The nut sector in Italy: not a success story

Anania G., Aiello F.

in

Albisu L.M. (ed.).
Economics of nuts in the Mediterranean basin

Zaragoza : CIHEAM
Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 37

1999
pages 51-70

The nut sector in Italy: Not a success story

G. Anania and F. Aiello
Dipartimento de Economia Politica, Universitá della Calabria
87030 Arcavata di Rende (CS), Italy

SUMMARY – The history of nut production in Italy has not been a success story. Even though Italy is still today one of the major world producers, the importance of its role, both as producer and exporter of nuts, has radically diminished over the years. Hazelnuts, almonds and walnuts, in that order, are the three principal edible nuts produced in Italy. The common factor among all three edible nuts is the structural weakness of the vast majority of farms producing them. The small size of the farms has caused most of the problems faced by the production of edible nuts in Italy: the lack of introduction of the new production and harvesting technologies; the reluctance to replace trees which have been cut down; the lack of homogeneity as regards products; and the inadequate quality of a large share of production in the face of increasingly sophisticated market demands. The decline of the edible nut sector in Italy stems from the incapacity of most farms to provide even partial answers to the challenges which have arisen as a result of the profound changes occurring elsewhere in the world nut industry; this has eroded over the years the competitive margins of most of the Italian nut growers. If a considerable effort needs to be made to reduce production costs as far as possible, this is by no means the specific terrain on which Italy can beat its competitors. The battle to increase the competitiveness of the Italian edible nut sector is also a battle to increase its price competitiveness, but, more importantly, it is a battle which must be fought on the quality terrain, both of the product itself and of the services sold with it.

Key words: Italy, hazelnuts, almonds, walnuts.

RESUME *– "Le secteur des fruits secs en Italie : Une histoire sans succès". L'histoire de la production des fruits secs en Italie n'est pas une histoire à succès. Bien que l'Italie soit encore aujourd'hui l'un des plus grands producteurs mondiaux, l'importance de son rôle, aussi bien comme producteur que comme exportateur de fruits secs, a diminué de façon considérable au cours des années. Les noisettes, les amandes et les noix dans l'ordre, sont les trois principaux fruits secs produits en Italie. Le facteur commun à ces trois fruits secs est la faiblesse structurelle de la plupart des exploitations agricoles qui les produit. Les dimensions réduites des exploitations agricoles ont provoqué la plupart des problèmes auxquels est confrontée la production de fruits secs aujourd'hui en Italie : la diffusion limitée des nouvelles technologies de production et de récolte, le faible taux de renouvellement des arbres qui ont été abattus, l'insuffisante homogénéité des produits, la qualité inadéquate d'une grande partie de la production en présence de demandes de marché toujours plus sophistiquées. La crise du secteur des fruits secs en Italie provient de l'incapacité de la plupart des exploitations agricoles à donner des réponses, même partielles, aux défis qui sont apparus en conséquence aux profonds changements qu'il y a eu ailleurs dans le secteur mondial des fruits secs. Ceci a réduit dans le temps les marges de compétitivité de la plupart des producteurs italiens de fruits secs. Si un effort majeur est nécéssaire pour réduire les coûts de production autant que possible, ce n'est sûrement pas un terrain où l'Italie peut penser battre la compétition. La bataille pour augmenter la compétitivité du secteur des fruits secs en Italie représente aussi une bataille pour augmenter sa compétitivité au niveau des prix, mais c'est surtout une bataille qui doit être combattue sur le terrain de la qualité, aussi bien du produit en soi que des services vendus avec lui.*

Mots-clés *: Italie, noisettes, amandes, noix.*

Introduction

Hazelnuts, almonds and walnuts, in that order, are the three principal edible nuts produced in Italy. Their portion of Italy's total value of marketable agricultural production is, however, very limited - in 1994 it was only 0.64%.

The history of nut production in Italy has not been a success story. Even though Italy is still today one of the major world producers, the importance of its role, both as producer and exporter of nuts, has radically diminished over the years.

In 1961 Italian hazelnut production was equal to 30.4% of world production, that of almonds to 43.4% and that of walnuts to 14.3%. In 1994 those percentages declined to 19%, 6.6% and 1.1%, respectively (Fig. 1).

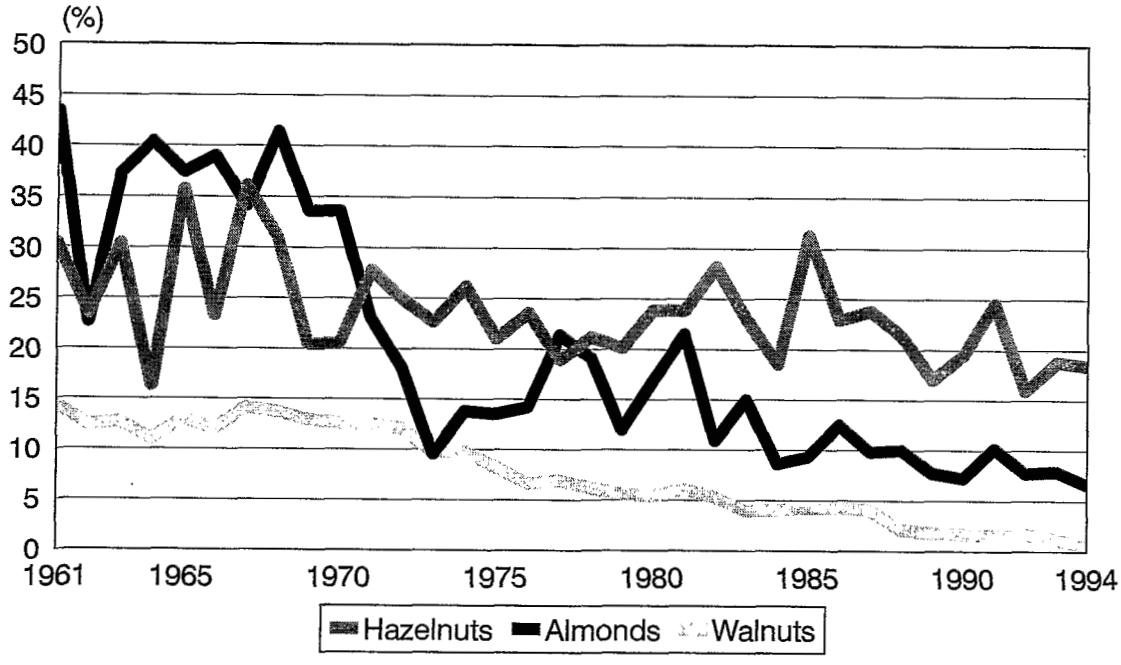

Fig. 1. Italy. Almonds, Hazelnuts and Walnuts. Production as a percentage of world production (1961-1994) (Source: FAO).

The reduction in importance of the Italian nut sector is even more marked in terms of its role in international trading. In 1961 Italian exports accounted for 94% of world trade in in-shell hazelnuts and 21% of shelled hazelnuts; the Italian share of the world market of in-shell hazelnuts, a market which is undergoing a rapid decline, fell to 24.9% in 1994, while in 1994 and 1995 Italy became a net importer of shelled hazelnuts. In 1961 exports of Italian shelled almonds amounted to 55% of the total, but Italy has been a net importer of almonds for several years now. Again, as regards walnuts, Italy has gone from holding a significant share of world exports (in 1961, 32% for in-shell walnuts and 18% for shelled walnuts) to being a net importer.

Italy is the second biggest importer of pistachios after Germany; in 1995 it imported nearly 30 million ECU worth.

Thus, today Italy, from being an important net exporter of nuts [in 1964 its overall nut (almonds, hazelnuts, walnuts, pistachios, pecans and pine-seeds) net trade balance was equivalent to roughly 64.5 million USD] has become an important net importer; in 1995 the net negative trade balance was 88.5 million ECU.

The aim of this paper is to sketch an outline of the structure and dynamics of the production and international trading of nuts in Italy, with the goal of pointing out the most relevant elements which characterise the present situation and how it has evolved over the years. The three nuts considered - hazelnuts, almonds and walnuts - will be dealt with separately, while in the final section a number of conclusions of a general nature will be presented on the prospects for the nut industry in Italy.

Hazelnuts

In 1994, Italian production of hazelnuts was equal to 127,571 t and the area under production was 65,300 ha[1] (Table 1). However, hazelnuts have in Italy a basically marginal role in the total value of agricultural production. In 1994 the value of hazelnut production only amounted to roughly 259 billion L. (about 150 million USD) equal to a mere 0.42% of the overall value of Italian agricultural production.

[1] The source of this estimate is FAO. According to the Italian Agricultural Census of 1990, the overall area covered by hazelnuts (including those areas not yet in production and those where the nuts are not harvested) was equal to approximately 79,500 ha.

Table 1 Italy. Hazelnuts. Production, area harvested, yields, imports, exports and net trade balance (1961-1995) (Source: FAO and Eurostat)

	Production (mt)	Area harvested (ha)	Yield (hg/ha)	In-shell hazelnuts				Shelled hazelnuts			
				Imports (mt)	Exports (mt)	Net trade (mt)	Net trade (000$)	Imports (mt)	Exports (mt)	Net trade (mt)	Net trade (000$)
1961	55379	52600	10528	0	12938	12938	6639	0	10641	10641	11951
1962	53004	52400	10115	0	11137	11137	7139	608	7911	7303	10000
1963	58122	52500	11071	0	12222	12222	7669	232	5978	5746	7584
1964	46877	52600	8912	20	11852	11832	6634	1281	5476	4195	5561
1965	60782	52300	11622	1	13911	13910	7212	564	11487	10923	12559
1966	72951	54300	13435	0	13719	13719	7205	19	14558	14539	16460
1967	64805	57800	11212	0	12889	12889	7796	1721	12229	10508	13172
1968	82960	59000	14061	37	13724	13687	8027	641	15892	15251	20145
1969	53672	60000	8945	0	11738	11738	8647	3475	11092	7617	11336
1970	78877	60400	13059	43	13502	13459	8969	1644	11182	9538	13839
1971	84847	62200	13641	147	15718	15571	9891	31	23106	23075	30238
1972	80904	65200	12409	11	17647	17636	11959	290	14564	14274	21165
1973	87700	66700	13148	87	15786	15699	12192	2130	15052	12922	20635
1974	105100	67700	15524	261	19698	19437	16741	2577	20962	18385	35192
1975	99108	68000	14575	612	18069	17457	15204	1675	19467	17792	35156
1976	95282	68000	14012	26	18927	18901	15998	1919	17719	15800	28195
1977	84439	68300	12363	435	13249	12814	13583	5800	11095	5295	14113
1978	100600	68500	14686	189	13000	12811	15720	3019	16509	13490	35468
1979	93750	70400	13317	52	13596	13544	18936	2429	29091	26662	81310
1980	100600	70200	14330	84	8825	8741	17952	4636	15660	11024	50573
1981	130114	70000	18588	34	11736	11702	19532	841	22144	21303	73814
1982	110918	69600	15936	39	10487	10448	12344	2691	23740	21049	50123
1983	137119	69353	19771	196	11329	11133	11986	951	33798	32847	73385
1984	80082	68925	11619	272	9247	8975	10470	3149	23943	20794	45818
1985	117681	69871	16843	339	10482	10143	14453	7181	29552	22371	70324
1986	108821	70416	15454	368	6101	5733	10388	4062	17477	13415	57208
1987	112782	69189	16301	224	6007	5783	12027	10519	19577	9058	44414
1988	130230	67994	19153	184	6976	6792	11538	8529	30590	22061	77249
1989	127248	67919	18735	209	8226	8017	10449	6648	39531	32883	85149
1990	109344	67406	16222	2127	4933	2806	6295	8879	28045	19166	64214
1991	128149	68044	18833	2647	5208	2561	5597	12882	30145	17263	54266
1992	115316	66651	17301	1311	3739	2428	4488	10192	21466	11274	38841
1993	90778	69605	13042	1008	2964	1956	3105	14974	21280	6306	12114
1994	127571	65300	19536	941	3377	2436	4066	22379	14369	-8010	-33094
1995	n.a	n.a	n.a	1343	3498	2155	3382	20919	11429	-9490	-23125

