschofilero* grape is cultivated producing the quality wine psr '*Mantineia*'.

Voreio Aigaio

The Aegean islands have an important winemaking tradition that dates back to the Neolithic age. Having developed a strong shipping network, our Aegean ancestors traded their wines throughout the known ancient world. The moderate Mediterranean climate of the Aegean combined with the rocky, volcanic soil, plentiful sunshine and constant sea breezes provide excellent conditions for the cultivation of grapes.

The island of Samos, whose history of wine culture dates back to the third millennium B.C., gained an unparalleled and long-lasting international reputation for its sweet *Moscato (white)* grapes that began in the 1600's. Now entering its fifth millennium of wine production, the island's quality wine (psr) 'Samos' is as outstanding and fabulously delicious today as it was in the time of the Renaissance.

The island of Limnos is known for two quality wines (psr): the 'Moschatos Limnou' and 'Limnos' made both from *Moschato* grape.

Notio Aigaio

Rhodes, legendary island of the knights, was one of the first areas in ancient Greece known for the production of wine. Rhodes enjoys the longest periods of sunshine and the shortest periods of rainfall in all of Greece, favorable factors in the production of the high quality Rhodos wines. The dominant grapes are the white *Athiri* and the red *Mantilaria*, cultivated on the northwesterly slopes of Mount Attaviros, produce the two elegant quality wines (psr) 'Rhodos' white and red respectively. Another quality wine (psr) 'Moschatos Rhodou' from *Moschato* grapes is also made in Rhodes.

On the breathtaking island of Santorini, the production of wine dates back to the time of the Bronze Age. After the devastating volcanic explosion, circa 1650 BC, the island was covered with volcanic ash, lava and pumice stone. This catastrophe created the foundation for perfect soil conditions, which now produce very distinctive wines. The vines are cultivated in low basket shaped crowns, close to the ground for protection from the strong winds. Coming off the sea, the nocturnal fog brings needed water to the vines during the hot summer nights and together with the refreshing northerly winds provide excellent growing conditions for the creation of the superb Santorinis' quality wines (psr).

The ancient civilization of Santorini was completely destroyed by a catastrophic volcanic explosion that occurred somewhere between 1620-1640, BC. With every trace of life gone, all that remained was covered with volcanic ash; lava and pumice stone, which eventually lead to the creation of a compact soil, called aspa. It was in Santorini that Archeologists discovered the ancient village of Acrotiri, the oldest and best-preserved bronze-age village in Europe. The archeologists unearthed a great deal of evidence here that indicated the existance of viniculture and winemaking as far back as the Bronze Age. They found carbonized grape seeds, drawings that included evidence of vine cultivation and winemaking as well as numerous amphoras that were used to store the wine. Ironincally, it was the aspa created from the volcanic lava that preserved this ancient era in Greek Civilization for future generations to study Maragou, A. (1990), Kopaka, K. (1997).

The porous volcanic soil of Santorini allows the earth to retain water, giving the vineyards the ability to stay nourished during the high summer temperatures. During the hot Greek summer, rains are extremely rare and the only source of water for the vineyards is the nocturnal fogs. After the evening sun sets the island becomes enveloped in a fog that comes in from the sea. The vines are able to retain the water they need from this evening fog and use it during the warm daylight hours when it is needed most. Santorini was also one of the rare wine making areas in the world not attacked by phylloxera, because of the high content of sand found in volcanic soil. Because of their resistance to phylloxera, most of the picturesque vineyards that cover the island are more than 100 years old and retain their original root stocks.

Every trace of life on this enchanting island is found on the top of an impressive rock. The winds saturate the island throughout the year. The only way for the grapes to survive from the direct exposure of sun and strong winds is to be protected inside low-basket-shaped vines, the ampelies, as they are called locally. The refreshing northerly winds that blow from July to September; known as the meltemia, also help keep the vines from developing the numerous fungi that can result from the combination of summer heat and humidity.

The different wines of Santorini owe their special qualities to the unique geology of Santorini. The soil is rich in inorganic ingredients, but very poor in organic ingredients.

Asirtiko is probably Greece's finest multi-purpose white grape variety. It was first cultivated on the island of Santorini, where it has developed a unique character. It has the ability to preserve its acidity while keeping a high alcoholic content. *Asirtiko* gives a bone-dry wine that has citrus aromas mixed with the characteristic earthy flavors that the volcanic soil of Santorini provides. It ends with a pleasantly mineral aftertaste. The last 25 years *Asirtiko* was replanted at an area near Thessaloniki and from there many other winemaking regions of Greece have begun to plant the grape. Away from Santorini, *Asirtiko* expresses a milder and more fruity character with less earth and mineral hints.

In Santorini, *Asirtiko* can also be used together with the aromatic *Aidani* and *Athiri* grapes for the production of the quality wine (psr) '*Santorini*'.

Athiri is one of the most ancient of Greek grape varieties. The name of the grape gets its name from Thira, which is the other name for Santorini. In ancient times *Athiri* was known for the production of sweet wines. The grapes mature early, have a thin skin and give sweet and juicy fruit that are qualities especially in demand for the production of sweet wines. It produces wines slightly aromatic, having medium alcoholic content with low acidity. *Athiri* has been replanted in several other regions of Greece, with the variety being especially popular in the Rhodes, Macedonia and the Islands of the Cyclades.

Aidani is another ancient Greek grape variety. We find it only in the Islands of the Cyclades, especially on the island of Santorini, Naxos and Paros. It produces wines pleasantly aromatic with medium alcoholic content and acidity. It can be successfully mixed with grapes having high alcoholic content and acidity such as *Asirtiko*.

The island of Paros are known for two quality wines (psr): the '*Paros*' made from a combination of *Monemvasia* and *Mantilaria* grapes and '*Paros*' (*white*) made from *Mantilaria* grape.

Kriti

The winemaking tradition of Crete dates back almost 4000 years ago to the celebrated Minoan Civilization. In fact it was on Crete near the village of Archanes that the oldest wine press in the world was discovered. The vineyards of Crete are planted on the northern part of the island, protected from the warm African winds by the mountains that crisscross the island from east to west. The unique Cretan ecosystem provides the ideal environment for the production of six quality wines (psr). The first two quality wines (psr) are '*Sitia*' (red) made from a combination of *Liatiko* and *Mantilaria* and '*Sitia*' (white) made from *Vilana* and *Thrapsathiri* grapes. The other two quality wines (psr) are '*Peza*' (red) and '*Archanes*', made from a combination of *Kotsifali* and *Mantilaria* grapes. The last two ones are '*Dafnes*' and '*Peza*' (white) made from *Liatiko* and *Vilana* grapes respectively.

2. DATA AND METHODS

The source of data comes from basic surveys of area under vines of years 1989 and 1999 and the intermediate statistical surveys of area under vines for the rest years. These surveys carried out by National Statistics Service of Greece, according to Council Regulation (EEC) No 357/79 of 5 February 1979 on statistical surveys of areas under vines, as amended by Council Regulation (EEC) No 3719/81.

According to the above legislation (article 1, paragraph 1 of the Council Regulation (EEC) No 357/79), Member States shall carry out: a) Every 10 years basic survey on the area under vines; b) Annually from the **second** year after the basic surveys, intermediate surveys on the changes taking place in the areas under vines.

Because of this procedure **missing data** should have been for the first year after the basic survey (1990 and 2000). However the data for the year 1990 exists, because the intermediate survey was carried out for national purposes.

Missing observations can be problematic in analysis, and some time series measures cannot be computed if there are missing values in the series. Sometimes the value for a particular observation is simply not known. **Missing data** at the beginning or end of a series pose no particular problem; they simply shorten the useful length of the series. Gaps in the middle of a series (embedded missing data) can be a much more serious problem. The extent of the problem depends on the analytical procedure you are using. For this reason, the missing values for the year 2000 are replaced with their *predicted values of their linear trend for that point* as suggested by SPSS v. 13.

Exponential smoothing method is used to remove unexpected and not regularly repeated facts that influence the annual data Gardner (1985), Makridakis, Wheelwright, and McGee (1983), Makridakis and Wheelwright (1989) and Montgomery, Johnson, & Gardiner (1990), Rontos J. and Rondos K. (1996).

Exponential Smoothing has become very popular as a forecasting method for a wide variety of time series data. A simple and pragmatic model for a time series would be to consider each observation as consisting of a constant b and an error component ε (epsilon), that is:

$$X_t = b + \varepsilon_t$$

The constant b is relatively stable in each segment of the series, but may change slowly over time. If appropriate, then one way to isolate the true value of b , and thus the systematic or predictable part of the series, is to compute a kind of moving average, where the current and immediately preceding (“younger”) observations are assigned greater weight than the respective older observations. Simple exponential smoothing accomplishes exactly such weighting, where exponential smaller weights are assigned to older observations. The specific formula for simple exponential smoothing is:

$$S_t = \alpha * X_t + (1 - \alpha) * S_{t-1}$$

Each smoothed value is the weighted average of the previous observation, where the weights decrease exponentially depending on the value of parameter α (alpha). If α is equal to 1, then the previous observation are ignored entirely; if α is equal to 0, then the current observation is ignored entirely. Values of α in-between will produce intermediate results.

Gardner (1985) discusses various theoretical and empirical arguments for selecting an appropriate smoothing parameter. Obviously, looking at the formula presented above, α should fall into the interval between zero (0) and one (1). He

reports that among practitioners, the exponential smoothing parameter α smaller than 0,30 is usually recommended. In this study, Simple Exponential Smoothing Method was used to smooth the data series.

Trend Analysis was afterwards implemented on those data in order to make intermediate forecasting projections. It was fitted the most appropriate **trend model** (linear or quadratic) in data, according to the value of coefficient R^2 . This coefficient measures the proportion of variation in Y that is explained by the independent variable Lavine, D., Krehbiel T., Berenson M.(2000)

Data processing was carried out with MS Excel and Statistical packages SPSS, Minitab.

Finally, in order to compute the indicator of production by area, we divide the production (total, quality wines, other wines) by cultivated area (total, quality wines, other wines) for the same growing year. This indicator describes the production capacity by cultivated area for each year.

3. ANALYSIS OF BASIC RESULTS

3.1. Holdings, total area under vines and wine production in National level

Studying the data of basic surveys of area under vines of years 1989 and 1999 and the intermediate statistical surveys of area under vines of the rest years, it reveals to exist a downward trend effect in the time series of holdings from 259.166 in 1989 to 142.399 in 2003 (Table 1).

Table 1 presents the series of data of holdings, area under vines and production by category per year.

