IENICA

Interactive European Network for Industrial Crops and their Applications

REPORT FROM THE STATE OF

ITALY

FORMING PART OF THE IENICA PROJECT

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PREFACE

The knowledge of the state of the art and of the perspectives on non food industrial crops in the EU member states is a main factor in order to reach IENICA's goals.

This knowledge is necessary for the scientific and technological aspects either to be or already applied in the agricultural and industrial segments of the chain. At the same time it is needed information on the market situations.

This paper on the state of the art and the perspectives of these crops in Italy will be part of IENICA's general report, and therefore it contributes in the realization of the prefixed goals.

First of all, the paper gives a general picture of the Italian agriculture enhancing those factors that may affect the introduction and the spread of non food crops now or in the future. It also deals with those subjective factors capable of an influence on the trends analysed.

Those general aspects either about agriculture, industry, economics, of non food crops without a strict connection to the Italian situation are not taken into consideration. They will be broadly analyzed in IENICA's general report.

Crops are divided into four big chains: industrial oils; fibres; carbohydrates; different and niche uses.

This paper considers from different points of view both those crops already used in Italy with a primary or secondary destination to non food industrial uses, and the ones only experimented in projects of research.

For all crops it is taken into consideration:

a) the state of the art with notes on the agricultural production, the industrial aspects, the market, and the impact on the environment.
b) barriers to the progress in the agricultural phase of the production concerning science, technology, environment, laws, economics.
c) comparative and perspective evaluations.

At the end, there are enclosed both tables with statistic data on the progress in time of the agricultural production, and a list of addresses of research Institutes, Institutions, Corporations and people already active or interested in the different sectors.

METHODOLOGY

This report is based primarily upon reviews of the literature and papers presented at recent events; discussions with experts and interviews with industrial and agricultural groups, research centres, and universities involved in this sector in Italy.
A great part of scientific informations derive from results of PRisCA (Italian Research Project on Alternative Crops funded by MiPA, Ministry for the Agricultural Politics).
The report is strictly limited to non food crops in Italy, especially to primary production.
In writing this paper official data, unofficial sources and evaluations have been used.

Special thanks to all those contributing in different ways and times to the realization of this paper.

GENERAL

Non food crops in the Italian agriculture

Non food crops in Italy

These crops received a different degree of attention respectively from the agricultural, industrial, and research sectors.

The agricultural world marked in new crops or in new uses of traditional crops important alternatives to be introduced in the farming systems of the different regions.

There were both economic and technical reasons because if compared to traditional crops prospects were higher not only as for gains, but also for the opening of new markets, and the sharing of risks. The opportunity to introduce new crops by widening rotations was pointed out as the possible solution to many problems arising from monosuccession or narrow rotations.

The agricultural world proved to be very willing to test and to introduce new crops in farms. Initiatives in this respect were manifold in many regions, but often disappointing.

Basically, the selling prices of new crops were little profitable. Sometimes, lacking a contract before sowing time, the product was not withdrawn by industries, or more often the qualitative characteristics determined rejections together with delays and cuts in payments.

Notwithstanding the strong interest industry has in new materials and in new uses of agricultural raw material, it has not been able to establish conditions proving profitable for the farmer and therefore enabling a continuity of the chain. Besides, industries are not really interested in a local production, as they can get supply from the world market.

The difficult relationship between agriculture and processing industry has given way to the alternation of surfaces assigned to alternative crops. A clear example is to be found in the most developed sector, the oil crops.

The research coped enthusiastically with the problems arising from alternative crops during the agricultural phase, especially thanks to the MiPA (Ministry for the Agricultural Politics)'s initiatives and to the commitment of both public and private groups. As for the processing phase, there were mainly private initiatives only in specific sectors. However, wide was the Italian participation to EU projects involving both the agricultural and the processing phases (Eurobiodiesel, Euroflax, Eurokenaf, etc.).

As for the agronomic research, connected somehow to the processing phase, in Italy PRisCA (Research Project on Alternative Crops) has been most active working with the

commitment of 26 Institutions since 1993. The results of great interest are shown in the following tables. PRisCA has sometimes applied its investigation activity onto practice, hence placing its knowledge at disposal and collaborating actively to realize the chain.