With 18.4% of the production and 15.2% of the global area devoted to hazelnut production around the world, in 1994 Italy was ranked among the most important producers second to Turkey (70.7% of

world production), and followed by Spain (3.3%), USA (2.8%) and China (1.3%)[2], in that order. Therefore, despite a clear tendency towards a reduction in its relative importance - between 1967 and 1994 the Italian share of world production was halved (Fig. 2) - Italy continues to occupy an important role in world hazelnut production.

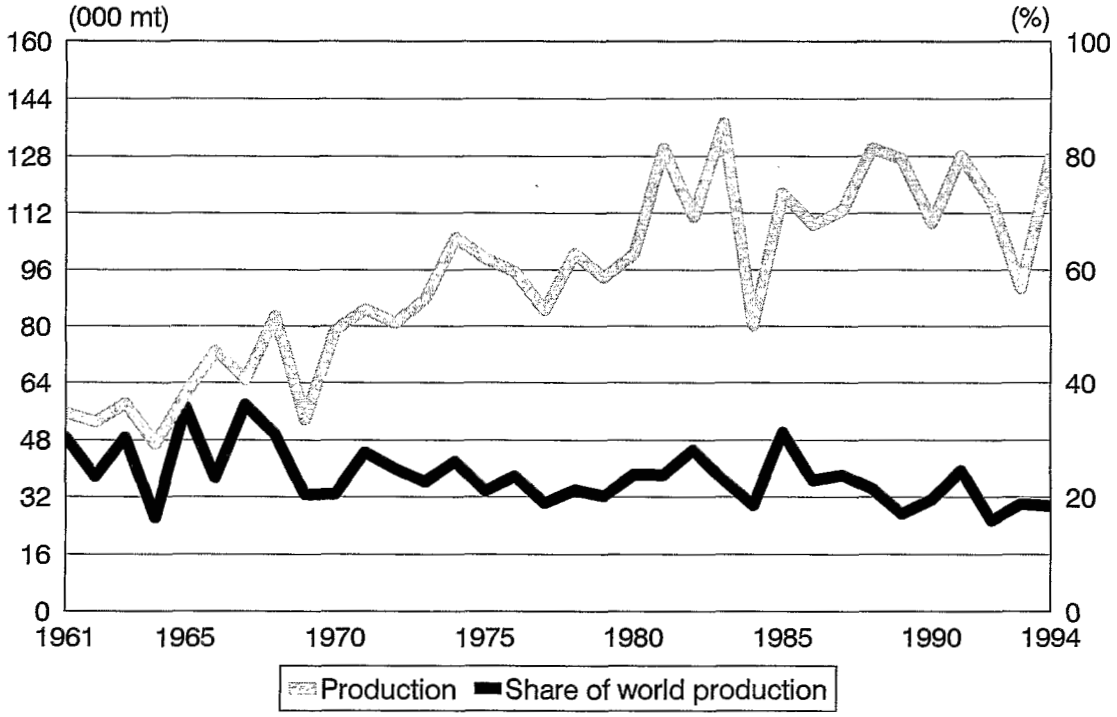

Fig. 2. Italy. Hazelnuts. Production: Absolute value (mt) and share of world production (%) (1961-1994) (Source: FAO).

The downsizing of the importance of Italian hazelnut production appears to be linked both to the changes in the surface area under cultivation and in the ratio between Italian and average world yields (Table 1). This ratio, although remaining above one, over the last thirty years has shown a definite, albeit slight, tendency to decrease (Fig. 3).

Italian production of hazelnuts grew at a significant rate from the beginning of the 1960s until the early 1980s; in the last ten years this growth tendency appears to have stopped (Table 1; Fig. 2). The quantity of hazelnuts produced in Italy in 1994 was a little more than double that produced at the beginning of the 1960s; the area under production had increased by only a quarter. Basically, this increase in the area under production occurred during the 1960s and early 1970s, while it has remained stable since then. If the overall area under cultivation has remained basically stable for the last twenty years, its altimetric distribution has changed. There has been a reduction in the presence of cultivated areas of hazelnuts in the plains and in mountain areas and a contemporaneous increase of the same amount in the hilly areas. The pattern of yields between 1961 and 1994 shows a definite increase; however, the increases appear to be more pronounced between the beginning of the 1960s and the beginning of the 1980s (Table 1; Fig. 3).

As in the other main exporting countries, hazelnut production in Italy is highly concentrated in few provinces. If it can be said that it definitely plays a minor role in Italian agricultural production considered as a whole, hazelnuts, nevertheless, assume a crucial role in the economy of the main areas where they are cultivated. Considering the average production for the three years from 1992 to 1994, 77% of production was concentrated in only four provinces [Viterbo (in Lazio, 31% of Italian production); Avellino (in Campania, 25%); Messina (in Sicily, 11%); and Naples (in Campania, 10%)],

[2] Also in 1961 Italy was second among the major world producers of hazelnuts, behind Turkey and followed by Iran, Spain, USA, China and Greece, in order of importance. According to provisional data released by FAO, the United States had overtaken Spain in 1995 and 1996, thus moving into the third place.

and 95.9% was concentrated in just 10 provinces[3]. The four most important hazelnut-producing provinces in the three year period between 1969 and 1971 and, again, between 1979 and 1981 were the same as today; their share of Italian total production was equal to 72.0% and 78.3%, values which are not much different from the most recent ones. However, the ranking of the four provinces has changed over the years as a result of the strong growth of production in the province of Viterbo, which in over twenty years has increased its production 2.7 times[4]. In 1994 in the province of Viterbo hazelnut production represented 40.1% of the value of agricultural production as a whole.

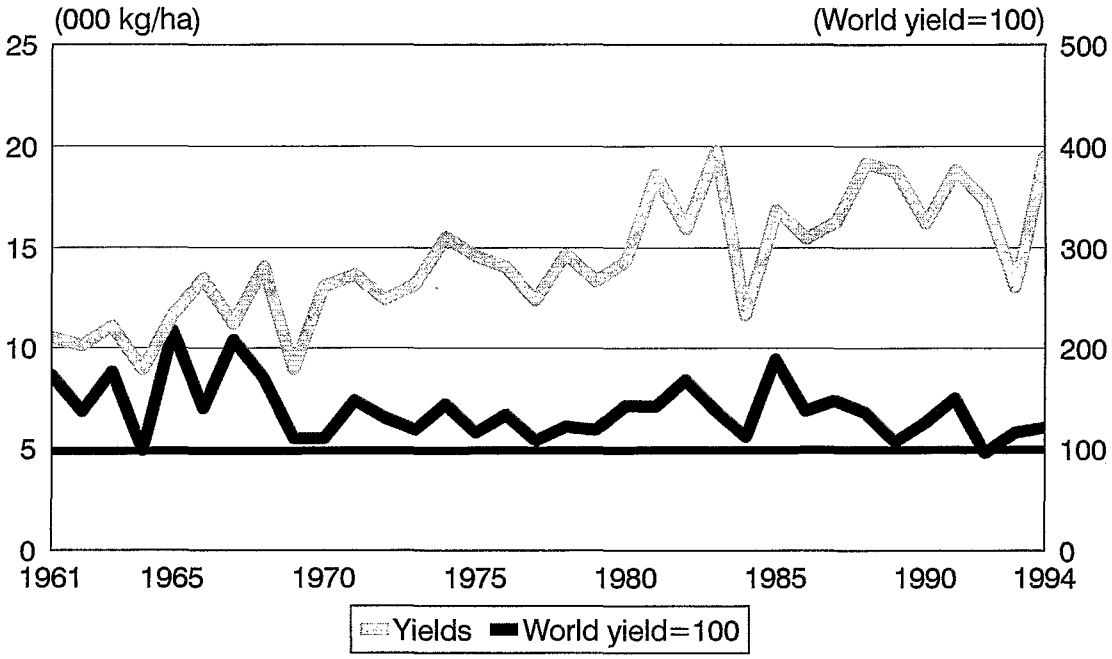

Fig. 3. Italy. Hazelnuts. Yield: Absolute value (kg/ha), world yield = 100 (1961-1994) (Source: FAO).

The species of *Corylus* overwhelmingly predominant in Italy is the *Avellana*. A characteristic, and limitation, of hazelnut production in Italy is the high number of varieties grown, sometimes even within the same area. Among the most common varieties are, in Campania the 'Tonda di Giffoni', the 'Riccia di Talanico', the 'Mortarella' and the 'Lunga di S. Giovanni'; in Lazio we find the 'Tonda Gentile Romana'; in Piemonte the 'Tonda Gentile delle Langhe'; in Sicily a large number of different varieties are cultivated, often characterised by relatively low yields and for not having a strong market demand (Bassi and Pellegrino, 1993; Di Stefano, 1990; Dono, 1995; Tudisca, 1994).