Table 1: Holdings, area under vines, wine production by category per year
(Area in stremmas, Production in 1.000 litres)¹

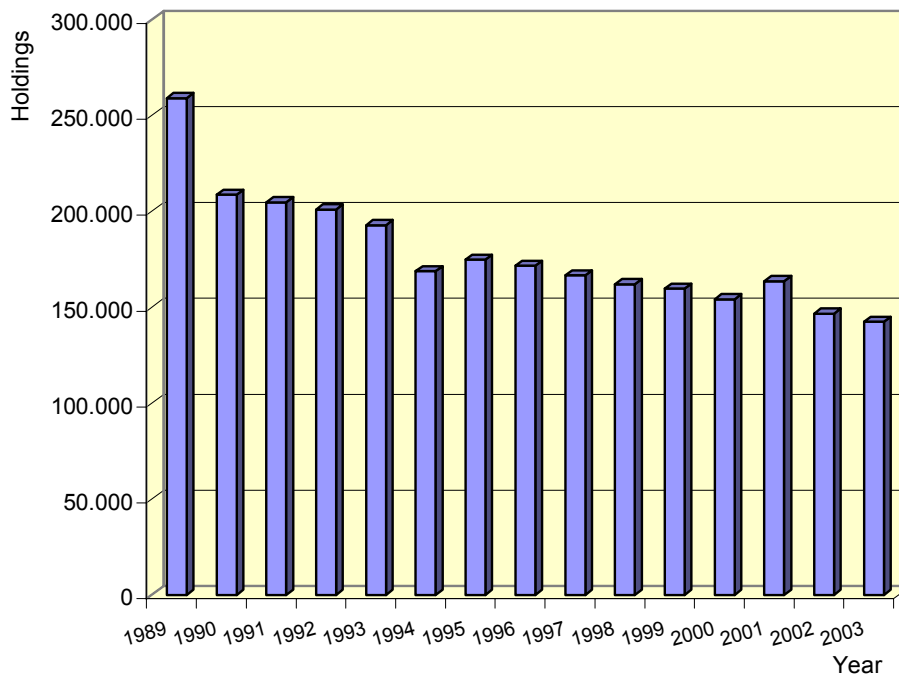
Year	Area under vines (stremma)				Wine Production (1.000 litre)		
	Holdings	Total Area	For production of quality wines	For production of other wines	Total Production	For production of quality wines	For production of other wines
1989	259.166	741.454	132.981	608.473	513.396	93.126	420.270
1990	208.794	691.543	130.034	561.509	448.551	75.023	373.528
1991	204.868	673.680	127.359	546.321	458.922	80.504	378.418
1992	200.983	653.133	133.402	519.731	497.655	96.912	400.743
1993	192.895	637.032	121.938	515.094	458.049	77.813	380.236
1994	168.852	539.645	106.069	433.576	424.025	75.042	348.983
1995	174.843	543.168	118.187	424.981	435.735	90.548	345.187
1996	171.668	531.006	105.992	425.014	475.143	86.694	388.449
1997	166.634	522.888	108.247	414.641	450.232	100.147	350.085
1998	162.059	508.767	127.907	380.860	466.916	97.238	369.678
1999	159.787	508.842	136.731	372.111	412.699	104.420	308.279
2000	154.160	512.354	127.082	385.271	434.839	97.665	337.173
2001	163.729	514.630	138.992	375.638	444.221	96.986	347.235
2002	146.707	527.987	131.355	396.632	389.722	93.854	295.868
2003	142.399	517.083	133.578	383.505	454.187	107.003	347.184

¹ In whole study, areas are measured in stremmas and the production in 1.000 litres.

A decrease also exists in the series of total area under vines from 741.454 in 1989 to 517.083 in 2003 as well as in wine production from 513.396 in 1989 to 454.187 in 2003 (Table 1).

These decreases in total area and wine production may have occurred for many reasons. One of them is the change in the socio-economic structure of the Greek agricultural holdings. The development of the much more profitable tourist industry is such a reason. In the last fifteen years, many regions such as Notio Aigaio, Kriti, Peloponnisos have highly developed the tourist industry. This development has urged the farmers to abandon their agricultural employment and become involved with tourism.

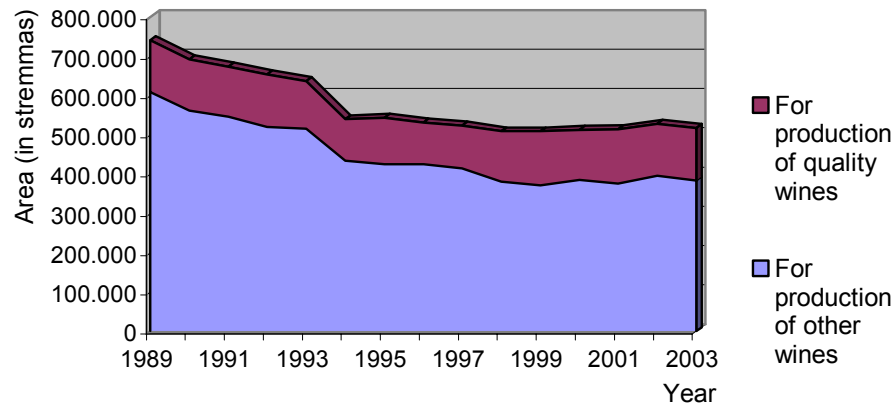
Figure 1: Holdings of area under vines by year



According to article 2, paragraph 2 of the Council Regulation (EEC) No 357/79, the area under wine grape varieties, further broken down into **quality wines psr** and **other wines**.

In Figure 2 there is a presentation of total area under vines broken down into quality wines psr and other wines. There is a downward trend effect in the time series of total area from 741.454 in 1989 to 517.083 in 2003 (Table 1). This reduction is due to the decrease of area for production of other wines from 608.473 in 1989 to 383.505 in 2003, when the area for the production of quality wines shows a small increase during the period from 132.981 in 1989 to 133.578 in 2003 (Table 1).

Figure 2: Area under vines from 1989 to 2003



The same result come from the comparison of the two basic surveys (1989 and 1999) for the area of quality wines and other wines (Figure 3).

Figure 3: Area under vines per wine category for the basic surveys (1989, 1999).

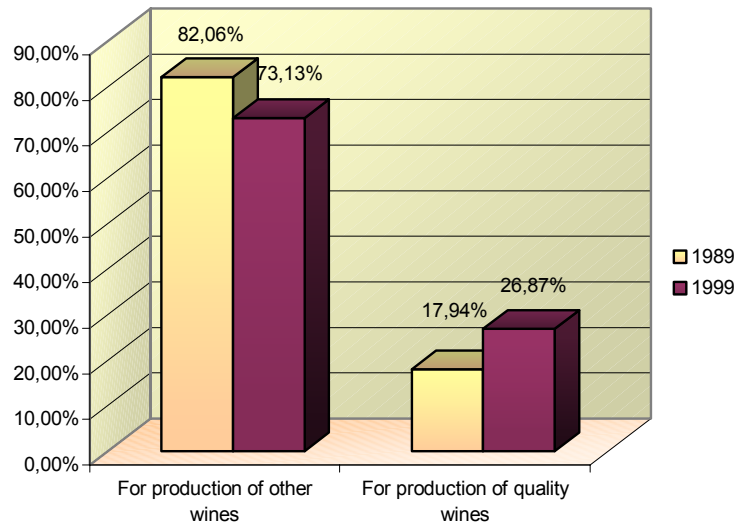
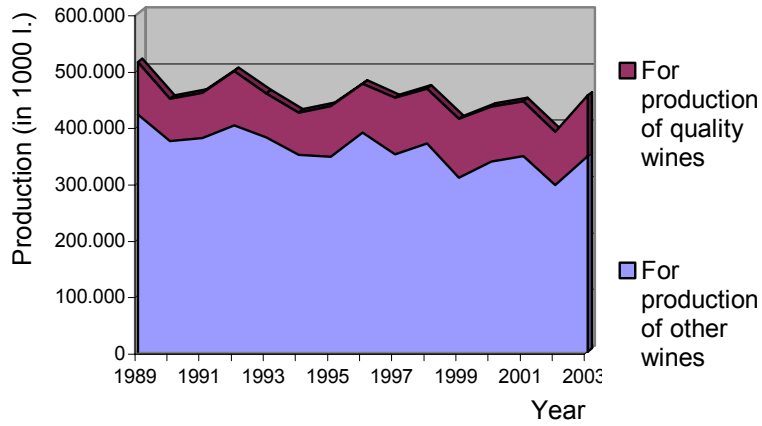


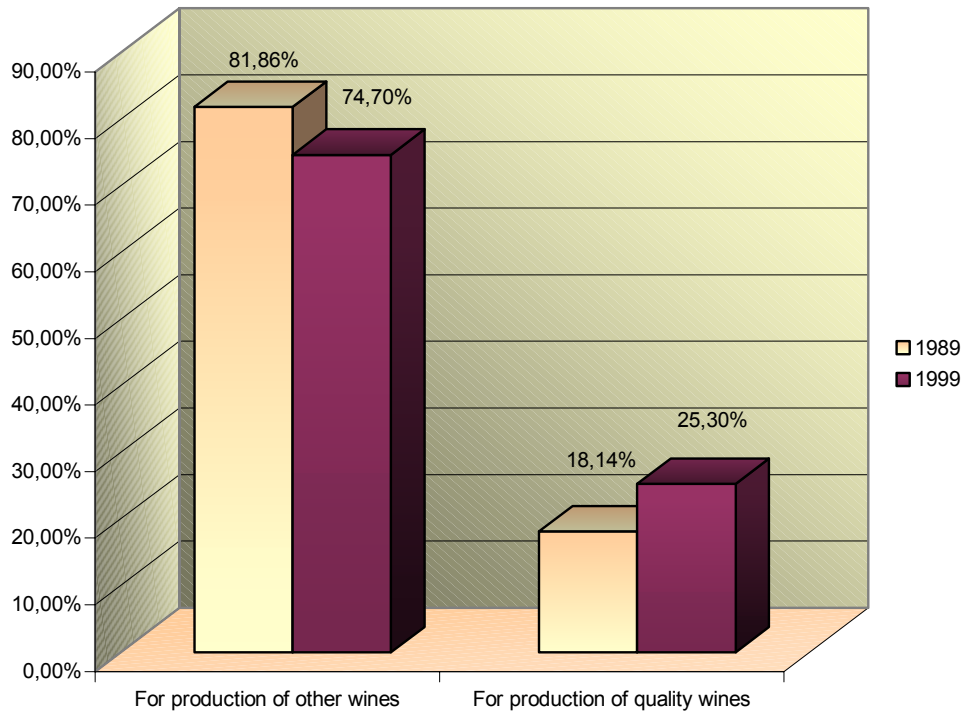
Figure 4 presents the wine production break down into quality wines psr and other wines. There is a downward trend effect in the time series of total production from 513.396 in 1989 to 454.187. in 2003 (Table 1). This reduction is due to the decrease of production of other wines from 420.270 in 1989 to 347.184 in 2003, while there is an increase in production of quality wines from 93.126 in 1989 to 107.003 in 2003 (Table 1).