Italian agriculture and non food perspectives

The development of a non food agriculture depends directly on the politics specifically determined for this producing sector. Indirectly, the role it might play is connected both to the structural elements typical of the agricultural sector, and to the kind of integration and developing conditions of each chain (tab. 0).

Table 0. Italian agriculture picture (sources: ISTAT-Istituto Nazionale di Statistica, INEA-Istituto Nazionale di Economia Agraria, ISMEA-Istituto per studi, ricerche e informazioni sul mercato agricolo).

Gross Added Value (1997)	ECU	~ 30,883,614
from agriculture	ECU	1,173,577
	%	3.8
Employees (1997)	no.	22,200,000
in agriculture	no.	1,731,000
	%	7.8
agricultural job on total population	%	3.0
Selling gross production (1996)	ECU	35,694,000
in comparison with EU	%	16.2
Farms (1995)	no.	2,482,095
total surface	ha	20,500,000
SAU	ha	14,685,448
average SAU per farm	ha	5.92
arable land of the SAU	%	40

- The physic environment. In short, the Italian territory is characterized by hilly and mountainous grounds. On a territorial surface of about 30 million ha, only 23% of it is represented by level grounds, which come down to 18% and 9%, respectively in the South and in the Centre of the country.

  Besides, the agricultural surface undergoes a progressive erosion because of the urbanization. The unproductive surface covered by the road network, settlements and infrastructures occupies almost 10% of the territory. According to other sources, between

1960 and 1990, the unproductive surface increased from 9.6% to 19.3%. Therefore, the Italian agricultural surface has been diminishing constantly as in all EU countries, however being the decrease rate relatively more marked. For example, between 1990 and the average of the three year period 1994/96, the average fall off per year of SAU (Useful Agricultural Surface) was by 1% as opposed to the 0.1% average in the other 15 EU countries.

- The Gross Added Value. In 1997, the Gross Added Value to the cost of the factors in the primary sector (returns for the farmers) - i.e. 30,883,614 ECU (ECU = 1,959 lire) - diminished by 1.6% compared to the previous year in current terms, but remained constant in real terms.

  The contribution of agriculture to the growth of added value in the economy of the country was by 3.3%. With constant prices, the influence on the national total amount of the agricultural added value to the cost of the factors passed from 8.1% in 1970 to 6.2% in 1980, and to 3.8% in 1997.

- Employees. The effect of the agricultural sector on the Italian economy results higher than that of other industrialized countries, especially in terms of employment. This aspect is enhanced by strong regional differences. In the North, agriculture counts for 2.6% on added value and for 5.7% on employees, whereas such values soar respectively to 5.4% and 13% in the South.

  In 1997, on a totality of 22,203,000 employees, 1,731,000 were in the agricultural sector, with a decrease by 1.4% compared to the previous year. This phenomenon characterizes both dependent (-1.9%) and independent (-1.1%) employees. In absolute terms, the former lowered of 11,000 unities, the latter of 12,500 unities.

  In the same year, the role of the agricultural job on the total population was limited to 3% compared to a percentage of 7% in 1970.

  As for the volume of agricultural employment, in Italy there are 9.1 employee for 100 ha of SAU, a value inferior only to Greece, Portugal and Holland. This value shows on the one hand a lower technological development in comparison with the agriculture of other countries; on the other it marks a higher farming intensity.

  With constant 1990 prices, the Added Value for job unity was little less than 15,315 ECU, resulting by 44.4% in the industry and by 41.9% in the selling services. It has therefore become wider the gap of the preceding decade, when such values were respectively by 38% and 33%.

- The selling gross production. In 1996, on the total value of the agricultural selling gross production (35,694,000 ECU, i.e. 16.1% of the EU agricultural production), vegetables counted for 16.1%, nursery gardening for 7%, grapevine for 10.1%, fruit and citrus for 9.2%, whereas cereals, fodder plants, and fresh legumes counted only for 8.8% and industrial crops (sugarbeet, tobacco, oil seeds, textile fibres) for 4.1%.

- Overall picture. The coming out picture is that of an agriculture strongly differentiated because of producing conditions, surface extension, development conditions, intensity of farming, and added value for job unity. Such conditions imply the possible development of productions assigned to a non food use in those areas offering the best conditions to practice an agriculture with a low use of productive inputs, or where these new crops do not compete with highly remunerative and specialized crops.

- Farms. Moreover, non food perspectives depend on the features of the agricultural structures.