The different varieties are characterised by different organoleptic traits, different shapes (round or oblong - the former more in demand within the industry, the second mostly destined for local consumption or used by the industry for making pastes), and different fruit sizes. Moreover, different varieties lend themselves to greater or lesser extent to mechanical shelling and peeling (that is, the separation of the fruit from the perisperm, the film that envelopes the kernel) and differ in perishability (Bassi and Pellegrino, 1993; De Rosa *et al.*, 1990; Rivella, 1984). As a result, there are different demands, and prices, for each of the different varieties. The 'Tonda Gentile delle Langhe' and, at a certain distance, the 'Tonda Gentile Romana' and the 'Tonda di Giffoni' - because of their shape (round), size (medium), the fact that the husk is easy to remove and their excellent organolectic characteristics - are the varieties most in demand by the industry[5]. To have an idea of the differences among the markets for the different hazelnut varieties it may be useful to recall that at the beginning of the 1990s the ratio between the price (in-shell) of the 'Tonda Gentile delle Langhe' and that of the 'Tonda Gentile Romana' and of the 'Tonda di Giffoni' was 1.4; the ratio with the price of the 'Lunga di

[3] In 1992 in Italy there were less than a hundred provinces.
[4] At the beginning of the 1970s Viterbo was the third most important province producing hazelnuts, with 11.4% of national production.
[5] The share of hazelnuts destined to direct consumption is limited to 10%.

S. Giovanni' was 1.9, and that with the price of a group of varieties produced in Sicily was a little over 2[6] (Botta *et al.*, 1993; Tudisca, 1994).

Hazelnut production in Italy is carried out in a wide range of settings (Angeli and Senni, 1995; Antinelli and Scarpa, 1992; Schifani, 1994; Schimmenti, 1994), from a small number of modern specialised farms, where hazelnut production takes place on a relatively large scale with production technologies, yields and production costs in line with those of the most efficient producers on the north-west coast of the USA, at one end, to a large number of very small farms which still rely on traditional production methods resulting in high production costs and a lower quality, at the other end. Information about these differences can be derived by looking at the distribution of land under hazelnut cultivation by class size. In 1990, 12.5% of hazelnut cultivated land was on farms where no more than half a hectare was given over to hazelnut production. Hazelnut cultivated area on farms where hazelnut cultivation took up no more than one hectare was 26.8%; furthermore, 21.3% of the area devoted to hazelnut cultivation in Italy was on farms where between one and two hectares were given over to hazelnut production. At the opposite extreme, hazelnut cultivated area in farms using at least five hectares for hazelnut production comprised 25.5% of the overall total, and that on farms with at least ten hectares devoted to hazelnut production only 14.4%[7].

A large part of the world production of hazelnuts is traded internationally. Italy has for a long time been an important exporting country. In the 1960s the volume of Italian imports of hazelnuts was basically negligible, while exports of shelled hazelnuts accounted for one seventh of world exports, and exports of in-shell hazelnuts for over 80%. Considering the shelled and the in-shell nuts together, in 1994 and 1995 for the first time since 1961 Italy became a net importer of hazelnuts. In 1994 Italy imported 22,379 t of shelled hazelnuts and 941 of in-shell hazelnuts, while exporting 14,369 and 3,377 t, respectively (Table 1). The overall negative net trade balance was slightly over 29 million USD. In 1995 the volume of imported shelled and in-shell hazelnuts was 20,919 and 1,343 tons, respectively, while the volume exported was 11,429 and 3,498 t (Table 1; Figs 4 and 5).

Yet, only six years before, in 1989, Italian exports of shelled hazelnuts were equal to a quarter of the world total; the Italian net trade balance was equal to over 85 million USD for these alone, and to over 10 million USD for in-shell hazelnuts. Italian exports of in-shell hazelnuts had been declining steadily since 1975; exports of shelled hazelnuts experienced first a phase of expansion, which lasted from 1975 until 1989, followed in more recent years by a drastic fall. Despite a significant drop in the prices expressed in liras, Italian exports have lost out to Turkish producers and have declined by over 70% in only six years, from 1989 to 1995; in the same period imports of shelled hazelnuts have tripled.

If one looks at the composition of Italian imports by country of origin, it is certainly not surprising that Turkey emerges as virtually the sole source, with 97.8% of the total in 1995. It is useful to underline how Turkey has dramatically increased over time its penetration of the rapidly expanding Italian market, to the detriment of Germany, which even as recently as at the end of the 1980s provided 18% of Italian imports.

Italian imports of in-shell hazelnuts are far less significant than those of shelled hazelnuts. Imports were equal to 184 tons in 1988; 75% of these came from the USA and the rest from Germany. In more recent years imports have increased and by 1995 they amounted to 1,343 tons; at the same time the number of supplier has increased: alongside the USA which provided 45.8% of Italian imports of in-shell hazelnuts, other important sources have emerged, such as Georgia (25.6%) and Azebaijan (21.6%), with Germany now providing only 4.9%.

While Italian imports of hazelnuts are overwhelmingly provided by countries outside the European Union, the countries which import Italian hazelnuts are mostly EU members. In 1995 Italian exports of in-shell hazelnuts - equal to 3,498 t - went to France (19.6%), the UK (17.3%), Norway (15%), Holland (10.8%), Germany (10%), Denmark (8%) and Sweden (6.3%). It is worth underlining how Germany relinquished its role as the main buyer of Italian hazelnuts between 1988 and 1995; this role has been taken over by France, which in 1988 occupied the third place, absorbing 13% of Italian exports of in-shell hazelnuts.

[6] It should also be said that the varieties produced in Sicily have lower yields, both per hectare and in shelled nuts, than the other varieties which have been mentioned ('Monastra', 'Tamponi' and 'Avanzato', 1990; 'Tudisca', 1994).

[7] ISTAT (Central Institute of Statistics, Italy) pers. comm.

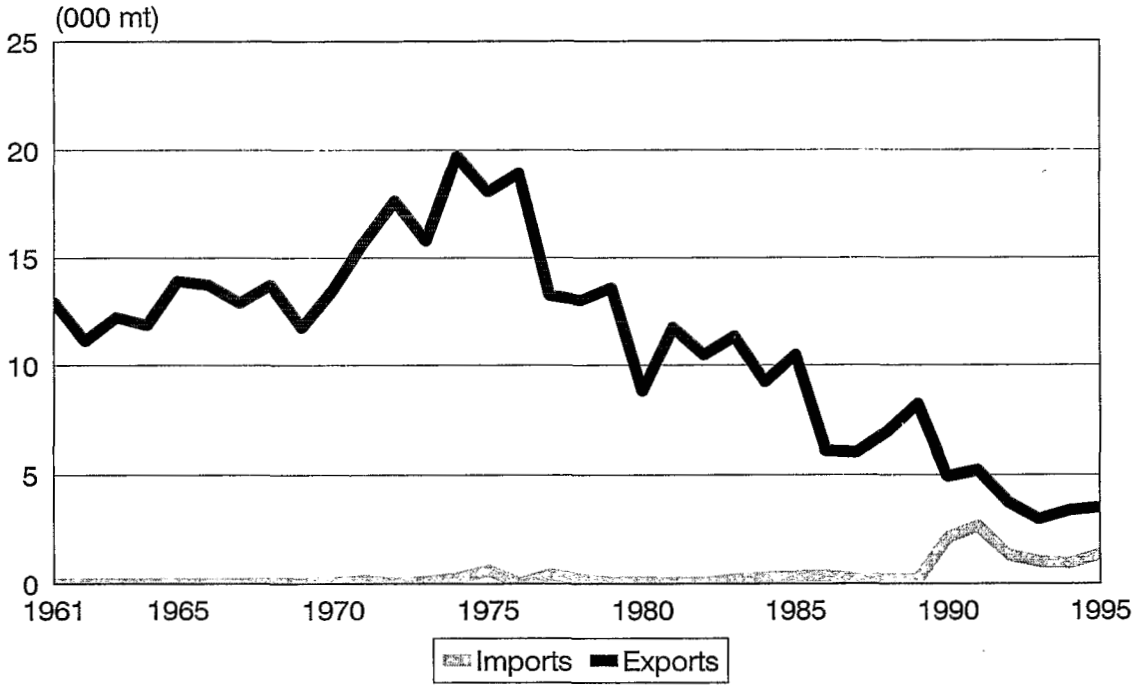

Fig. 4. Italy. In-shell hazelnuts. Imports and exports (mt) (1961-1995) (Source: FAO, Eurostat for 1995).

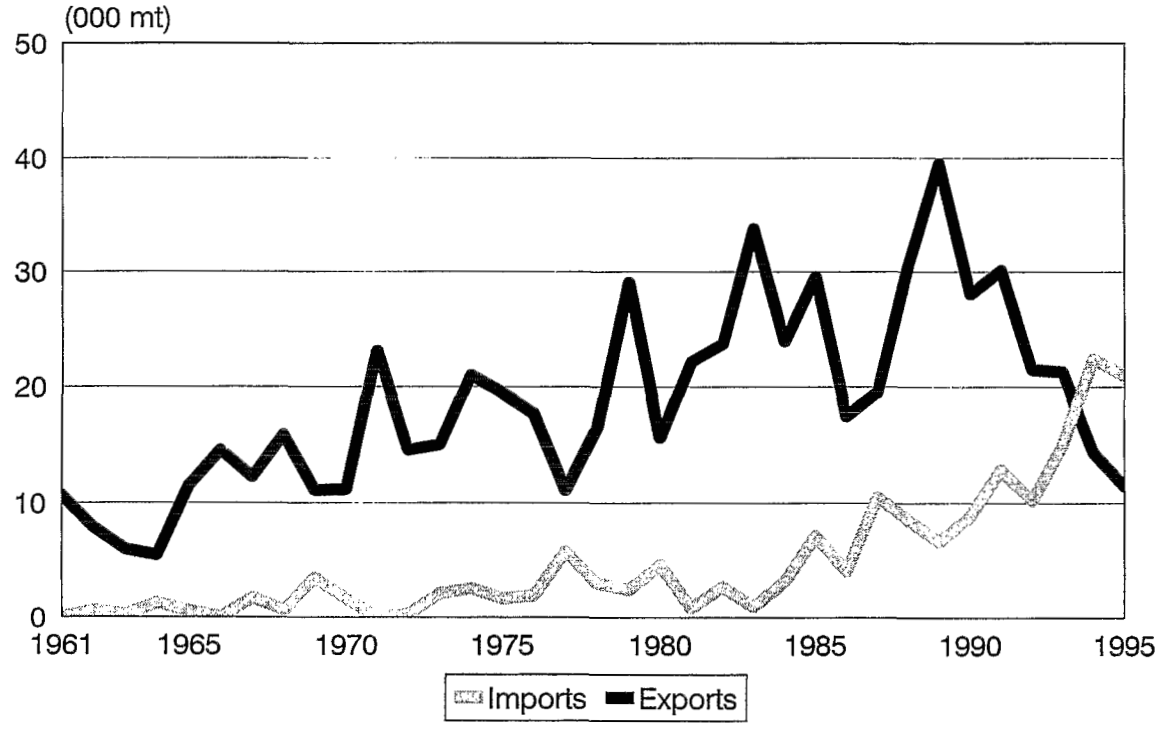

Fig. 5. Italy. Shelled hazelnuts. Imports and exports (mt) (1961-1995) (Source: FAO, Eurostat for 1995).