Figure 4: Wine production from 1989 to 2003



Same results come from the comparison of the two basic surveys (1989 and 1999) for the area of quality wines and other wines (Figure 5).

Figure 5: Wine production per wine category for the basic surveys (1989, 1999)



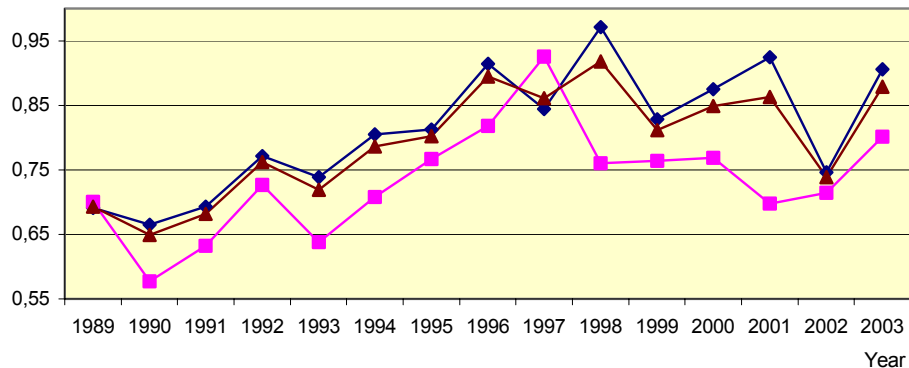
Indicators of production by area under vines

Although, there exist downward trend effects in area under vines and in wine production, the indicator of production by area under vines has the opposite trend. The indicator of total production by area under vines increases from 0,692 in 1989 to 0,878 in 2003 (Table 2), for other wines has increased from 0,691 in 1989 to 0,905 in 2003 and for quality wine from 0,7 to 0,801. The increase of those indicators are due to the more systematic methods for the cultivation of area under vines and the implementation of high-level agricultural technology by most producers.

Table 2: Indicator of production by area under vines per category

Year	Indicator of Total Production by Area under Vines	Indicator of Production of Other Wines by Area under Vines	Indicator of Production of Quality Wine by Area under Vines
1989	0,692	0,691	0,700
1990	0,649	0,665	0,577
1991	0,681	0,693	0,632
1992	0,762	0,771	0,726
1993	0,719	0,738	0,638
1994	0,786	0,805	0,707
1995	0,802	0,812	0,766
1996	0,895	0,914	0,818
1997	0,861	0,844	0,925
1998	0,918	0,971	0,760
1999	0,811	0,828	0,764
2000	0,849	0,875	0,769
2001	0,863	0,924	0,698
2002	0,738	0,746	0,715
2003	0,878	0,905	0,801

Figure 6: Indicator of production by area under vines per category



- ◆— Indicator of Production of Other Wines by Area under Vine
- Indicator of Production of Quality Wine by Area under Vine
- ▲— Indicator of Total Production by Area under Vine

3.2. Regional analysis of area under vines

Total area under vines

Table 3 presents the data of total area under vines by region from 1989 to 2003.

Table 3: Total area under vines by region (Area in stremmas)

Years	Anatoliki Makedonia & Thraki	Kentriki Makedonia	Dytiki Makedonia	Thessalia	Ipeiros	Ionia Nisia	Dytiki Ellada	Stereia Ellada	Pelop/sos	Attiki	Voreio Aigaio	Notio Aigaio	Kriti
1989	6.130	23.352	16.466	31.545	6.995	41.686	131.966	78.953	105.744	109.583	26.211	58.474	104.349
1990	5.794	31.788	16.001	38.367	7.256	39.714	106.334	69.389	96.327	102.152	24.215	60.941	93.265
1991	5.383	29.918	15.529	36.317	7.198	39.193	104.106	67.975	92.108	100.939	24.200	60.479	90.335
1992	6.210	23.506	16.082	36.185	7.355	37.628	94.999	66.782	90.919	96.916	23.841	60.725	91.984
1993	6.017	22.062	15.664	35.279	6.586	35.724	97.353	66.857	86.055	96.068	24.226	59.828	85.313
1994	7.701	21.291	17.011	27.891	5.117	26.300	77.393	67.254	75.995	82.701	20.798	44.390	65.803
1995	7.225	20.172	17.628	25.717	5.064	27.116	80.500	66.738	77.491	82.698	21.020	43.902	67.898
1996	6.649	19.359	17.632	26.525	4.797	25.790	76.160	63.698	79.270	82.728	20.014	42.402	65.983
1997	6.706	19.687	16.539	29.327	5.124	25.421	77.861	65.567	75.049	81.981	18.652	39.906	61.068
1998	3.301	26.155	17.245	26.116	7.067	29.778	72.621	61.794	76.575	68.964	22.408	39.871	56.872
1999	3.844	24.945	16.900	30.437	6.324	27.081	80.312	59.919	81.600	61.138	21.965	41.243	53.134
2000	6.462	28.279	16.822	27.228	5.840	27.565	74.879	60.871	78.282	66.956	21.228	37.873	60.067
2001	7.129	29.998	15.757	24.917	7.034	31.358	68.332	61.182	77.441	71.230	21.990	44.059	54.203
2002	8.367	37.390	14.677	27.981	4.802	31.483	83.631	51.156	77.200	57.020	21.354	34.397	78.529
2003	6.881	34.441	18.897	27.301	6.192	24.880	77.208	66.481	86.826	60.670	22.069	29.347	55.890
2003/1989 (%)	12,25	47,49	14,76	-13,45	-11,48	-40,32	-41,49	-15,80	-17,89	-44,64	-15,80	-49,81	-46,44

In many regions there is a decrease in total area under vines from 1989 to 2003 (Table 3, Figures 7 and 8). This trend is more obvious to Notio Aigaio (from 58.474 in 1989 to 29.347 in 2003, decrease 49,81%), Kriti (from 104.349 in 1989 to 55.890 in 2003, decrease 46,44%), Attiki (from 109.583 in 1989 to 60.670 in 2003, decrease 44,64%) and Dytiki Ellada (from 131.966 in 1989 to 77.208 in 2003, decrease of 41,49 %). This decrease in total area under vines may have occurred for many reasons such as the development of tourist industry and the change in the socio-economic structure of Greek agricultural holdings.

However, an upward trend exists in total area under vines in some regions such as Kentriki Makedonia (from 23.352 in 1989 to 34.441 in 2003, increase 47,49%), Dytiki Makedonia (from 16.466 in 1989 to 18.897 in 2003, increase 14,76%) and Anatoliki Makedonia & Thraki (from 6.130 in 1989 to 6.881 in 2003, increase 12,25%).

The increase of total cultivate area under vines is merely explain by the development of large export companies which are well-organized and use the most advanced production methods and equipment (TSANTALI, PORTO CARRA).