  Up to 1995, Italian farms were 2,482,095, covering a total surface of 20.5 million ha and a SAU of 14,685,448 ha. More than 78% of the farms belonged to the class SAU inferior to 5 ha, and only 0.5% to classes superior to 100 ha. The average SAU per farm was of 5.92 ha. More than 54% of the Italian farms were distributed in the southern regions, and 42% of them in only 4 regions: Campania (9.4%), Apulia (12.2%), Calabria (6.9%), Sicily (13.4%).

  Due to this distribution, the SAU concentration was only by 47% in the southern regions. As a consequence, the average SAU per farm resulted higher in the northern regions (with a maximum of 7.9 ha in the North-West) and in the Centre, whereas it was remarkably lower in the South (4.4 ha).

- Arable lands. Arable lands cover over 40% of the SAU in almost all the areas of the country with the exception of the islands, where they decrease to about 34%. The spread of agricultural wood crops (grapevine, olive, fruit-bearing trees) appears on the contrary very diversified. It shifts from 5.1% in the North-West to 22.5% in the southern areas, excluding the islands where these crops cover only 15%.

  It results that the most favourable conditions to the diffusion of non food crops are to be found in the north-western Italian plains and in the mild hills of the Centre of the country, that is in those areas with the highest concentration of zootechnical activity (62.9 % of the universe of zootechnical farms).

- Employees'age. Similar considerations seem possible as for the age of the manager-producer, considering the younger generations as those more sensitive to the introduction of innovations. If this is the case, aging in the management, i.e. the impact of entrepreneurs over 65, is a matter especially for the southern farms, involved in this phenomenon for the 38.4% against a percentage of 37.1% in the central regions, and of 34% in the northern farms, where there is the highest percentage of entrepreneurs under 45.

- Specialization. The specialized Italian farms represent about 83% on the totality and yield about 83% of the Gross Standard Income. It is important to stress on the one hand how the arable lands realize only 25.1% of the GSI, even if they involve 27% of the farms and 32.8% of the SAU; on the other hand horticulture and flower growing as much as permanent crops are practiced respectively in 1.8% and 41.5% of the farms covering 0.6 and 19.3% of the SAU and take part in the GSI for the 10.8% and 30.7%. Specialization concerns foremost Italian insular (84.1%) and northern (83.7%) farms, whereas it is inferior in the South (81.7%) and in the Centre (75.8%).

- Economic dimension. As for the economic dimension, 51.1% of the farms realize less than 2 EDU (Economic Dimension Unit, that is 4.3 millions lire). These farms cover 18.7% of the SAU, contributing for 11.8% to the GSI. On the contrary, about 65% of the GSI is own to 9.6% of those farms that, cultivating 52.7% of the SAU, employ 34.5% of the total job. The farms with GSI inferior to 6 are concentrated for the 56% in the South, whereas those having economic dimension higher than 100 EDU are for the 30.7% in the North-West.

  It is therefore confirmed the idea of an Italian agriculture characterized by a strong economic and territorial differentiation in the enterprises. This feature seems to affect the spread of non food crops within the limits of geographical areas favoured by farm size, availability of resources (both hydric supply and availability of youth labour), and economic dimension.

- The effect on Agenda 2000. This briefly sketched picture cannot be deeply modified by the realization of the interventions planned by AGENDA 2000, unless a specific non food crops politics is defined.

  In fact, the reform started in 1992 hasn't produced remarkable changes as to the agricultural structural evolution typical of dynamic societies.

- Other factors. The Italian agriculture has been definitely more affected by the devaluation of the lira occurred in the same year and by the extremely favourable conditions of prices and of EU compensations. Due to this, since 1993 there has been a sharp trend inversion in the machine and building investments, both with constant 1990 prices and current ones, thus co-operating to the good renewal of the farm instrumental equipment.

  However, it is reckoned that in the near future the main impacts on the evolution of agriculture, of its structures, and on the possibility of the development of non food crops, might derive from the serious emergence of aging with its repercussions on the improvement of the agricultural structures and farming trends.

  With regard to this, it is important to remember the influence of the distribution system's most recent evolution, characterized on the one hand by the growth of large scale retail trade, on the other by a global decrease in small retail trade and employment.

  Up to 1 January 1997, there were surveyed 5,207 supermarkets, with a numeric growth by 8.8% if compared to the previous year. In this way, the global selling surface has reached 4.5 millions square meters with 95,950 employees.