Analogously to what has happened to in-shell hazelnuts, Italian shelled hazelnuts are being bought by a relatively small number of countries, in particular Switzerland, France and Germany. The market

share held jointly by these three countries in 1988 was 72.4%, it increased to 76.8% in 1991 and to 79.7% in 1995. Between 1988 and 1995, years in which, as discussed above, a rapid decline occurred in the exports of Italian shelled hazelnuts, there was a reduction in the share going to Germany (from 37.4% to 20.9%) and an increase in exports to Switzerland (from 19.4% to 35.7%).

Despite the fact that, when one looks at what has happened in the Italian nut sector over the last few decades, hazelnut has certainly been the best performer, the difficulties that this industry faces are considerable. These appear linked partly to internal and partly to external factors.

Among the most relevant internal factors, which are obviously interrelated, are:

(i) The structural inadequacy of the vast majority of Italian hazelnut producing farms, which implies outmoded production techniques, production costs way above market prices - especially after their significant reduction in recent years - and the atomisation of supply.

(ii) The exorbitant number of varieties - leading to a critical lack of homogeneity of supply - and the fact that many of these are not highly valued by the industry.

(iii) The presence of too many actors in the marketing chain, where, alongside the wholesalers, we still find many small commercial operators who play a role between wholesalers and the smaller producers.

On the other hand, among the *external* factors, the most important ones seem to be the following:

(i) The rapid increase in production in Turkey[8], which is highly competitive in terms of prices thanks to considerably lower production costs than those in Italy, even if the quality of Turkish hazelnuts tends to be inferior to that of the more valued Italian varieties.

(ii) The recent developments of the exchange rates of the Italian lira, which after having been undervalued for a considerable period of time - thus sustaining Italian exports - was recently revalued.

The European hazelnut industry has repeatedly identified the trade preferences granted by the European Union to Turkish exports of hazelnuts - the EU exempts a large proportion of its imports from Turkey from paying import duties - as being one of the main causes of the present crisis. However, the emphasis which EU producers place on this preferential treatment appears, frankly, quite excessive. If the preferential duty-free import quota did not exist, the duty imposed on EU imports of Turkish hazelnuts would still be less than 4% (it will be equal to 3.1% in 2001). This is a barrier which could hardly compensate for the differentials in production costs between those in Turkey and those within the EU. The rapid expansion of imports of hazelnuts from Turkey has not been caused by EU preferences but by the strong growth of hazelnut production in that country and by the price competitiveness of Turkish production compared to that in Europe.

If this is so, then the problem faced by the European hazelnut industry cannot be solved by abolishing the preferences granted to imports from Turkey, which are in any case limited, but rather by identifying effective ways of intervening in favour of the European industry to help it improve the *quality* of its production and reduce production costs, as far as this is possible.

Within the Italian hazelnut industry it is possible to identify set-ups which are so diverse that it is hazardous to make any judgement on the prospects of the sector as a whole, and it makes more sense to talk about the Italian hazelnut industrie*s*. Larger-scale hazelnut production appears to be capable of taking the necessary steps to allow them to continue successfully to remain active in the sector. This means resisting the strong Turkish price competition by reducing production costs while maintaining its competitive edge in terms of the *quality*, both of the product in itself and of the services sold in association with it (such as the ability to deliver consistent quality standards; the reliability of supply; the ability to supply a large range of semi-processed products; the ability to respond quickly to variations in the needs of the industry; and the "reputation" of its commercial operators).

At the opposite extreme we find a very large number of small non-specialised farms in which hazelnut production is often carried out on marginal lands, production costs are high and the varieties

[8] Hazelnut production in Turkey has quadrupled between the beginning of the 1960s and the mid 1990s. If only the most recent years are considered, by comparing the average production in the years 1993-95 and in the years 1985-87, we find an increase of 64% in just eight years.

cultivated are not those which are most valued by the market. For this component of the Italian hazelnut industry - which, it should be remembered, often plays a significant and not easily replaceable role in protecting the environment - the prospects are somewhat bleak. The survival of these economically extra-marginal farms in the mid-term will mostly depend on the evolution of the EU Common Agricultural Policy, and, in particular, on the proposed introduction of "decoupled" direct payments as part of rural development strategies aimed at maintaining agricultural production in areas where, although not justifiable from a purely economic point of view, it plays a unique role in the protection of the environment and in the conservation of the rural world.

Almonds

In 1994, Italian production of almonds was equal to 89,944 t according to the FAO; the area harvested was 102,459 ha[9] (Table 2). The value of the almonds produced in 1994 was equivalent to 111 billion liras (approximately 70 million USD), corresponding to only 0.18% of total Italian agricultural production in value.

In 1994 Italy was the third largest producer of almonds with 6.6% of world production, preceded only by the United States[10] (40.3%) and Spain (17.4%), and followed by Iran (4.9%), Morocco (4.2%), Greece (4.1%) and Turkey (3.4%). Still in 1961 Italy with 43.3% of world production (Fig. 6) was the most important world producer, followed by Spain (26.9%) and the United States (8%). The rapid reduction in Italy's importance as world leader in almond production is due to two concomitant factors: the strong contraction in Italian production and the contemporaneous and equally rapid expansion of production in other parts of the world. In fact, between the beginning of the 1960s and the middle of the 1990s Italian production contracted by 70%, whereas world production increased by over 80% and production in the United States alone increased nine-fold.

The harvested area in Italy in 1961 was equal to 316,000 ha; here too, as with production, one has a value equivalent to three times that in the mid 1990s (Table 2).

While the area under cultivation for almonds has been declining steadily in Italy over the past 30 years, the pattern of production shows considerable variability in the first part of the period - with high points in production in 1968 (297,100 t) and again in 1981 (266,500) on the one hand, and, on the other, a trough in 1973 (60,200) - and a more regular trend in more recent years (Table 2; Fig. 6). Given the regular reduction in area, the high variability of production can only be due to a similar variability in the yields (Table 2; Fig. 7). The fact that until the beginning of the 1980s Italian yields were systematically below the world average while those of more recent years do not show any significant difference from this, would confirm the hypothesis that the reduction in area has involved not only the plains - where farmers have preferred more profitable crops to almonds - but, above all, the less productive lands (Bellia, 1972).

As with hazelnut production, Italian almond production is highly concentrated in a few provinces. Considering the average production in the three years between 1992 and 1994, the four largest producing provinces - Bari (19.7% of national almond production) in Apulia; Agrigento (16.9%), Caltanissetta (13.4%), and Enna (11%) in Sicily - accounted for over 61% of total Italian production. The eleven most important producing provinces were all located in Apulia or Sicily; over 92% of the total production of almonds in Italy was concentrated in these eleven provinces alone.

As with the cultivation of hazelnuts, but to an even greater degree, one has to talk in terms of the coexistence of very different kinds of almond producing farms, characterised by different sizes, level of expertise, production technologies, quality of product, production costs and positioning on the market[11]. An idea of how structurally different the almonds producing farms can be, emerges by looking at the distribution of the almond-cultivated area by class sizes. Almonds production is highly atomised, even more so than for hazelnuts. In 1990 15.7% of almond cultivated area was on farms which utilised no more than half a hectare to produce almonds; 32.7% of the area was on farms where no more than one hectare was used for almond production. At the opposite extreme, 18% was on

[9] For a second opinion it may be useful to look at the results of the Italian Agricultural Census of 1990. According to this, the area given over in Italy to almond production in that year was 92,255 ha, as opposed to a FAO estimate for the same year of 120,430 ha.

[10] All USA production is concentrated in just one state, California.

[11] One can find a useful analysis of the different typologies of almond-producing farms in Italy in the early 1970s in Bellia (1972).

farms where almonds occupied more than 5 ha and only 8.7% in farms where at least 10 ha were given over to almond production[12].

Table 2 Italy. Almonds. Production, area harvested, yields, imports, exports and net trade balance (1961-1995) (Source: FAO and Eurostat)

	Production (mt)	Area harvested (ha)	Yield (hg/ha)	In-shell almonds				Shelled almonds			
				Imports (mt)	Exports (mt)	Net trade (mt)	Net trade (000$)	Imports (mt)	Exports (mt)	Net trade (mt)	Net trade (000$)
1961	328500	316000	10396	10	1917	1907	757	176	37567	37391	36447
1962	98900	313400	3156	331	1797	1466	978	37	26315	26278	34534
1963	215500	311300	6923	91	1252	1161	893	210	23233	23023	34704
1964	255800	309800	8257	259	1345	1086	1124	259	28978	28719	42774
1965	226400	307000	7375	36	1345	1309	967	129	26734	26605	39250
1966	236900	304200	7788	52	1621	1569	1020	116	30005	29889	43321
1967	245400	302000	8126	97	1396	1299	890	103	31255	31152	45716
1968	297100	299400	9923	0	0	0	0	657	28912	28255	41408
1969	191900	296500	6472	0	0	0	0	529	25942	25413	46476
1970	230600	296000	7791	0	0	0	0	361	16353	15992	29302
1971	134900	278600	4842	0	0	0	0	1610	15496	13886	26041
1972	127700	248000	5149	0	0	0	0	5559	9709	4150	11511
1973	60200	241300	2495	0	0	0	0	4580	6686	2106	6725
1974	119200	242700	4911	0	0	0	0	2884	2325	-559	-2031
1975	103100	235400	4380	0	0	0	0	1732	2922	1190	3076
1976	134000	228600	5862	0	0	0	0	1252	7288	6036	13007
1977	176100	223000	7897	0	0	0	0	684	12801	12117	30735
1978	175000	215500	8121	0	0	0	0	1440	10381	8941	29757
1979	101000	212000	4764	0	0	0	0	3235	7121	3886	17294
1980	155600	206600	7531	0	0	0	0	5220	3463	-1757	-7651
1981	266500	203400	13102	0	0	0	0	1158	7004	5846	17774
1982	115000	199400	5767	0	0	0	0	1813	8508	6695	15446
1983	127200	129015	9859	0	0	0	0	1472	14739	13267	39079
1984	100500	127543	7880	0	0	0	0	2120	10989	8869	29041
1985	105650	125835	8396	0	0	0	0	7994	2792	-5202	-12931
1986	122700	124525	9853	0	0	0	0	4132	7499	3367	18840
1987	121790	123657	9849	0	0	0	0	11782	3108	-8674	-34425
1988	114400	115749	9883	1299	654	-645	-469	10594	3447	-7147	-22927
1989	97800	120544	8113	987	764	-223	-198	8456	5238	-3218	-12034
1990	94970	120430	7886	1086	618	-468	-624	11148	1723	-9425	-31197
1991	126440	119333	10596	713	528	-185	-297	11789	2002	-9787	-34102
1992	99013	115144	8599	566	577	11	232	9962	1964	-7998	-30890
1993	99106	112410	8816	312	523	211	90	6065	4490	-1575	-6108
1994	89944	102459	8779	575	734	159	-171	9418	1274	-8144	-37584
1995	n.a	n.a	n.a	509	888	379	278	6942	2055	-4887	-17088