Figure 7: Change (%) 2003/1989 of total area under vines by region

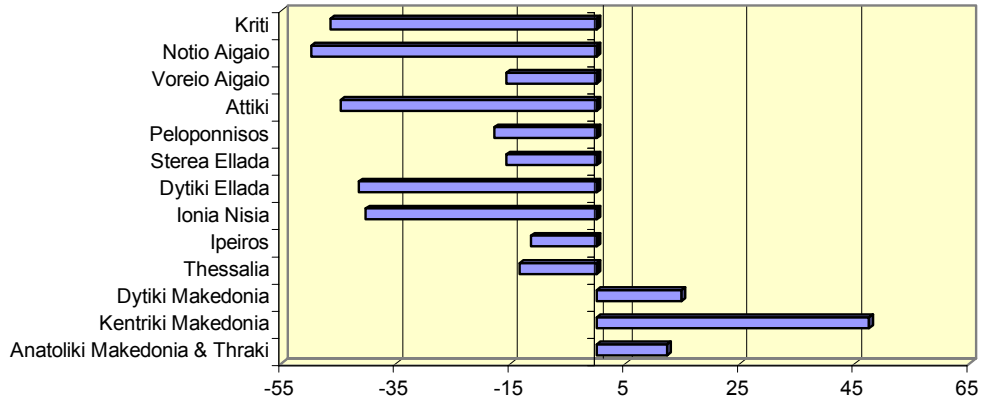


Figure 8: Total area under vine by region from 1989 to 2003

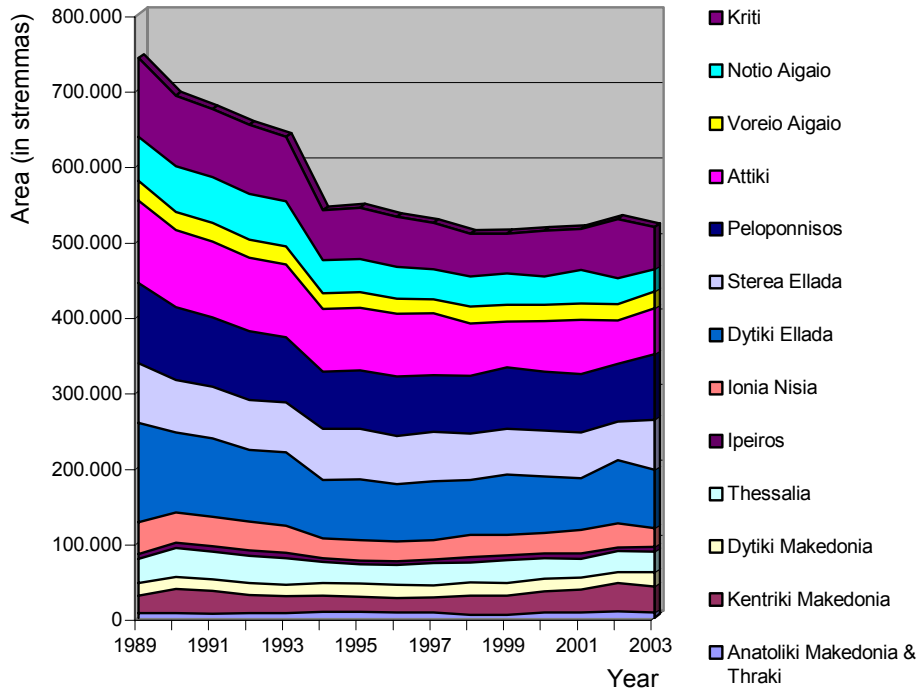


Figure 9: Distribution of total area under vines by region for year 1989

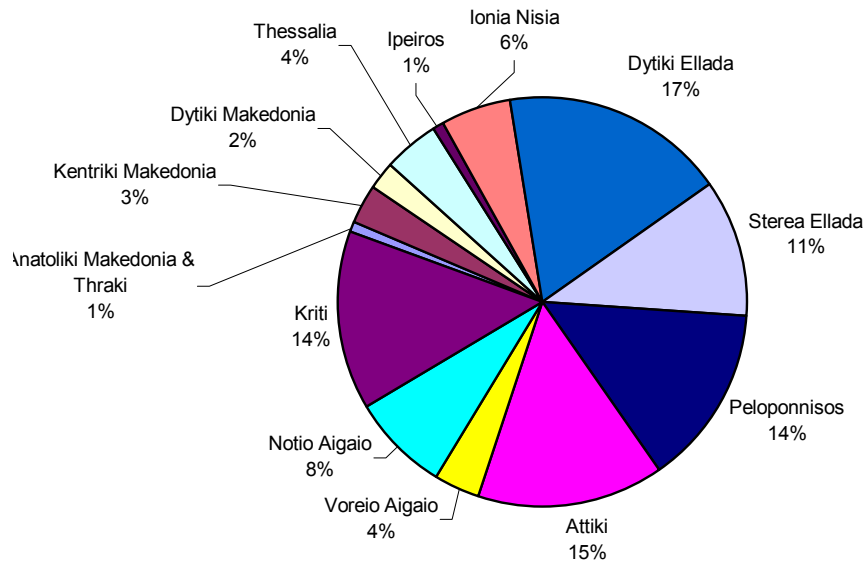
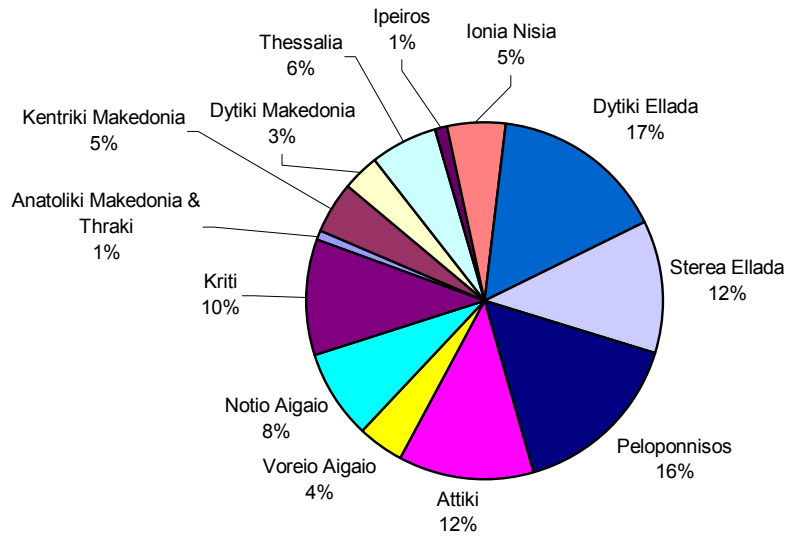


Figure 10: Distribution of total area under vines by region for year 1999



As observed on Figures 9 and 10 the regions share for years 1989 and 1999 are similar, with only slight differences as for Kriti where a decrease from 14% in 1989 to 10% in 1999 is noticed.

Area under vines for production of quality wine

Table 5 presents the data of area under vines for production of quality wine by region from 1989 to 2003.

Table 4: Area under vines for production of quality wine by region. (in stremmas)

Years	Kentriki Makedonia	Dytiki Makedonia	Thessalia	Ipeiros	Ionia Nisia	Dytiki Ellada	Peloponnisos	Attiki	Voreio Aigaio	Notio Aigaio	Kriti
1989	8.093	4.409	4.153	1.242	5.618	27.000	15.318	742	20.786	27.140	18.430
1990	9.882	4.065	3.025	1.104	5.495	17.426	19.950	893	17.365	34.894	15.934
1991	9.783	4.038	2.463	1.104	5.490	16.962	19.803	890	17.350	34.454	15.022
1992	9.403	3.766	3.240	1.190	5.206	16.387	18.557	803	16.668	43.818	14.364
1993	9.446	3.240	2.513	991	5.612	16.073	18.416	763	17.627	32.347	14.910
1994	9.093	5.314	1.096	1.392	2.658	13.618	20.205	24	15.882	25.972	10.815
1995	9.147	5.054	2.325	1.421	2.641	21.578	22.105	24	13.294	27.782	12.816
1996	8.908	5.426	1.348	1.348	3.341	11.704	22.310	0	14.509	25.769	11.329
1997	8.470	6.523	1.768	1.444	2.544	15.336	23.124	0	13.421	23.772	11.266
1998	12.121	5.589	1.401	1.126	5.721	11.347	26.849	0	18.861	29.921	14.971
1999	6.541	5.740	2.952	1.038	3.852	26.521	20.436	0	18.580	30.826	20.245
2000	10.116	5.878	1.764	1.262	3.992	17.441	26.142	0	17.056	26.256	17.124
2001	12.039	5.419	1.581	1.738	5.302	10.952	24.074	0	18.377	34.674	24.836
2002	10.996	5.931	1.156	1.091	4.593	22.240	27.304	110	16.897	22.043	18.994
2003	10.439	6.666	2.490	1.065	3.391	20.990	34.248	0	19.041	18.547	16.701
2003/1989 (%)	28,99	51,19	-40,04	-14,25	-39,64	-22,26	123,58	-100	-8,40	-31,66	-9,38

In many regions there is a decrease in area for production of quality wine from 1989 to 2003 (Table 4, Figures 11 and 12). Decrease of 100% for Attiki is due to a change in regulation. More specific, the quality wine prr specie Savvatiano_for Attiki was classified until 1993 and afterwards to other wines.

The downward trend in the area of production of quality wine is more obvious to some regions such as Thessalia (from 4.409 in 1989 to 2.490 in 2003, decrease 40,04%), Ionia Nisia (from 5.618 in 1989 to 3.391 in 2003, decrease 39,64%), Notio Aigaio (from 27.140 in 1989 to 18.547 in 2003, decrease 31,66%). The decrease trend in area for quality vines is in line to the general decrease trend in total area under vines.

It is worthwhile mentioning that in Peloponnisos the area for production of quality wine was doubled (from 15.318 in 1989 to 34.248 in 2003, increase 123,58%). An upward trend also appears in Kentriki Makedonia (from 8.093 in 1989 to 10.439 in 2003, increase 47,49%), Dytiki Makedonia (from 4.409 in 1989 to 6.666 in 2003, increase 51,15 %), as part of the increase of total cultivated area under vines in these regions.

Figure 11: Change (%) 2003/1989 of area for production of quality wines by region

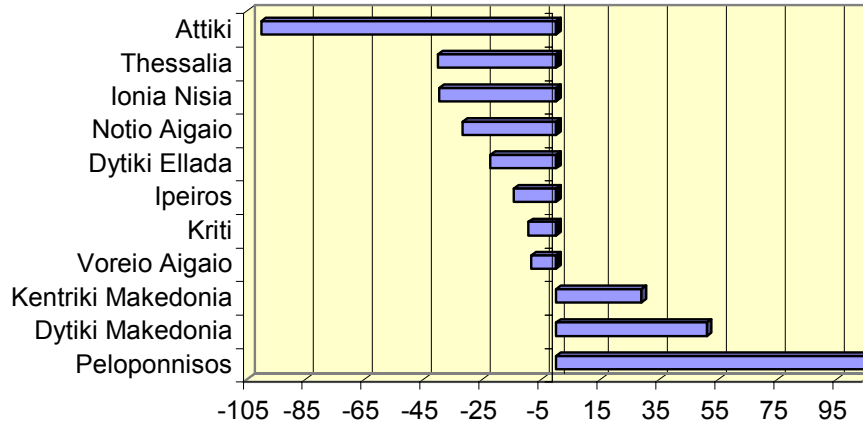
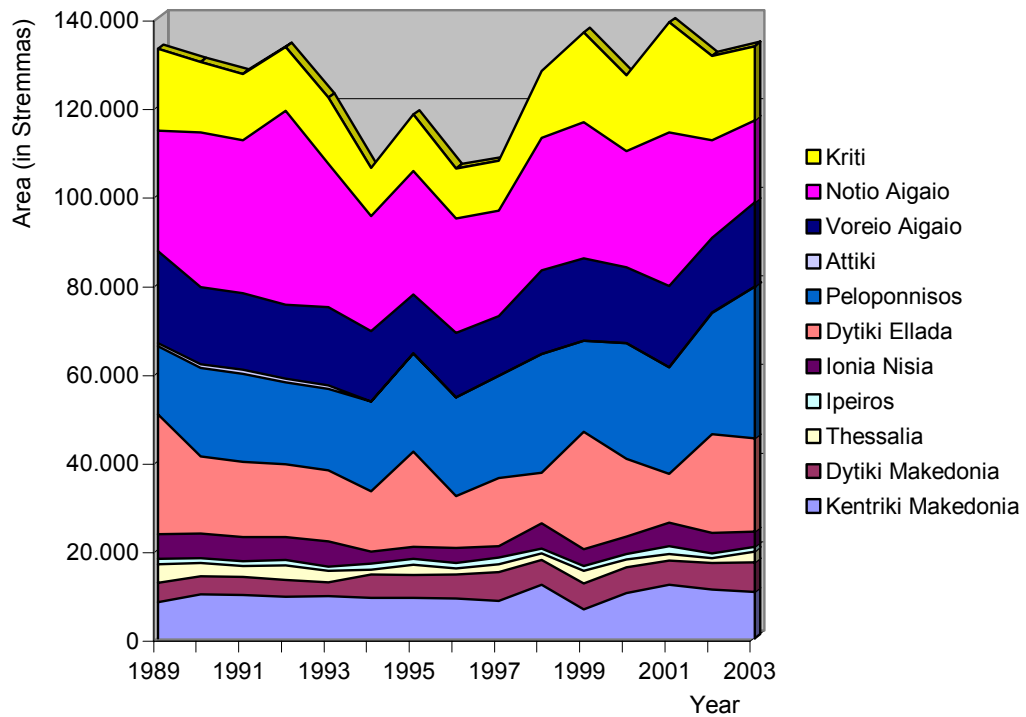


Figure 12: Area for production of quality wines by region



Area under vines for production of other wine

Table 5 presents the data of area under vines for production of other wine by region from 1989 to 2003.