  On the same date, hypermarkets were 230 units with a selling surface of almost 1.2 millions square meters and 33,000 employees. The cash and carry system was in a slightly opposing trend with 288 units and a surface of about 728,000 square meters.

  All this confirms the deep and fast change taking place in the Italian distributing system. In the last years it has represented - and it still might in the nearest future - one of the major impact factors on the evolution of the agricultural farming system. This is due to the effects on the development of trends in farming and production techniques. It is within such developments that the growth of the non food agriculture can be joined as one of the few productive alternatives feasible for farmers.

  Under this point of view, it is necessary to underline the lack of either specific process innovations for non food crops and of "chain" projects. The only exception is the biodiesel experience supported by the Eridania Beghin Say Group through the checking of Novaol, which has realized at Livorno the biggest plant for the esterification of vegetal oils in all Europe.

  This reality does not prevent the world of the industrial enterprises to be interested and available. The most interested have been those producing lubricating oils and additives, those producing pannels based on fibre-cellulose materials, and paper mills.

  In the field of the technical oils, for example, some experiences in the development of products obtained from set-aside grown species, were done by the Houghton Italiana.

The Italian pannel industry has resulted particularly interested in the product innovation and in the research of fibre-cellulose alternative materials in order to keep the first rate role it plays in Europe.

In the sector of cellulose paste production, the scanty national production has not prevented the two major firms operating in this sector - Istituto Poligrafico e Zecca di Stato and Sicem-Saga - to show interest in new sources of raw material.

In all these cases, however, the lack of a non food politics has limited the shift from a phase of study to a pre-industrial one.

Subjective and unquantifiable factors

Opportunities in the spread of non food crops in Italy depend also on unquantifiable different situations. It is necessary a distinction between agriculture and industry.

The agricultural world witnesses the erosion of its own income and fears the near future because of the increase of costs and of the ongoing lowering of prices. It is therefore psychologically ready to face new crops and/or innovative production methodologies needed for new destinations of the product.

Industries potentially interested in non food crops claim their availability, however without taking practical initiatives. Indeed, on the one hand they can be supplied with raw material at a lower price by the world market; on the other, they don't want to run the risks implied in investments for innovations. They fear the difficult relationship with agriculture, the latter being considered unable to ensure qualitative and quantitative constancy in the different production years.

Not only does a real point of contact lack among the parts, now limited to certain sectors, but in general there is not a set of rules defining the agreements among them.

However, an ecological awareness has been developing lately in our country. As a result, the consumer requires those products considered environmentally friendly because of their features or of their processing methods.

The research has placed at disposal much information about the agricultural ring of the chain, while the knowledge about the industrial aspects is vague as the results are often patented.

At present, almost all the non food crops result economically unfit.

It would be necessary to consider in the budget both the direct environmental costs and the differences deriving from the replacement of crops with higher inputs.

There would be a need for fiscal measures considering the environmental aspect and supporting the start of non food chains.

Unfortunately, such a politics does not pay at once, but only in the long run, and the present economic situation of the Country does not foster investments without a prompt feed back.

Examining both the general situation of the Italian agriculture, above described, and the non objective limits above summarized, the opinion is that a strong spur is fundamental for a meaningful development of non food industrial crops. With regards to this, a working hypothesis could be either that of international commitments aimed at the environmental safeguard or new industrial patents rendering particularly convenient agricultural raw material.
It is more difficult to suppose driving effects deriving from peculiar market situations.

Opportunities for non food industrial crops and their products

At present, non food industrial crops farmed in Italy on a commercial basis regard only a limited number of species, and for almost all of them very narrow surfaces.
Many traditional food crops assign part of the yield to uses in the non food sector. Many new species have been or are still under experimentation.
Among exclusively non food crops, a definitely wider surface is assigned to sunflower, followed at a far distance by colza, flax, crambe.
Among fibre crops, cotton, flax, kenaf and hemp cover surfaces shifting globally between some ten to some hundred ha according to the years.
Also niche crops do not globally exceed some ten ha (dyes, biocide, aromatic and medicinal plants).
To the non food sector is addressed part of the production of sugarbeet, potato and cereals farmed prevailingly for human and animal food.
Many have been the species tested in research programs within a community, national or regional range or even carried out by single Universities, private or public groups of research.
Among the national Projects of Research it is to be mentioned in particular the PRisCA (Project of Research on Alternative Crops), supported and financed by the Ministry for the Agricultural Politics (MiPA). It carried out researches from 1992 to 1997 committing 26 Operative Units, foremost University Institutes, distributed al l over the Italian territory.
The activity of PRisCA was articulated into 5 chains: 1) Technical oils 2) Energy 3) Fibre and Cellulose 4) Starch 5) Special Uses.