In Italy almond production is characterised by the extremely large number of varieties - over 1,000 according to some (FAO, 1990), several hundred according to others (Monastra *et al.*, 1990) - generally with a hard shell and a low yield when shelled. As a result, a lot of inferior varieties are

[12] Italian Central Institute of Statistics (ISTAT), pers. Comm.

produced as regards quality and/or yields and production lacks homogeneity, which leads to more difficulties in the marketing phase. To get a better picture of the problem we should consider the situation in California; in California slightly under 50% of production is of just one variety[13] ('Nonpareil') with a soft shell and a yield when shelled of 60-70% as opposed to approximately 25% for the hard shell varieties and 35-50% for the more highly regarded soft shell varieties cultivated in Italy (FAO, 1990). In Italy it is only quite recently that a small number of selected varieties has been used for new plantings (Monastra *et al.*, 1990).

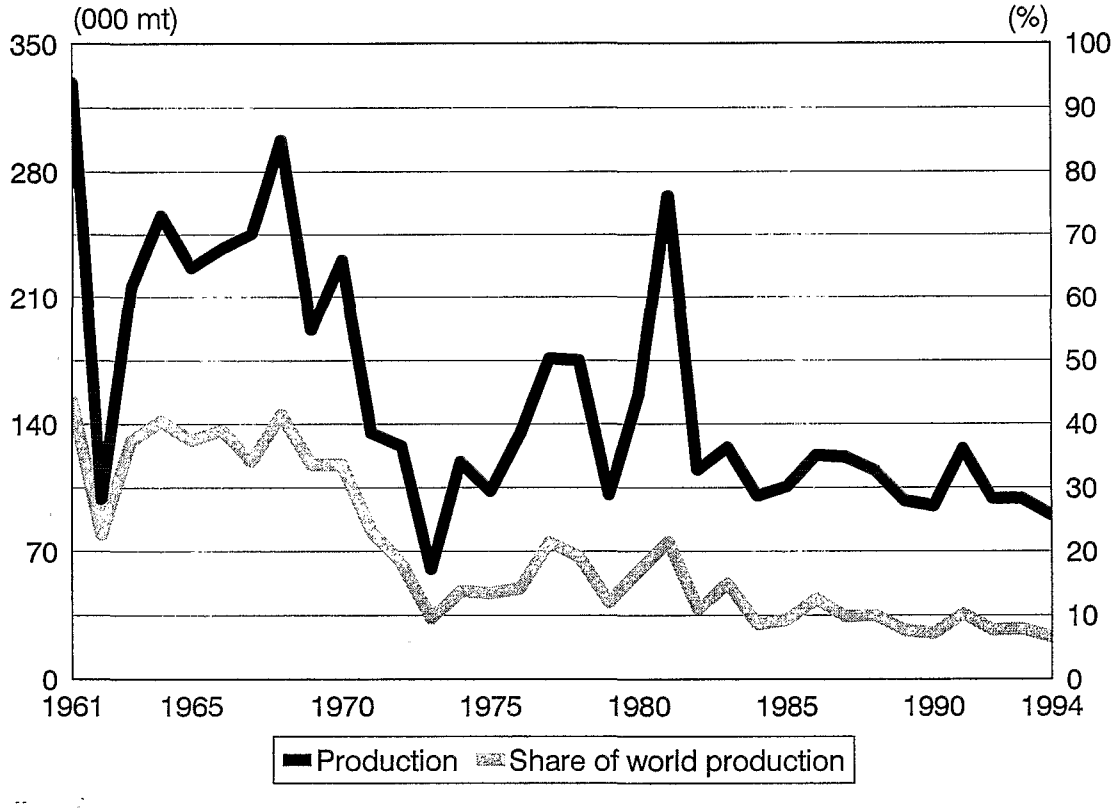

Fig. 6. Italy. Almonds. Production: Absolute value (mt) and share of world production (%) (1961-1994) (Source: FAO).

As with hazelnuts, much the greater proportion of sales on the international market concerns shelled nuts.

Between 1961 and 1967 Italy was a net exporter of in-shell almonds, even though with a limited volume exported and a market share of around 10%. In recent years Italy has become a net importer of in-shell almonds, but with a market share which does not go over a few percentage points. Therefore, in the international market for in-shell almonds, which is in any case a small one, Italy is a marginal actor.

At the beginning of the 1960s Italy played a major role in the market for shelled almonds: in 1961 Italy exported 37,567 t, equivalent to 55.4% of the world market (Table 2; Figs 8 and 9). Italian exports of shelled almonds drastically dropped throughout the 1960s and early 1970s with the result that, by the year 1974, only 2,325 t were exported (less than 4% of world exports). Apart from two peaks in 1977 and 1983, when its share of the world market exceeded 10% once again, Italy's exports have continued to decline. Thus, as with in-shell almonds, Italy has become a mere marginal exporter with an extremely low percentage of the world market (Fig. 9).

[13] In 1993 the area covered by the four most important varieties ('Nonpareil', 'Carmel', 'Texas/Mission' and 'Prince Cluster') was nearly 80% of total area covered by almonds (California Almonds, 1994).

As exports have declined, so have imports increased; in recent years Italy's share of world imports has been about 5%.

Around the middle of the 1980s the different dynamics of almonds exports and imports determined a change in the sign of Italy's net trade position. If in 1961 Italy recorded net exports of 37,391 tons of shelled almonds (valued around 36.5 million USD), in 1994 the net balance was negative and equal to 8,144 tons (valued 37.5 million USD) (Table 2). The self-sufficiency rate for almonds in recent years in Italy has been roughly 75%.

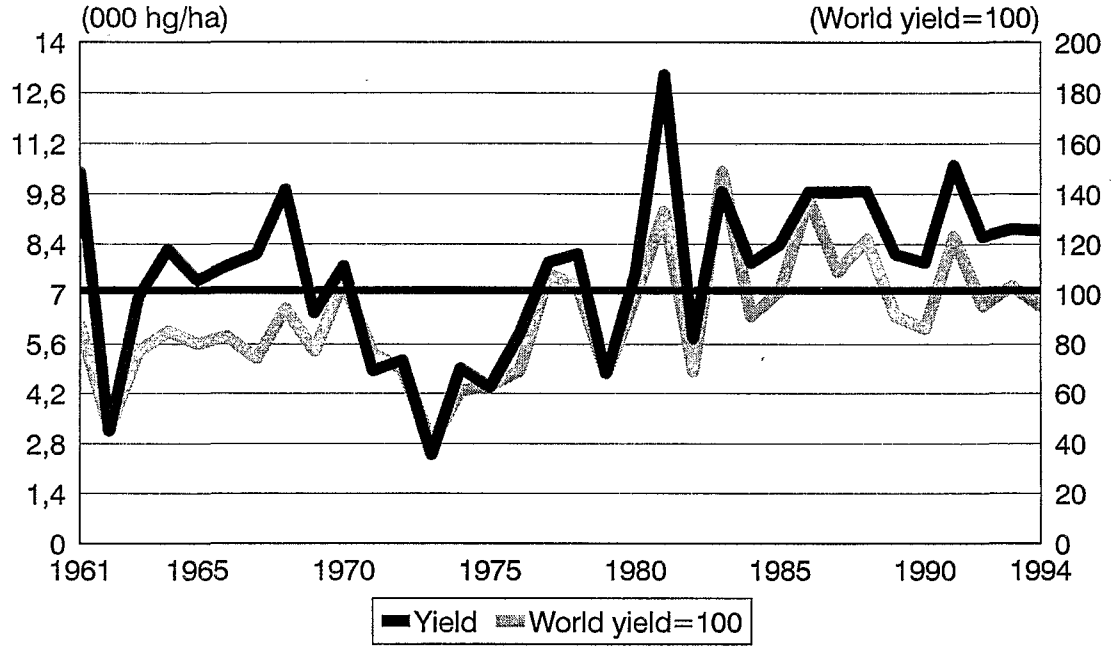

Fig. 7. Italy. Almonds. Yield: Absolute value (hg/ha), world yield = 100 (1961-1994) (Source: FAO).

In 1995 Italy bought 6,942 t of shelled almonds on the world market: 57.5% came from the United States, 26.9% from Spain and 5.4% from Greece. In the years between 1988 and 1995 these countries, along with Germany, were Italy's main suppliers: the market share held by these four countries together has always been over 90%. The USA and Spain have alternated in the role as principal supplier; Spain was first in 1989, 1990, 1992, 1993 and 1994, the United States in 1988, 1991 and 1995.

Over the years Italy's position on the world market has radically changed as the United States become the main actor. It is useful to underline, however, how the growth in production and exports from the USA has had different repercussions in Spain and Italy. At the beginning of the 1960s, the United States held less than a 10% share of global exports as against Italy's 50% and Spain's 33%. Ten years later, at the beginning of the 1970s, the United States had become the world leader with 40% of the market, Spain was second with slightly under 30% and Italy third with less than 15%. At the beginning of the 1980s the market shares were 60%, 22% and less than 8%, respectively. At the beginning of the 1990s Italy had practically disappeared from the market as an exporter, the United States held over 70% of the market and Spain was still the second most important exporter, with a greater volume of exports than it had 30 years before but with only 16% of the market. The "explosion" of almond production in the USA has, therefore, contributed to driving out of the market a large portion of almond production in Italy, where the weakest components have been unable to adjust and compete, causing a decline in production and exports and an increase in imports. The volume of Spanish exports, on the other hand, did not decrease as USA exports grew, although this country's market share has declined as a result of the growth of the world market.