Table 5: Area under vines for production of other wines by region. (in stremmas)

Years	Anatoliki Makedonia & Thraki	Kentriki Makedonia	Dytiki Makedonia	Thessalia	Ipeiros	Ionia Nisia	Dytiki Ellada	Stereia Ellada	Peloponnisos	Attiki	Voreio Notio Aigaio Aigaio Kriti		
1989	6.128	15.259	12.057	27.392	5.753	36.068	104.966	78.906	90.426	108.841	5.424	31.334	85.919
1990	5.794	21.906	11.936	35.342	6.150	34.219	88.908	69.390	76.377	101.259	6.850	26.047	77.331
1991	5.382	20.134	11.490	33.854	6.092	33.702	87.144	67.976	72.307	100.049	6.850	26.027	75.314
1992	6.210	14.102	12.316	32.945	6.165	32.423	78.611	66.782	72.364	96.112	7.174	16.907	77.620
1993	6.016	12.616	12.425	32.764	5.594	30.114	81.280	66.857	67.639	95.304	6.599	27.483	70.403
1994	7.702	12.201	11.701	26.793	3.728	23.637	63.772	67.247	55.791	82.674	4.916	18.419	54.995
1995	7.229	11.030	12.573	23.395	3.643	24.483	58.903	66.735	55.407	82.674	7.731	16.117	55.061
1996	6.644	10.447	12.215	25.178	3.450	22.436	64.452	63.689	56.953	82.716	5.497	16.660	54.677
1997	6.126	11.229	10.013	27.555	3.678	22.878	62.533	65.576	51.918	81.969	5.229	16.138	49.799
1998	3.301	14.036	11.656	24.715	5.941	24.059	61.271	61.795	49.723	68.961	3.552	9.948	41.902
1999	3.844	18.404	11.160	27.485	5.286	23.229	53.791	59.919	61.164	61.138	3.385	10.417	32.889
2000	6.408	18.165	10.945	25.464	4.577	23.573	57.437	60.873	52.139	66.955	4.172	11.619	42.944
2001	7.129	17.959	10.338	23.336	5.296	26.056	57.380	61.182	53.367	71.230	3.613	9.385	29.367
2002	8.367	26.394	8.746	26.825	3.711	26.890	61.391	51.156	49.896	56.910	4.457	12.354	59.535
2003	6.881	24.002	12.231	24.811	5.127	21.489	56.218	66.481	52.578	60.670	3.028	10.800	39.189
2003/1989 (%)	12,29	57,30	1,44	-9,42	-10,88	-40,42	-46,44	-15,75	-41,86	-44,26	-44,17	-65,53	-54,39

A decrease exists in cultivated area for production of other wines in most regions from 1989 to 2003 (Table 5, Figures 13 and 14). The downward trend is more obvious to regions such as Notio Aigaio (from 31.334 in 1989 to 10.800 in 2003, decrease 65,53%), Kriti (from 85.919 in 1989 to 39.189 in 2003, decrease 54,39%), Dytiki Ellada (from 104.966 in 1989 to 56.218 in 2003, decrease 46,44%) Attiki (from 108.841 in 1989 to 60.670 in 2003, decrease 44,26%) and Peloponnisos (from 90.426 in 1989 to 52.578 in 2003, decrease 41,86%). This decrease in area for other wines is in line with the decrease in total area under vines.

It is noteworthy stating that an upward trend appears in Kentriki Makedonia (from 15.259 in 1989 to 24.002 in 2003, increase 57,30%) and Anatoliki Makedonia & Thraki (from 6.128 in 1989 to 6.881 in 2003, increase 12,29 %), as part of the increase of total cultivated area under vines in these regions.

Figure 13: Changes (%) 2003/1989 of area under vines for production of other wines by region

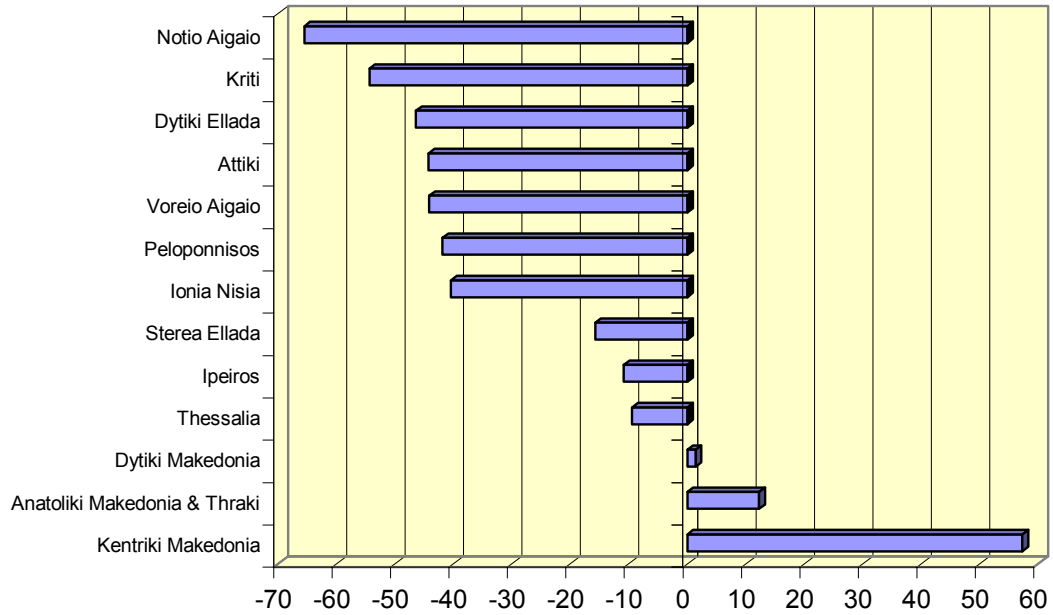
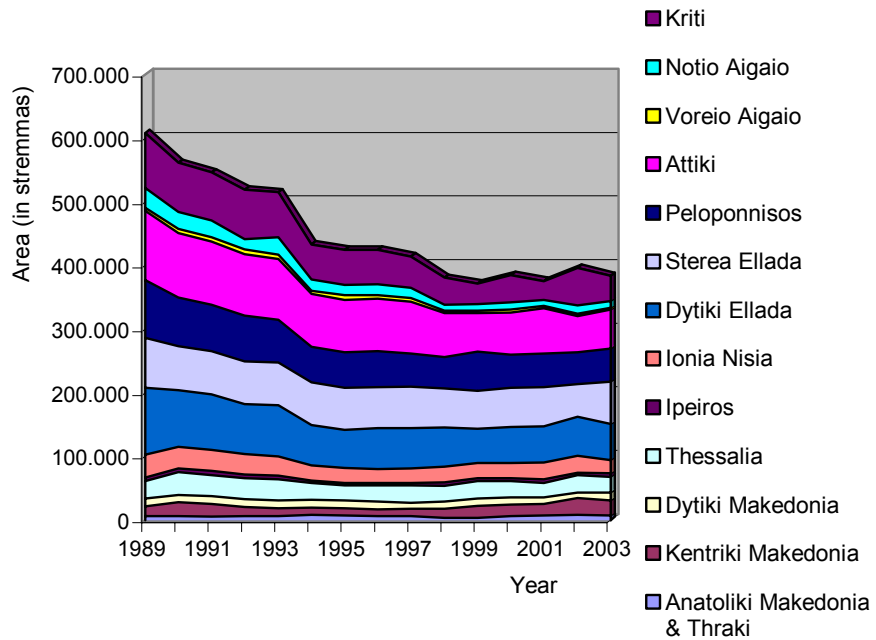


Figure 14: Area under vines for productions of other wines by region



3.3. Regional analysis of wine production

Total wine production

Table 6 presents the data for total wine (quality and other) production by region from 1989 to 2003.

Table 6: Total wine production by region (in 1.000 litres)

Years	Anatoliki Makedonia & Thraki	Kentriki Makedonia	Dytiki Makedo nia	Thessalia	Ipeiros	Ionia Nisia	Dytiki Ellada	Stereia Ellada	Peloponni sos	Attiki	Voreio Aigaio	Notio Aigaio	Kriti
1989	2.298	13.588	6.867	19.079	4.943	19.864	104.146	71.582	80.788	84.678	15.789	27.910	61.864
1990	2.097	22.828	7.932	28.914	5.592	22.927	90.634	56.959	55.363	63.371	15.775	19.206	56.953
1991	2.650	25.626	7.754	26.905	5.490	20.685	95.359	63.732	62.720	64.597	15.405	15.441	52.558
1992	2.699	17.162	9.551	43.891	4.515	25.673	96.088	69.849	68.192	70.187	14.466	25.372	50.010
1993	2.544	15.615	6.339	31.483	3.209	24.375	100.282	62.691	63.590	58.243	14.114	22.260	53.304
1994	3.478	14.555	9.505	26.410	3.327	20.487	92.485	77.138	58.832	45.301	10.239	22.913	39.355
1995	4.775	16.098	4.878	21.000	2.935	19.980	96.125	80.278	68.460	45.301	10.728	20.079	45.098
1996	7.652	15.387	7.352	35.254	3.355	19.767	88.913	74.836	82.562	67.015	10.575	20.442	42.033
1997	9.262	14.119	7.482	28.652	3.118	19.342	99.123	68.104	73.715	57.151	13.371	21.693	35.100
1998	4.226	19.445	6.137	31.877	4.015	24.368	90.603	82.292	85.334	55.335	14.101	12.668	36.515
1999	2.282	21.086	8.399	34.989	3.476	18.532	87.960	48.208	76.422	46.167	14.661	16.578	33.939
2000	4.883	23.265	6.723	26.638	3.512	21.125	100.455	67.039	73.087	44.080	12.566	14.197	37.267
2001	4.148	28.587	6.882	25.936	4.593	26.590	99.078	71.764	80.891	41.848	8.788	11.593	33.523
2002	4.685	35.368	3.988	11.213	3.217	15.014	118.505	48.949	42.557	34.500	13.622	9.923	48.181
2003	4.439	22.766	7.738	27.318	3.667	23.166	107.127	73.342	86.817	38.094	14.757	11.154	33.802
2003/1989 (%)	93,17	67,54	12,68	43,18	-25,81	16,62	2,86	2,46	7,46	-55,01	-6,54	-60,04	-45,36

As expected the downward trend in area under vines was followed by a reduction in total wine production in some regions (Table 6, Figures 15 and 16). In Notio Aigaio there is a decrease of 60,04% of the production that means from 27.910 in 1989 to 11.154 in 2003, Attiki (from 84.678 in 1989 to 38.094 in 2003, decrease 55,01%), Kriti (from 61.864 in 1989 to 33.802 in 2003, decrease 45,36%). These decreases are due to the reduction in cultivated area under vines.

As it was also expected, there is an increase in total wine production in regions such as Anatoliki Makedonia & Thraki (from 2.298 in 1989 to 4.439 in 2003 increase 93,17%), Kentriki Makedonia (from 13.588 in 1989 to 22.766 in 2003 increase 67,54%) and Dytiki Makedonia (from 6.867 in 1989 to 7.738 in 2003 increase 12,68%).