The researches dealt foremost with the agronomic aspects connected to the primary production and to the environmental impact, whereas much smaller was the stress on the primary industrial process.
It was evaluated the flexibility of many genotypes with different origin and provenience. According to different grades of close examination, the setting up of new farming techniques was started for the most promising species in the different chains.
The efforts were directed onto the productive level as much as on the evaluation of the environmental impact and on how the crop techniques affect the qualitative and technological characteristics.
Other national projects have been promoted and financed by the CNR (National Council for Scientific Research): CITECA (Textile and Paper Industrial Crops 1990-1995) and ABSOV (Biological Activity Substances of Vegetable Origin 1996-1997). Besides, numerous Italian Institutes have taken parts in EU Projects: Euroflax; Eurocastor; white Lupin; Cynara; Miscanto; Hemp; fibre and sugar Sorghum.
The sum of these Projects has supplied a discrete amount of knowledge on the primary production of different species. Such a knowledge is capable of being transferred and applied wherever there are the conditions for an applicative development.

The following chapters will be about four chains: oil crops; fibre crops; carbohydrate crops and crops with specialist uses.

Part I OIL CROPS

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1. Opportunities

Annual oil crops started to have a certain importance for Italian agriculture only in the nineteen seventies but it was only in the eighties that oil crops reached a large success both under the agronomic and the economic points of view.

During the nineties, the limitations fixed by international agreements determined a contraction of oil crops (tab. 1).

Soybean (*Glycine max*) and secondarily sunflower (*Helianthus annuus*) might be considered the best oil crops for Italian agriculture.

Starting from the nineteen seventies sunflower was introduced in Italian crop rotations owing to its good tolerance to dry environments. In 1981 this crop was cultivated on 43.000 ha. Thereafter an increasing interest brought sunflower to its maximum cultivation in 1997 (over 290.000 ha).

Even more extraordinary was the performance of soybean cultivation, which was introduced for the first time in 1981 on 317 ha and, in 1991, after 10 years of lasting increase, it was cultivated on 520.000 ha with an average production of 1.901.000 tonnes.

Another interesting crop, which was never cultivated on large surfaces, is rape (*Brassica napus* L. var. *oleifera* Metzg). Its maximum production, which didn't coincide with its largest cultivation, was reached in 1997 with 91.000 tonnes obtained on 85.000 ha.

The previous data are referred both to the food and non food production.

In 1994-95 and 1995-96, non food oil crops were cultivated on about 60.000 ha; after this peak non food oil crops acreage has declined progressively, due to the low profit even compared with full set-aside (tab. 2 a-b).

In 1995, the overall production of oils and fats exceeded 86 million tonnes, of which 75% were vegetable and 86% were assigned to food use. 4,8 million tonnes of chemicals destined for non food use were also produced from oils and fats. Vegetable oils were the main source (80%) of this last destination (Vannini and Venturi, 1998).

Table 1. Italian surfaces, productions and yields of rape, sunflower and soybean for food uses (source AISO).

Years	Oil seeds			Rape			Sunflower		
	surface (ha x 10^3)	production (t x 10^3)	yield (t ha^{-1})	surface (ha x 10^3)	production (t x 10^3)	yield (t ha^{-1})	surface (ha x 10^3)	production (t x 10^3)	(
1986/87	359.4	1,143	3.2	23.0	46	2.0	104.0	261	
1987/88	639.6	2,090	3.3	19.0	41	2.1	140.0	390	
1988/89	620.0	1,891	3.1	23.0	51	2.2	165.0	365	
1989/90	630.1	2,081	3.3	16.0	40	2.5	136.0	340	
1990/91	711.2	2,348	3.3	17.0	44	2.6	173.0	403	
1991/92	587.0	1,833	3.1	14.0	35	2.5	163.0	397	
1992/93	483.5	1,331	2.8	8.6	15	1.7	119.9	259	
1993/94	262.9	743	2.8	4.0	6	1.5	89.1	196	
1994/95	365.0	1,041	2.9	12.3	26	2.1	154.8	363	
1995/96	408.5	1,104	2.7	43.6	76	1.8	193.0	390	
1996/97	547.8	1,415	2.6	85.3	91	1.1	231.1	453	
1997/98	734.0	1,822	2.5	101.3	88	1.0	294.7	491	

Source: AISO.