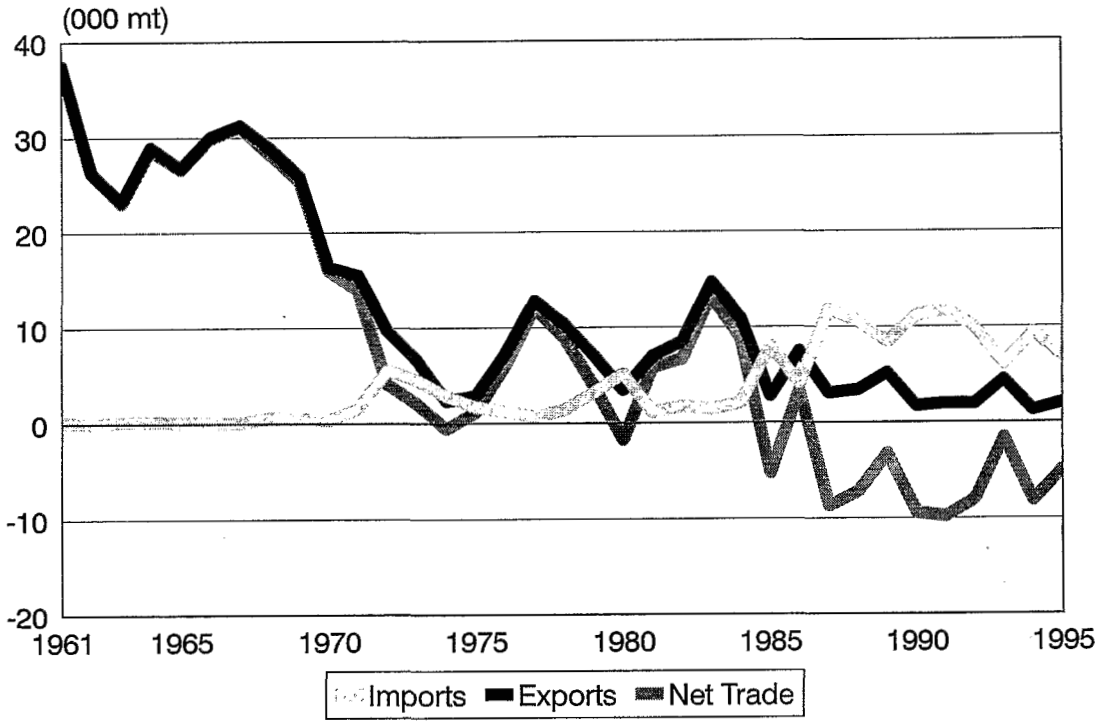

Fig. 8. Italy. Almonds shelled. Imports, exports and net rate (mt) (1961-1995).

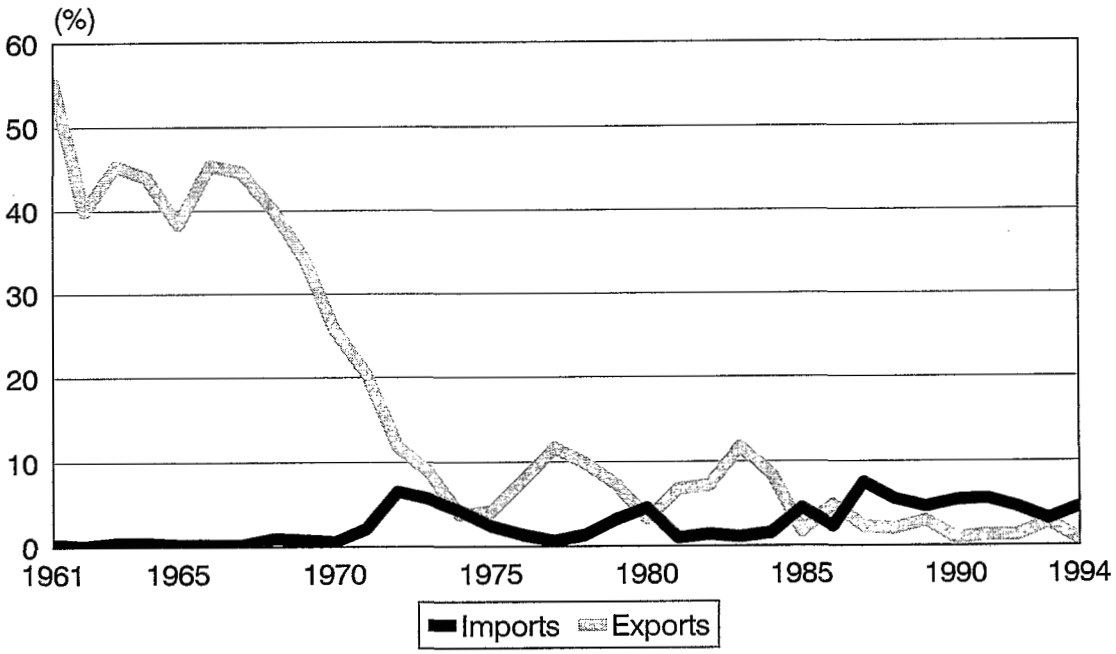

Fig. 9. Italy. Almonds shelled. Imports and exports in volume: World market shares (%) (1961-1995) (Source: FAO).

The problems of competitiveness which the Italian almond industry has to face concern both the quality of the product and the production costs.

The lack of homogeneity induced by the large number of varieties cultivated, and a quality which is often found lacking by the processors, have caused and cause serious problems for a sizeable

proportion of the almonds produced in Italy when it comes to finding a market different from the local one.

Highly fragmented production has impeded farmers from exploiting the advantages which derive from a large scale of production and from introducing new production and harvesting technologies. Moreover, most of the varieties grown in Italy give low yields, both in terms of in-shell and shelled almonds. These factors help to explain the high production costs which are associated with most of almond production in Italy and, therefore, its lack of competitiveness in terms of prices.

As with hazelnut production, almond production suffers from problems which are structural in nature, and these hinder its ability to compete on the EU market against imports from outside, in this case from the United States.

In other words, as was the case for hazelnuts, here too it does not seem that the problems of the lack of competitiveness of Italian (and Spanish) producers are due to the relatively low preference granted by the European union to its domestic sector (the tariff imposed on imports of shelled almonds has long been 7% and will fall to 3.5% in year 2001; the tariff on in-shell almonds was also 7% until 1995, and will be lowered to 5.6%) or the generous reduced tariff quota (90,000 t on which only a 2% tariff is imposed) allocated to the United States. The causes of the lack of competitiveness of most of the almond production in Italy are internal ones, mostly due to the structural characteristics of the industry, and, for this reason, not to be easily resolved.

Walnuts

Of the three most important species of edible nuts grown in Italy the walnut has always been the least important from the point of view of the value of its production. In 1953 the value of the production of walnuts was equivalent to only 0.25% of the value of total agricultural production in Italy and over the years its share has never risen above 0.6%. Since the end of the 1960s its share has steadily declined: in 1994 the value of the walnut production was only equivalent to 0.04% of overall Italian agricultural production. The reduction in the contribution of walnuts to the value of Italian agricultural production is due to the notable contraction in the quantity produced: 81,100 t of walnuts were produced in Italy in 1968, by 1994 only 10,244 tons (Table 3; Fig. 10).

This reduction in the production of walnuts corresponds obviously to a decline in Italy's role among the major world producers. In 1961 Italian production of walnuts was equal to 14.3% of world production and Italy was second in world rankings, just behind Turkey (with a 16.2% share) and followed by the United States (12.3%), China (8%) and Rumania (7.2%). By 1980 its share had declined to a little over 5%, after which it continued its decline and in 1994 was only 1%. In that year Italy was 17th in the world walnut production rankings. The first places were occupied by the United States (21.4%) and China (21.4%), followed by Turkey (11.4%) and Iran (6.7%).

The reduction of the production of walnuts in Italy is connected to a similar reduction in the area under cultivation. This has, in fact, passed from 33,000 ha in 1961 to 4,257 ha in 1994 (Table 3); thus, if the area given over to the cultivation of walnuts in Italy represented 20.5% of the world total in 1961, by the year 1994 it had shrunk to approximately only 2%. The pronounced and steady reduction of area under cultivation must be seen in relation to the absence of new plantings to substitute for the trees cut down, with the result that the average age of walnut trees in Italy has been rising. The cutting of trees was also encouraged by the notable increase in the price of walnut wood and by the low rate of profitability in most of the Italian walnut sector due to high production costs and quality standards which often are not in line with those demanded by the market.

The trend in walnut yields has been different from those outlined above for hazelnuts and almonds. In fact, average walnut production per hectare in Italy has not only remained under the world average but in the last twenty years has also shown a regular tendency to decline, both in absolute terms and with respect to the world average (Fig. 11). This means that - unlike what we have seen for almonds, for example - the notable reduction in area under cultivation has not mainly affected the marginal areas but, on the contrary, those areas where yields were significantly above the average; that is to say, areas destined for presumably more profitable crops. This can be confirmed if one looks at the rates of reduction by altimetrical areas; between 1983 and 1994, for example, the area given over to walnut production on the plains decreased in Italy by 69%, on hills by 58% and in the mountains by 51%. The result of this tendency is that walnut production in Italy is being increasingly confined to areas where there are no suitable alternatives.

Table 3 Italy. Walnuts. Production, area harvested, yields, imports, exports and net trade balance (1961-1995) (Source: FAO and Eurostat)

	Production (mt)	Area harvested (ha)	Yield (hg/ha)	In-shell walnuts				Shelled walnuts			
				Imports (mt)	Exports (mt)	Net trade (mt)	Net trade (000$)	Imports (mt)	Exports (mt)	Net trade (mt)	Net trade (000$)
1961	71300	33000	21606	158	13608	13450	7587	0	1023	1023	1031
1962	65500	31000	21129	243	12198	11955	6246	0	585	585	676
1963	67200	29800	22550	232	6976	6744	3818	4	808	804	754
1964	60300	28400	21232	27	7578	7551	4056	0	578	578	592
1965	69600	27600	25217	668	12247	11579	6662	0	561	561	563
1966	70400	27200	25882	471	6488	6017	3629	45	492	447	498
1967	79300	27000	29370	779	9853	9074	5499	14	440	426	455
1968	81100	26700	30375	579	5872	5293	3746	0	441	441	555
1969	80100	26000	30808	1273	5959	4686	3628	11	264	253	354
1970	82200	24700	33279	697	5783	5086	3471	0	424	424	513
1971	84700	23300	36352	461	9785	9324	6191	0	291	291	416
1972	77200	21600	35741	2022	2682	660	837	0	184	184	288
1973	76600	16400	46707	1835	5279	3444	4272	9	271	262	318
1974	65300	16300	40061	864	3387	2523	2517	8	222	214	243
1975	60300	16200	37222	4393	3422	-971	-993	0	297	297	410
1976	49000	14800	33108	5978	2556	-3422	-3446	30	549	519	816
1977	49600	14700	33741	4531	3002	-1529	-1469	10	318	308	580
1978	45900	14600	31438	3156	2922	-234	152	111	174	63	252
1979	44050	14500	30379	4988	3416	-1572	-2893	3	541	538	1468
1980	42800	14400	29722	3710	2300	-1410	-2131	36	303	267	770
1981	47000	14200	33099	6199	2324	-3875	-4635	20	406	386	1148
1982	46200	14000	33000	6651	1248	-5403	-8602	4	442	438	801
1983	33050	13730	24071	5144	1417	-3727	-6613	15	348	333	534
1984	33500	13644	24553	5193	1245	-3948	-5167	31	162	131	228
1985	35200	13493	26088	8940	1612	-7328	-9161	56	262	206	239
1986	36000	13299	27070	6508	765	-5743	-8961	44	281	237	2292
1987	34980	12932	27049	7969	681	-7288	-13112	101	356	255	1019
1988	18700	6492	28805	8052	1029	-7023	-11301	310	584	274	728
1989	16990	6324	26866	7638	1011	-6627	-11917	116	876	760	2642
1990	15200	6036	25182	11311	1071	-10240	-19028	304	933	629	1252
1991	14510	5845	24825	12757	657	-12100	-23962	390	449	59	-1139
1992	15785	5755	27428	7437	733	-6704	-14294	387	207	-180	-1303
1993	13012	4869	26724	6918	782	-6136	-12583	364	128	-236	-1162
1994	10244	4257	24064	15789	480	-15309	-26394	699	108	-591	-2656
1995	n.a	n.a	n.a	11174	702	-10472	-16468	582	239	-343	-1142