However, there is an increase in total wine production in regions where there was decrease in cultivated area under vines. These regions are: Thessalia (from 19.079 in 1989 to 27.318 in 2003, increase 43,18%), Ionia Nisia (from 19.864 in 1989 to 23.166 in 2003, increase 16,62%), Peloponnisos (from 80.788 in 1989 to 86.817 in 2003, increase 7,46%) Dytiki Ellada (from 104.146 in 1989 to 107.127 in 2003, increase 2,86%) and Stereia Ellada (that means from 71.582 tl in 1989 to 73.342 in 2003, increase 2,46%). The increase in total wine production, despite the decrease in cultivated area, is due to the implementation of high-level agricultural technology and the systematic methods used for the cultivation.

Figure 15: Change (%) 2003/1989 of total wine production (quality and others) by region

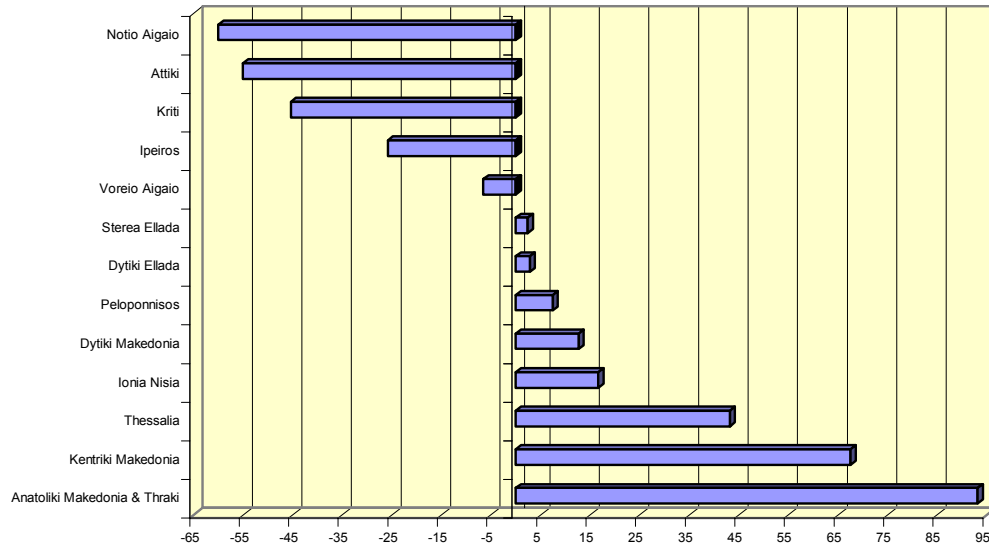
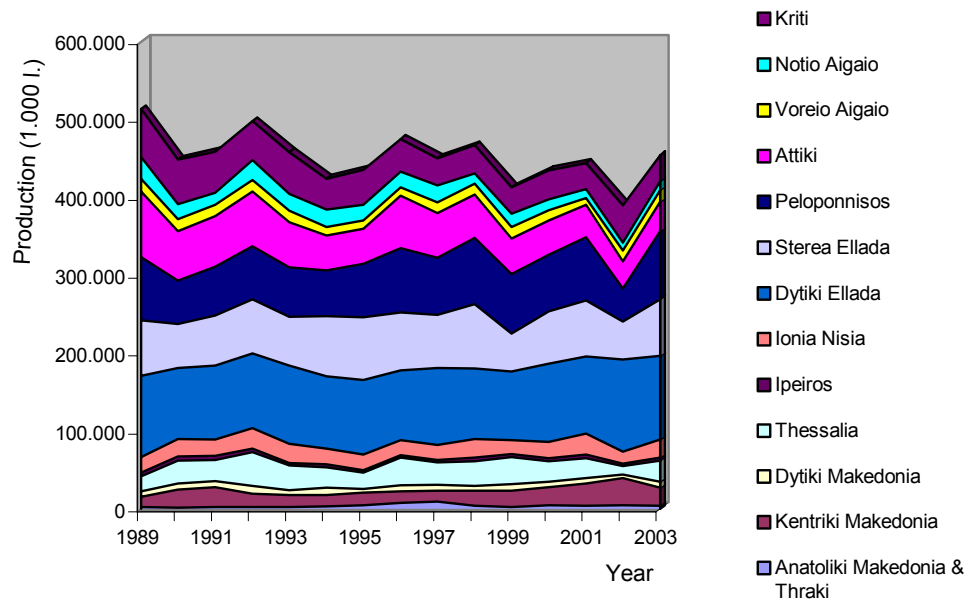


Figure 16: Total wine production (quality and others) by region



Wine production of quality wines

Table 7 presents the data for wine production of quality wines by region from 1989 to 2003.

Table 7: Wine production of quality wines by region (in 1000 litres)

Years	Kentriki	Dytiki	Thessalia	Ipeiros	Ionia	Dytiki	Peloponnisos	Voreio	Notio	Kriti	
	Makedonia	Makedonia			Nisia	Ellada		Aigaio	Aigaio		
1989	4.835	3.188	3.596	1.140	2.770	20.860	16.539	513	13.122	13.728	12.794
1990	5.365	2.560	2.931	1.019	3.836	13.018	12.998	482	12.440	11.776	8.598
1991	7.067	2.401	1.860	1.096	3.130	15.392	19.159	551	11.737	10.004	8.107
1992	6.751	3.654	4.430	1.140	2.486	16.441	20.405	472	12.172	20.262	8.699
1993	4.612	2.232	1.007	732	4.815	15.431	16.728	432	12.215	11.552	8.057
1994	4.743	5.865	499	1.062	1.903	14.654	16.859	9	8.950	13.051	7.447
1995	5.805	2.110	2.339	1.047	1.347	25.743	22.094	9	8.677	11.367	10.010
1996	4.670	3.999	1.360	1.242	2.289	11.263	27.846	0	9.007	15.332	9.686
1997	4.462	4.721	1.709	1.148	1.147	21.817	27.221	0	11.185	16.657	9.704
1998	7.874	4.227	551	799	3.490	15.596	33.061	0	11.982	9.815	9.843
1999	4.791	5.069	3.357	764	2.391	29.644	19.636	0	12.775	13.665	12.328
2000	6.082	4.115	1.918	899	2.020	25.049	24.023	0	10.813	10.637	12.082
2001	7.368	3.715	1.620	1.202	2.575	18.547	29.179	0	7.277	9.301	16.202
2002	7.090	2.464	1.303	828	1.468	43.817	5.207	48	11.601	6.697	13.331
2003	5.534	5.131	3.516	594	1.498	24.279	32.187	0	13.101	8.294	12.869
2003/1989 (%)	14,46	60,95	-2,22	-47,89	-45,92	16,39	94,61	-100	-0,16	-39,58	0,59

The results of Table 7 are in line with the results presented in Table 4. More specific in Peloponnisos there is a gradual increase to the production of quality wine during the examined period (from 16.539 in 1989 to 32.187 in 2003, increase 94,61%). This increase is a consequence of the increase in cultivated area. Note that the low production of this region for the year 2002 is due to intense bad weather conditions, which cause the distraction of the wine production.

Other regions with the same trend are Dytiki Makedonia (from 3.188 in 1989 to 5.131 in 2003, increase 60,95%) and Kentriki Makedonia (from 4.835 in 1989 to 5.534 in 2003, increase 14,46%).

An increase appears to Dytiki Ellada (from 20.860 in 1989 to 24.279 in 2003, increase 16,39%), although there is a decrease in area for production of quality wines.

No change in production of quality wines appears to the regions of Kriti and Vorio Aigaio, although some decrease to the cultivated area.

The downward trend in production of quality wine appears in Table 7 to regions Ipeiros (from 1.140 in 1989 to 594 in 2003, decrease 47,89%), Ionia Nisia (from 2.770 in 1989 to 1.498 in 2003, decrease 45,92%), Notio Aigaio (from 13.728 in 1989 to 8.294 in 2003, decrease 39,58%), Thessalia (from 3.596 in 1989 to 3.516 in 2003, decrease 2,22%). This decrease in quality wine production is in line with the decrease in cultivated area for production of quality wines (Table 4).

As mentioned in paragraph 4.2.1 A. 100% the decrease to Attiki is due to the change of regulation.

Figure 17: Change (%) 2003/1989 of production of quality wines

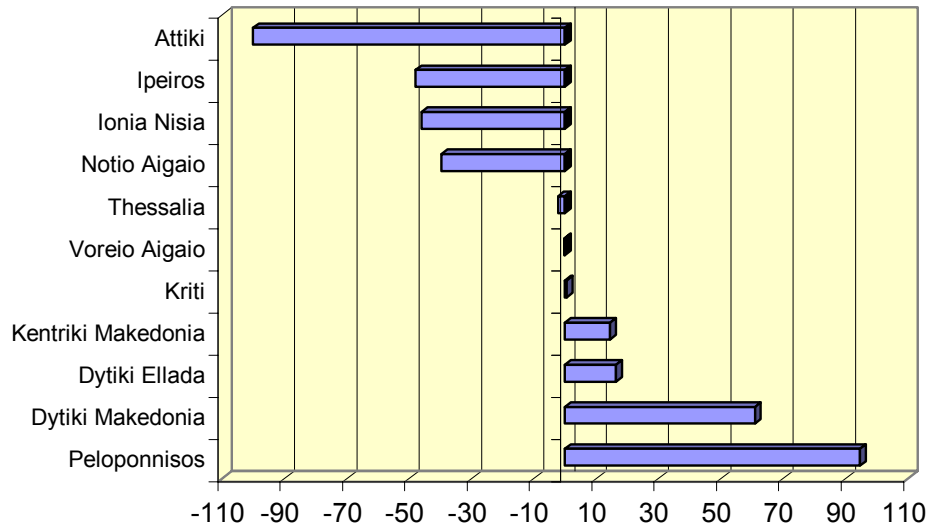
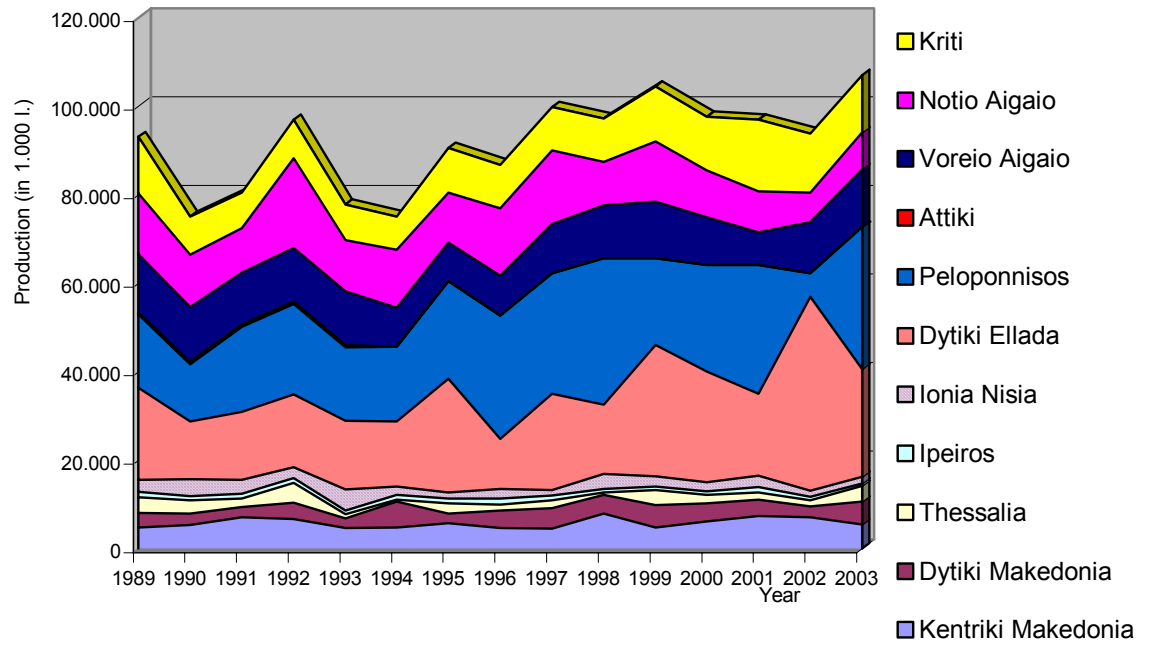