Table 2a. Italian surfaces, productions and yields of rape, sunflower for no food uses (source AISO).

	Oil seeds			Rape			Sunflower	
Years	surface (ha x 10^3)	production (t x 10^3)	yield (t ha^{-1})	surface (ha x 10^3)	production (t x 10^3)	yield (t ha^{-1})	surface (ha x 10^3)	production (t x 10^3)
1993/94	27.0	60	2.2	0.2	0.3	1.6	26.8	60
1994/95	61.7	134	2.2	1.6	2	1.3	60.1	132
1995/96	59.7	114	1.9	4.7	7	1.6	55.0	107
1996/97	36.5	77	2.1	4.2	7	1.7	32.3	70
1997/98	9.8	19	2.0	0.9	2	1.8	8.9	18
1998/99*	9.4	19	1.9	0.4	0.7	1.8	9.0	18

* estimated.

Table 2b. Italian regional surfaces, productions and yields of rape for non food uses (source AISO).

Regions	1995-1996			1996-1997			1997-1998			1998-	
	surface (ha)	production (t)	yield (t ha^{-1})	surface (ha)	production (t)	yield (t ha^{-1})	surface (ha)	production (t)	yield (t ha^{-1})	surface (ha)	prod o (
Piemonte	325	455	1.40	256	414	1.62	60	90	1.50	27	5
Lombardia	1,487	2,829	1.90	1,539	2,985	1.94	512	962	1.88	310	59
Veneto	427	814	1.91	318	671	2.11	86	194	2.26	54	12
Friuli	336	634	1.88	298	497	1.67	56	84	1.50	14	1
Emilia Romagna	553	1,071	1.94	662	1,131	1.71	45	83	1.84	22	4
Toscana	179	196	1.10	152	180	1.18	36	42	1.17	26	3
Umbria	136	126	0.93	73	79	1.08	10	10	1.00	16	1
Marche	47	52	1.11	18	21	1.17	13	11	0.85	9	1
Lazio	845	924	1.09	717	785	1.09	46	57	1.24	57	6
Abruzzo	100	102	1.02	5	6	1.20	-	-	-	-	
Molise	30	40	1.33	27	38	1.41	8	11	1.38	5	
Puglia	191	171	0.90	73	66	0.90	6	9	1.50	6	
Basilicata	47	38	0.81	18	20	1.11	-	-	-	-	
Calabria	10	4	0.40	-	-	-	-	-	-	-	
Sardegna	3	3	1.00	-	-	-	-	-	-	-	
Total	4,716	7,459	1.58	4,156	6,893	1.66	878	1,553	1.77	546	97

1.1. Science and technology

Scientific and technical knowledge, regarding both the agricultural and the industrial phases, is particularly advanced for soybean (crop which is not treated in this report) sunflower, rape and flax. Less information is available for Safflower, Crambe, Ethiopian mustard, Marigold e Coriander. Only superficial knowledge is available for other minor crops.

Rape (Brassica napus L.)

In Italy rape cultivation is concentrated mainly in the central and southern regions. It is grown both as a winter crop and as a spring crop. 2 t ha^{-1} is the average production which is largely variable in relation to cropping condition and mainly to water availability**.** In the best conditions of the northern plan a maximum yield of 4.0 t ha^{-1} can be reached.

In the early nineteen seventies, rape cultivation disappeared because of the presumed toxicity of its oil. Thereafter cultivars without erucic acid and/or glucosinolates were bred and recently rape cultivation regained significant surfaces (in Centre-South Italy), of which more than 5.000 were non food. Cultivars with high erucic acid content (High Erucic Acid Rapeseed) were bred to meet the need of non food industry.

Rape seed is considered a good alternative to the frequent mono-cultivation of durum wheat in the South. In October 1998, a project to promote the cultivation of 20.000 ha of rape in the regions of Apulia and Basilicata was started. Contracts regarding the purchase of rape seed at a minimum price (194 ECU/t) were prepared.