Along with the dramatic reduction of area under cultivation, walnut production has disappeared altogether from many provinces where it used to be practised, albeit on a limited scale. Thus, if walnuts were produced in 81 Italian provinces at the beginning of the 1970s, by the early 1990s this number had been reduced to no more than 40. However, the disappearance of walnuts from many provinces has not altered the concentration of production in a small number of provinces, all located in

Campania. In the three year period from 1969 to 1971, 77.4%, between 1979 and 1981, 74.2%, and between 1992 and 1994, 76.9% of Italian walnut production was obtained in the five provinces (Naples, Salerno, Caserta, Avellino and Benevento) of the Campania Region alone. Between 1992 and 1994 over 50% of total production took place in only two provinces - Naples (29%) and Salerno (22.8%).

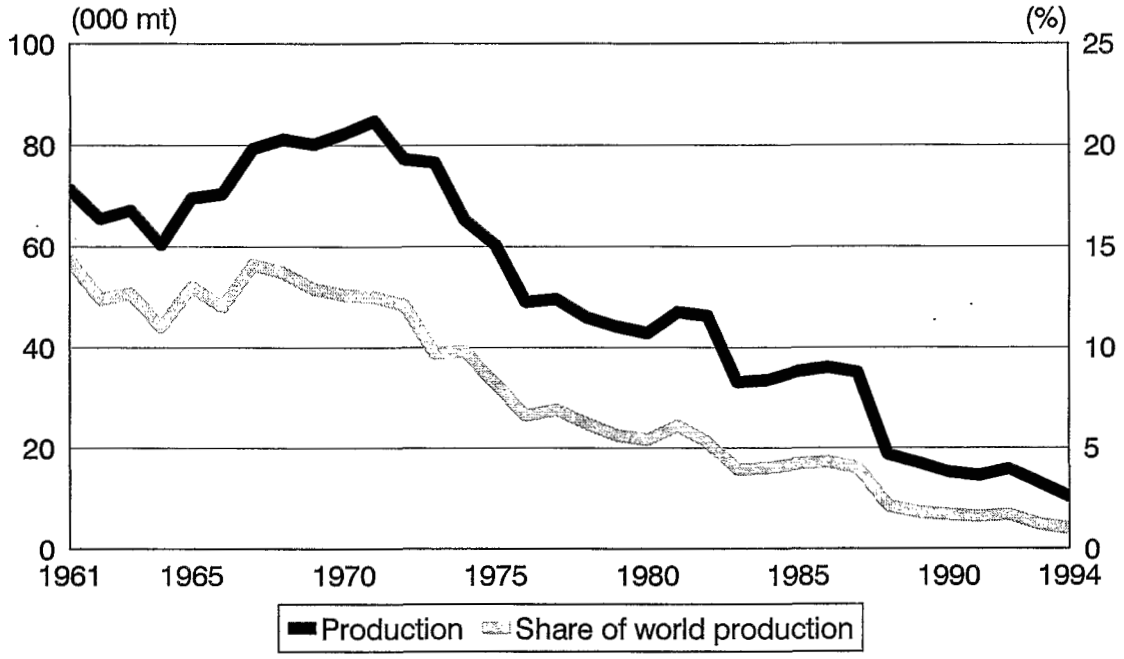

Fig. 10. Italy. Walnuts. Production: Absolute value (mt) and share of world production (%) (1961-1994) (Source: FAO).

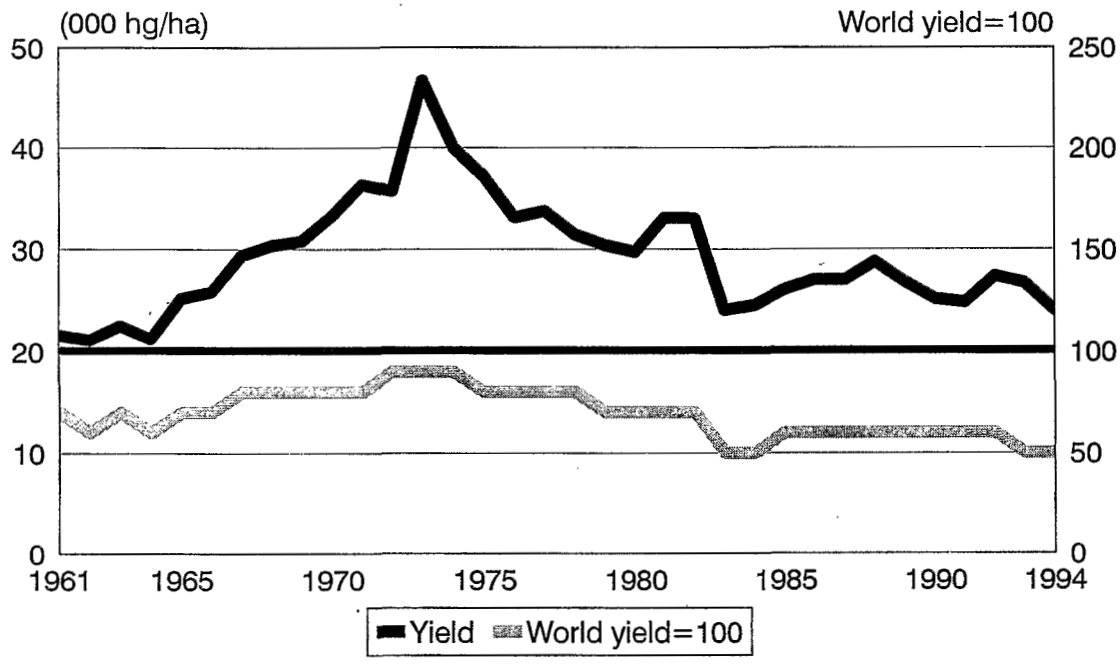

Fig. 11. Italy. Walnuts. Yield: Absolute value (hg/ha), world yield = 100 (1961-1994) (Source: FAO).

Traditionally farmers in Italy have always looked upon walnuts as being a double aptitude crop (nuts and wood), and this has had negative consequences as regards production costs and nut quality, because of the choice to leave the trees free to grow and develop vegetation. The greater part of the production of walnuts in Italy has been carried out in association with the cultivation of other crops. Specialised walnut farms are still very much in the minority (Monastra *et al.*, 1990). The most common variety of walnut produced in Italy is the one called 'Sorrento'. Unlike in California, most of the trees are grown from seed and not through the grafting of selected varieties. Moreover, it is only relatively recently that high quality selected varieties have become easily available in Italy (Gelone, 1997; Monastra *et al.*, 1990).

One of the consequences of the techniques of propagation used in Italy is that it takes more time for the plants to become productive, they produce less, the quality of the product is often inferior to that of other competitors and, finally, production is by no means homogeneous, even that obtained from trees of the same variety.

At the beginning of the 1960s, 32.4% of world exports of in-shell walnuts and 18.2% of those of shelled walnuts came from Italy (Figs. 12 and 13). The value of Italian walnut net exports was equivalent to 8.6 million USD. Italy's position on the world scene is much different today: it has become an important net importer of walnuts. As regards in-shell walnuts, Italy has been a net importer since the mid 1970s; as regards shelled walnuts the switch in the net trade position has been far more recent: Italy became a net importing country only in 1991 (Table 3). In 1994 the negative Italian net trade balance for in-shell walnuts was 26.4 million USD, for shelled walnuts the figure was 2.7 million USD. In that year Italy imported 18.2% of the in-shell walnuts exchanged on the world market.

Nearly all the imports of in-shell walnuts into Italy come from one country alone, the United States, which in recent years has had a share of between 80% and 90% of Italian imports.

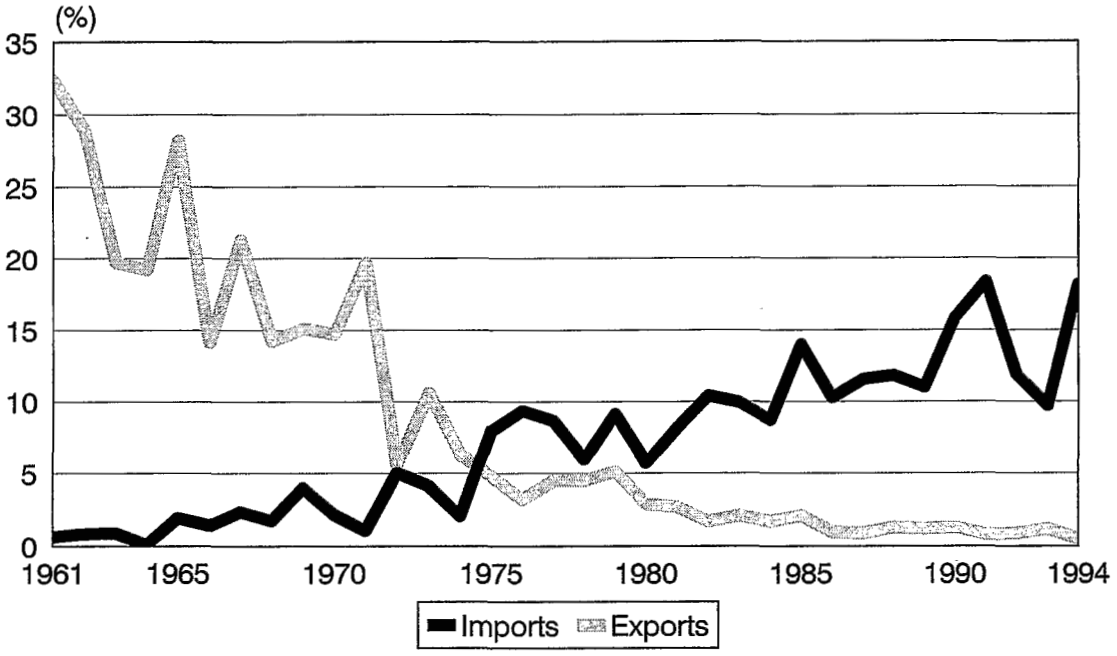

Fig. 12. Italy. In-shell walnuts. Imports and exports in volume: World market shares (%) (1961-1995) (Source: FAO).