Figure 18: Production of quality wine by region per year



Wine production of other wines

Table 8 presents the data for wine production of other wines by region from 1989 to 2003.

Table 8: Wine production of other wines by region (in 1000 litres)

Years	Anatoliki Makedonia & Thraki	Kentriki Makedonia	Dytiki Makedonia	Thessalia	Ipeiros	Ionia Nisia	Dytiki Ellada	Stereia Ellada	Peloponnisos	Attiki	Vorio Aigaio	Notio Aigaio	Kriti
1989	2.398	8.753	3.679	15.483	3.803	17.094	83.285	71.540	64.250	84.165	2.667	14.083	49.070
1990	2.096	17.462	5.371	25.982	4.571	19.091	77.618	56.959	42.368	62.888	3.335	7.430	48.357
1991	2.649	18.558	5.351	25.045	4.393	17.554	79.969	63.733	43.564	64.045	5.438	5.438	44.452
1992	2.698	10.410	5.895	39.462	3.374	23.187	79.648	69.849	47.789	69.715	2.294	5.110	41.312
1993	2.543	11.002	4.106	30.476	2.476	19.559	84.852	62.691	46.864	57.812	1.900	10.707	45.248
1994	3.478	9.812	3.640	25.911	2.265	18.584	77.831	77.138	41.973	45.292	1.289	9.862	31.908
1995	4.775	10.293	2.768	18.661	1.888	18.633	70.382	80.278	46.366	45.292	2.051	8.712	35.088
1996	7.652	10.717	3.353	33.894	2.113	17.478	77.650	74.836	54.716	67.015	1.568	5.110	32.347
1997	8.886	9.657	2.761	26.943	1.970	18.195	77.306	68.104	46.494	57.151	2.186	5.036	25.396
1998	4.226	11.571	1.910	31.326	3.216	20.878	75.007	82.292	52.273	55.335	2.119	2.853	26.672
1999	2.282	16.295	3.330	31.632	2.712	16.141	58.316	48.208	56.786	46.167	1.886	2.913	21.611
2000	4.845	17.183	2.608	24.720	2.613	19.105	75.406	67.041	49.064	44.087	1.744	3.564	25.185
2001	4.148	21.219	3.167	24.316	3.391	24.015	80.531	71.764	51.712	41.848	1.511	2.292	17.321
2002	4.685	28.278	1.524	9.910	2.389	13.546	74.688	48.949	37.350	34.452	2.021	3.226	34.850
2003	4.439	17.232	2.607	23.802	3.073	21.668	82.848	73.342	54.630	38.094	1.656	2.860	20.933
2003/1989 (%)	85,11	96,87	-29,14	53,73	-19,20	26,76	-0,52	2,52	-14,97	-54,74	-37,91	-79,69	-57,34

The results from Table 8 are in accordance with the results of Table 5. In Notio Aigaio there is a decrease of 79,69% of the production (from 14.083 in 1989 to 2.860 in 2003). It follows the region of Kriti (from 49.070 in 1989 to 20.933 in 2003, decrease 57,34%). Another decrease also appears to Attiki (from 84.678 in 1989 to 38.094 in 2003, decrease 54,74%), Vorio Aigaio (from 2.667 in 1989 to 1.656 in 2003, decrease of 37,91%), Ipeiros (from 3.803 in 1989 to 3.073 in 2003, decrease 19,20%), Peloponnisos (from 64.250 in 1989 to 54.630 in 2003, decrease 14,97%). These decreases are due to the reduction in cultivated area under vines for production of other wines.

In region of Dytiki Makedonia there is a decrease of production 29,14% (from 3.679 in 1989 to 2.607 in 2003), while in Table 5 appears an increase of 1,44% in cultivated area of other wines.

An upward trend appears in wine production of other wines in regions Kentriki Makedonia (from 8.753 in 1989 to 17.232 in 2003, increase 96,87%) and Anatoliki Makedonia & Thraki (from 2.398 in 1989 to 4.432 in 2003, increase 85,11%).

However, there is an increase in production in some regions, while there was a decrease in cultivated area for other wines. These regions are: Thessalia (from 15.483 in 1989 to 23.802 in 2003, increase 53,73%), Ionia Nisia (from 17.094 in 1989 to 21.668 in 2003, increase 26,76%), Stereia Ellada (from 71.540 in 1989 to 73.342 in 2003, increase 2,52%). These increases in wine production despite the decrease in cultivated area are due to the high-level agricultural technology from producers and more systematic methods for the cultivation.

Figure 19: Change (%) 2003/1989 of production of other wines

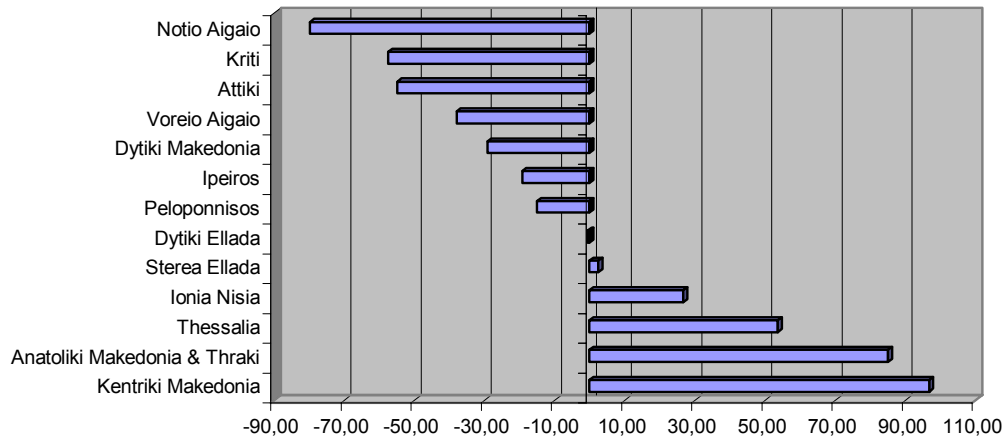
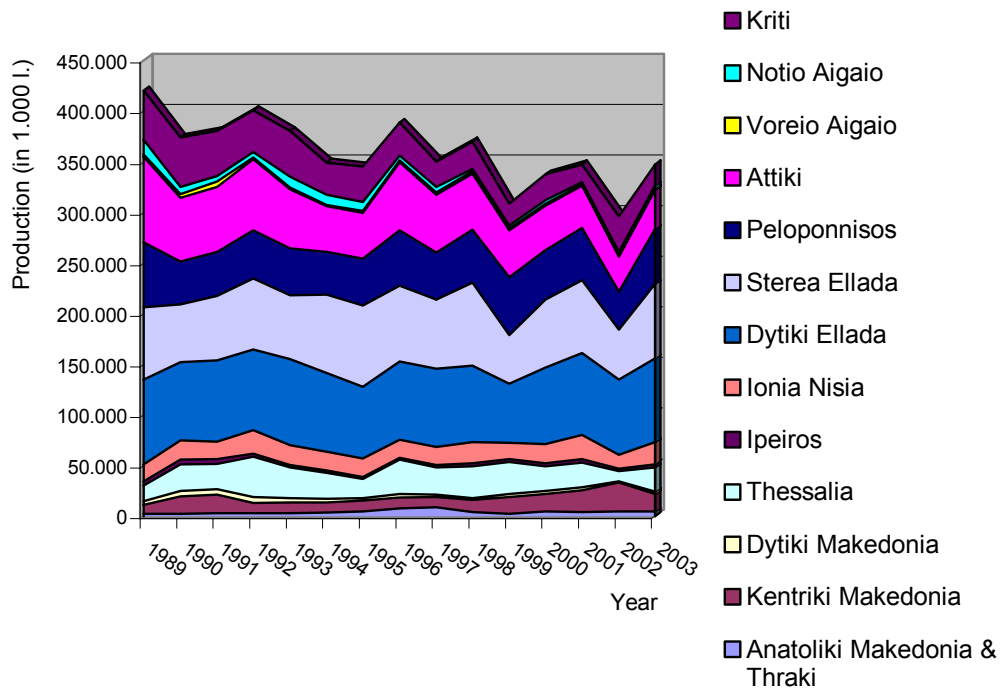


Figure 20: Production of other wine by region per year



3.4. Area and Production of Quality Wines (psr) produced in specified regions, year 1999

Table 9 presents the data for area and production of quality wines (psr) produced in specified regions for the year 1999.

Table 9: Area and production of quality wines (psr) in 1999

Quality Wines produced in specified regions (psr)				
Grapes	Area	Production	% Area	% Production
Roditis	23.437	26.247	17,14	25,14
Agiorgitiko	18.790	18.319	13,74	17,54
Moschato	16.676	11.490	12,20	11,00
Athiri	12.274	7.904	8,98	7,57
Xinomavro	11.740	9.522	8,59	9,12
Liatiko	11.483	6.277	8,40	6,01
Asirtiko	9.175	2.360	6,71	2,26
Mandilari	6.768	3.173	4,95	3,04
Kotsifali	5.253	3.570	3,84	3,42
Monemvasia	4.181	1.063	3,06	1,02
Moschato (white) or Moschoudi	3.695	3.323	2,70	3,18
Rombola	3.511	2.164	2,57	2,07
Mavrodafni	3.291	3.877	2,41	3,71
Vilana	1.861	1.629	1,36	1,56
Moschofilero	1.619	1.300	1,18	1,24
Dembina	1.038	764	0,76	0,73
Negkoska	962	695	0,70	0,67
Other varieties	977	743	0,71	0,71
Total	136.731	104.420	100,00	100,00

Table 9 shows that varieties Roditis, Agiorgitiko and Moschato are the most popular quality wines produced in specific regions for the year 1999 which cover almost the half production and cultivated area.

Figures 21 and 22 present the area and production of quality wines produced in specific regions for the year 1999.

Figure 21: Area quality wines produced in specified regions (psr)

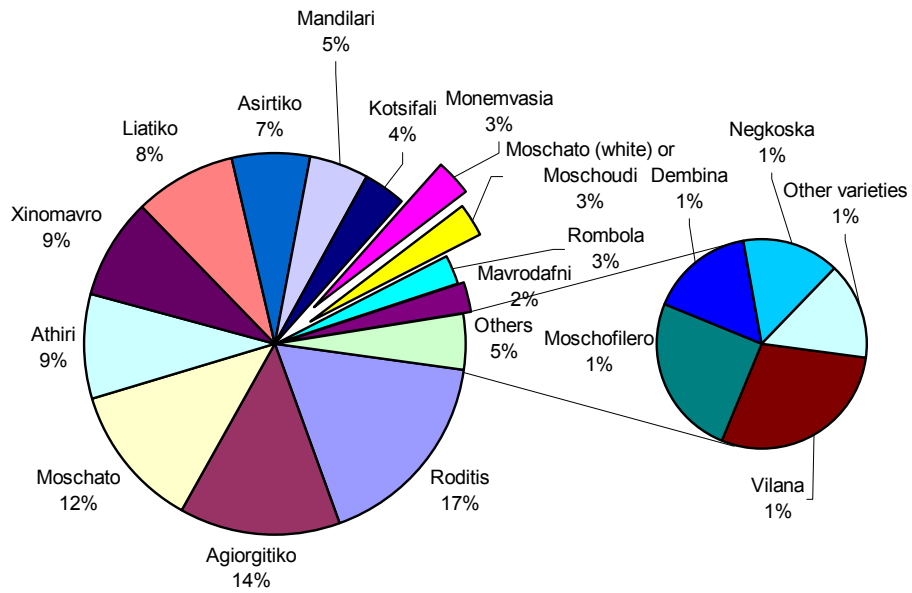
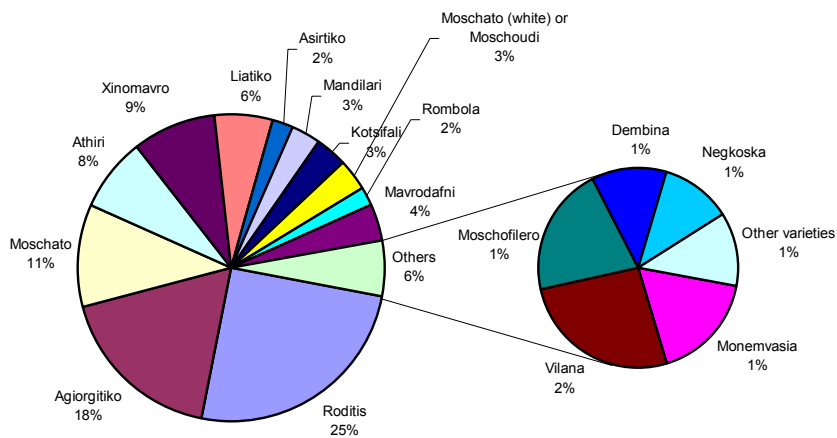


Figure 22: Production of quality wines produced in specified regions (psr)



3.5. Forecast of area under vines and wine production

In order to make intermediate forecasting projections for area and production of wine sector of Greece by categories for years 2004 and 2005, Simple Exponential Smoothing Method was used to smooth the specific data series. Trend Analysis was afterwards implemented on those data.

Table 10 presents the actual and exponential smoothing data for area under vines and wine production from 1989 to 2003 and forecast for 2004 and 2005.

Table 10: Actual and Exponential Smoothing data for Area and Production by category per year

Year	Total Area under vines	Area Quality Wines	Smoothed Area Quality Wines	Area Other Wines	Smoothed Area Other Wines	Total Wines Production	Production Quality Wines	Smoothed Production Quality Wines	Production Other Wines	Smoothed Production Other Wines
1989	741.454	132.981	132.699	608.473	607.612	513.396	93.126	88.541	420.270	403.178
1990	691.543	130.034	130.784	561.509	555.161	448.551	75.023	83.531	373.528	391.968
1991	673.680	127.359	128.322	546.321	545.104	458.922	80.504	82.409	378.418	386.845
1992	653.133	133.402	131.973	519.731	516.237	497.655	96.912	87.785	400.743	392.100
1993	637.032	121.938	124.761	515.094	514.937	458.049	77.813	84.088	380.236	387.614
1994	539.645	106.069	111.327	433.576	422.373	424.025	75.042	80.735	348.983	373.009
1995	543.168	118.187	116.257	424.981	425.340	435.735	90.548	84.373	345.187	362.490
1996	531.006	105.992	108.880	425.014	424.969	475.143	86.694	85.233	388.449	372.304
1997	522.888	108.247	108.425	414.641	413.219	450.232	100.147	90.761	350.085	363.904
1998	508.767	127.907	122.427	380.860	376.404	466.916	97.238	93.162	369.678	366.087
1999	508.842	136.731	132.707	372.111	371.520	412.699	104.420	97.335	308.279	344.231
2000	512.354	127.082	128.664	385.271	387.164	434.839	97.665	97.457	337.173	341.563
2001	514.630	138.992	136.087	375.638	374.051	444.221	96.986	97.283	347.235	343.707
2002	527.987	131.355	132.686	396.632	399.741	389.722	93.854	96.012	295.868	325.620
2003	517.083	133.578	133.327	383.505	381.269	454.187	107.003	100.086	347.184	333.773
Forecast 2004	467.517		146.209		321.308	424.252		99.626		324.626
Forecast 2005	458.998		153.485		305.513	420.308		100.840		319.468

The coefficient R^2 for linear model of “Area of Quality Wines” is 0,097, which doesn't show a good fit of the model and is selected the quadratic model, which has better fit and $R^2=0,669$. The model is $Y_t = 141.660 - 6.296,65 * t + 411,309 * t^2$ and the forecast value for Area of quality wines 2004 is 146.209 and for 2005 153.485 Athanasopoulos D. (1989), Kiohos P. (1972) and Panaretos J. (1997).

The coefficient R^2 for “Area of Other Wines” is 0,846, which shows the good fit of linear model to the smoothing data. The linear model is $Y_t = 574.039 - 15.795,7 * t$ and the forecast value for Area of other wines for 2004 is 321.308 and for 305.513.

The coefficient R^2 for “Production of Quality Wines” is 0,735, which shows the good fit of linear model to the smoothing data. The linear model is $Y_t = 80.212,5 + 1.213,36 * t$ and the forecast value for Production of quality wines for 2004 is 99.626,2 and for 2005 is 100.840.

The coefficient R^2 for “Production Other Wines” is 0,945, which shows the good fit of linear model to the smoothing data. The linear model is $Y_t = 407.160 - 5.158,35 * t$ and the forecast value for Production of other wines for 2004 is 324.626 and for 2005 is 319.468.

Table 11 presents the forecasting models for area under vines and wine production by category.

Table 11: Trend Analysis Models

	<i>Model</i>		<i>Forecast 2004</i>	<i>Forecast 2005</i>
<i>Area Quality Wines</i>	Quadratic	$Y_t = 141.660 - 6.296,65 * t + 411,309$	146.209	153.485
<i>Area Other Wines</i>	Linear	$Y_t = 574.039 - 15.795,7 * t$	321.308	305.513
<i>Productio n Quality Wines</i>	Linear	$Y_t = 80.212,5 + 1.213,36 * t$	99.626,2	100.840
<i>Productio n Other Wines</i>	Linear	$Y_t = 407.160 - 5.158,35 * t$	324.626	319.468

4. Conclusion

This study reveals that a downward trend effect exists in holdings with area under vines in total country from 1989 to 2003. Decreases, also, appear to the area under vines and the wine production for the same period. The downward trend of total area is more obvious in region Notio Aigaio, Kriti, Attiki, Dytiki Ellada, Ionia Nisia and follows Peloponnisos, Voreio Aigaio, Sterea Ellada, Thessalia and Ipeiros.

These reductions may have occurred for many reasons. One of them is the change in the socio-economic structure of the Greek agricultural holdings. The development of the much more profitable tourist industry is such a reason. In the last fifteen years, many regions such as Notio Aigaio, Kriti, Peloponnisos have highly developed the tourist industry. This development has urged the farmers to abandon their agricultural employment and become involved with tourism.

Despite the downward trend of area under vines and wine production, the indicator of production by area under vines has an upward trend. This increase is mainly due to the more systematic methods for the cultivation of area under vines and the implementation of high-level agricultural technology by most producers.

Upward trend effect of area under vines exists in region Kentriki Makedonia, Dytiki Makedonia and Anatoliki Makedonia & Thraki.

Trends of area under vines for production of quality wines and other wines are in the same line with the trend of total area under vines. Exception constitutes Peloponnisos where the cultivated area for quality wine was doubled from 1989 to 2003.

Moreover, the trend of total wine production is in accordance with the trend of total area under vines. However, there is an increase in total wine production in regions where there was a decrease in total cultivated area under vines. Such regions are Thessalia, Ionia Nisia, Peloponnisos, Dytiki Ellada and Sterea Ellada. This increase is due to the high-level agricultural technology implemented by the producers and the systematic methods used for the cultivation.

The trend of wine production of quality wines is in reference to the trend of area for quality wines except Dytiki Ellada where an increase appears in production of quality wine although there is a decrease in cultivated area under vines for production of quality wines.

The trend of production of other wine is general in the same line with the trend of cultivate area under vines for production of other wine and the total wine production. However, there is an increase in some regions, while there was a decrease in cultivated area for other wines. These regions are Thessalia, Ionia Nisia and Sterea Ellada.

In conclusion, in the last five years, it appears an improvement to the cultivated area under vines and to their wine production. This is due to implementation of high-level agricultural technology and systematic methods used by most producers.

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