As regards Italian imports of shelled walnuts by their country of origin the concentration is much smaller than for in-shell walnuts. In 1995 the first five suppliers were India (which supplied 28.7% of Italian imports), the United States (28%), Chile (10.8%), Rumania (8.3%) and France (6.2%).

As with the production of hazelnuts and almonds, the difficulties the production of walnuts in Italy has to face are linked to the unsatisfactory quality of much of the production and to the fact that

production costs are too high. Once more these problems are a consequence of structural inadequacies at the farm level, problems for which there are no easy solutions.

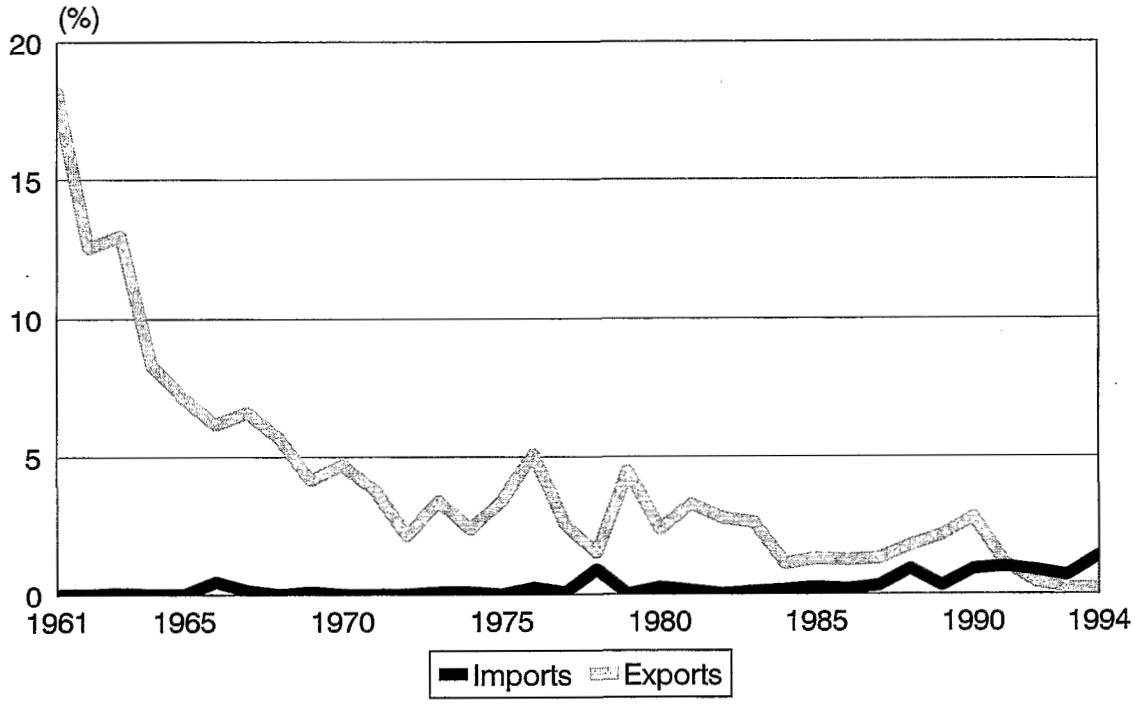

Fig. 13. Italy. Walnuts shelled. Imports and exports in volume: World market share (%) (1961-1995) (Source: FAO).

Conclusions

The recent history of the edible nuts sector in Italy has not been a successful one.

The common factor among all three edible nuts - hazelnut, and especially almond and walnut- is the structural weakness of the vast majority of farms producing them. The reduced size of the farms and the even more reduced scale at which nut production takes place, has caused and still causes many of the problems faced by the producers of edible nuts in Italy: the lack of introduction of the new production and harvesting technologies which have become available in recent years; the reluctance to replace trees which have been cut down with new ones; the lack of homogeneity as regards products; and the inadequate quality of a large share of production in the face of increasingly sophisticated market demands.

The atomisation of supply, as is always the case, has determined in the past, and continues to determine both a greater need for the farmers to act jointly, and more difficult problems to overcome as regards diffusion of co-operatives and producer associations, as well as the latter being able to operate effectively. Along the chain from production to sale to the final consumers in Italy we can still see the presence of commercial operators who act between the producers and the wholesalers, thus adding an extra step in the chain compared with what happens in other competing countries with a level of development similar to Italy's. This extra step only further reduces the already low profit margins of growers.

The slow inexorable decline of the edible nut sector in Italy stems from the incapacity of most farms to provide answers, even partial, to the challenges which have arisen as a result of the profound changes occurring elsewhere in the nut industry, and over the years this has eroded the already small competitive margins of most of the Italian nut growers.

What has happened can be seen as a debacle in a sector which not many years ago had Italy as the world leader.

Nor it is possible to find signs which might inspire a little optimism for the years ahead.

As regards the prospects for a large share of edible nut production in Italy (that realised by small-scale operators in marginal areas) it is hard to imagine any intervention which would restore its profitability. On the other hand, this specific nut production activity often plays an irreplaceable role in maintaining the environment; a role which EU agricultural and rural development policies appear to be ready to recognise as that of providing a service which should be paid for from public funds. The process of rapid contraction of the areas given over to edible nut cultivation by smaller growers in marginal areas could (and should), therefore, be slowed down in the near future through specific subsidies aimed at keeping them in business in order to maintain the environment and preserve the rural scene, even when this can not be justified in purely economical terms.

However, what has happened in recent years, especially as regards the production of hazelnuts, shows that there is still room for the consolidation and growth of a modern edible nut industry in Italy, albeit on an overall smaller scale than in the past, one capable of holding its own against the competition from other countries.

If considerable efforts are needed to reduce production costs as far as possible, this, for various reasons, is by no means the specific terrain on which Italy can beat its American or Turkish competitors. The battle to increase the competitiveness of the Italian edible nut sector is also a battle to increase its price competitiveness, but, more importantly, it is a battle which must be fought on the quality terrain, both of the product itself and of the associated services sold with it.

To sum up, therefore, one must aim for a much greater number of specialised farms, sufficiently large to allow for the use of modern efficient production and harvesting technologies, but also, and above all, for an expansion of an edible nut production sector in Italy characterised by a the high quality of its product. This can be achieved by reducing the number of varieties cultivated to a limited number of selected varieties, by radically reorganising the conditioning and marketing activities by reducing the number of actors and achieving a much larger product concentration, and by taking adequate steps to promote commercially a product (and the range of services which can be sold with it) which must be seen as "different" (and better) by the industry and by the consumers of nut based final products.

References

Angeli, L. and Senni, S. (1995). *Aspetti strutturali del tessuto produttivo corilicolo nella provincia di Viterbo.* Centro studi sull'Economia del Nocciolo, Quaderno No. 2, Viterbo.

Antinelli, A. and Scarpa, R. (1992). La struttura dei costi di produzione della nocciola "Tonda Gentile Romana" dei Monti Cimini. *L'informatore agrario*, 3: 72-76.

Bassi, R. and Pellegrino, S. (1993). Il successo commerciale della nocciola piemontese. *Rivista di frutticoltura*, 12: 31-37.

Bellia, F. (1972). Aspetti economici della mandorlicoltura. *Rivista di frutticoltura,* 12: 9-32.

Botta, R., Spanna, F. and Me, G. (1993). Nuovi orientamenti nella coltura del nocciolo. *L'Informatore agrario,* 42: 53-64.

California Almonds (1994). *Statistical Tables.* September.

Di Stefano, G. (1990). Luci e ombre della nocciolicoltura italiana. *L'informatore agrario*, 40: 49-52.

De Rosa, M., Malanga, R., Perri, A. and Picariello, C. (1990). *Produzione e commercializzazione della frutta secca in Irpinia,* Camera di Commercio I. A. e A. di Avellino, Atripalda (Av).

Dono, G. (1995). *Aspetti del mercato nel settore corilicolo.* Centro studi sull'Economia del Nocciolo, Quaderno No. 1, Viterbo.

FAO (Food and Agriculture Organization of the United Nations) (1990). *Market prospects for Edible Nuts,* ESC/M/90/2, Rome.

Gelone, R. (1997). Il noce, una coltura in crisi. *L'Informatore agrario,* 10: 37-40.

Monastra, F., Tamponi, G. and Avanzato, D. (1990). Nut Industry in Italy. In *Nut Production and Industry in Europe, Near East and North Africa.* Proceedings of the "Expert Consultation on the Promotion of Nut Production in Europe and Near East Regions" [Yalova (Istanbul), Turkey, 19-22 June), FAO.

Rivella, F. (1984). Qualità delle nocciole per l'utilizzazione industriale. *Rivista di frutticoltura*, 11: 26-31.

Schifani, G. (1994). La nocciolicoltura nel comune di Polizzi Generosa. In *Il nocciolo in Sicilia. Problemi e prospettive della corilicoltura madonita*. Tudisca, S. (ed.). Università degli studi di Palermo, Dipartimento di Economia, Ingegneria e Tecnologie Agrarie, Palermo.

Schimmenti, E. (1994). Caratteri dell'impresa nocciolicola nel comune di Polizzi Generosa. In *Il nocciolo in Sicilia. Problemi e prospettive della corilicoltura madonita.* Tudisca, S. (ed.). Università degli studi di Palermo, Dipartimento di Economia, Ingegneria e Tecnologie Agrarie, Palermo.

Tudisca, S. (1994). Aspetti della produzione e della esportazione delle nocciole. In *Il nocciolo in Sicilia. Problemi e prospettive della corilicoltura madonita*. Tudisca, S. (ed.). Università degli studi di Palermo, Dipartimento di Economia, Ingegneria e Tecnologie Agrarie, Palermo.