The new genotypes, especially hybrids recently appeared on the market, seem very promising.

Sunflower (Helianthus annuus L.)

In Italy sunflower is a traditional crop. The diffusion of this crop started in the North, but due to its good tolerance to high temperature and drought conditions it is grown mainly in the central regions and in the South.

In the last years the extension of sunflower cultivation has been variable according to the changes in agricultural policy. In 1997, sunflower was grown on 292.000 ha mainly in the Centre and South with an average increase by 21.5% compared with the average acreage cultivated in the previous decade. In the same period, in the North it was recorded a sharp decrease of sunflower cultivation in favour of soybean, which usually guarantees higher profits to farmers.

Another example of the effect of the agricultural policy on sunflower cultivation is brought by the strong reduction of non food sunflower cultivation (32.930 ha in 1996, 9.070 in 1997) following the decrease of set-aside in 1997 and especially due to the lower price offered to the farmer.

In almost 20 years of research, sunflower agro-technique has been remarkably improved, even though the limit of 2 t ha^{-1} of yield has not been steadily exceeded. However, inputs and production costs have been largely reduced.

In the last years, HOSO varieties have been substituting gradually the normal varieties, furthermore the new HOSO genotypes have a production potential (3.5 t ha^{-1} with 45-50% oil on dry matter) not lower than the traditional ones.

Despite of the difficulties in adapting to the changing agricultural policy, non food sunflower seems a very promising crop for Italy, in driest regions of North and especially for the central and southern regions. In particular the environmental conditions of these regions favour a high yield of oleic acid. Many field experiments have been carried out to set up the best agro-technique for "high oleic" sunflower. High temperature and isolation from "normal" sunflower's fields seem the most important factors to be controlled in order to achieve good yields from "high oleic" hybrids.

Flax (Linum usitatissimum L.)

In the past, flax cultivation was quite extensive in the regions Lombardia and Marche. However, flax was grown over 1,000 ha and only in the nineteen seventies this surface increased to reach its peak in 1977 when almost 10,000 ha of flax were grown. It progressively decreased and limited surfaces of linseed were kept in the South (Sicily and Apulia). In the last years, the renewed interest for oil flax brought about by the EU, the setting-up of the agro-technique and the availability of new cultivar produced a significant increase in flax cultivation and 3000 ha were grown in 1995. The lack of technical assistance to farmers was one of the main causes for flax crop to fail in 1995 and in the subsequent years the cultivation was reduced again.

Due to the environmental characteristics of Italy, oil flax crop is more adaptable to fibre one. High temperatures and intense radiation in fact favour seed production and oil accumulation. Moreover, at high temperatures the oil is richer in saturated glycerides while at low temperatures and less intense radiation the plants tend to remain in the vegetative phase yielding more fibre of better quality. The average crop yields about 1 t ha^{-1}, but experimental trials in the Po valley proved that the best varieties can produce up to 3 t ha^{-1} of seed with 40% of oil content and 20% of proteins.

Castor (Ricinus communis L.)

Castor behaves as a poliannual crop where temperature doesn't fall below -2°C; in Italy, thereafter, it could be grown as a poliannual crop in the South of Italy and as a annual crop in the rest of the peninsula. Due to the deep rooting system and good drought tolerance it is an interesting alternative for non food agriculture in the southern regions, where it can be sown also during the winter season. Nowadays, the mechanisation of each phase of crop growth causes this cultivation to be annual also in the southern regions.

In the past, it was cultivated on 5,000 ha with an average production slightly over 1 t ha^{-1}; few hectares of castor are cultivated in Sardinia with an average production of 0.6-1.0 t ha^{-1}. Experiments carried out in Sicily proved that winter sown castor can produce over 5 t ha^{-1} (Patanè *et al*., 1995).

A wide choice of varieties is available on the market, important parameters are cycle length and plant height. New dwarf varieties have been bred to improve harvesting. Normal varieties in good conditions can reach up to two meters in height while dwarf ones never exceed 1.5 meter but are usually less than 1 meter. Both hybrids, with short and normal internodes, yield more than 2 t ha^{-1}. Harvest is carried out with a reaping-machine (modified by Cemagref and CLAAS) a prototype of which is owned by ESS (Ente Sviluppo Sardo).

Castor cultivation is known in its general aspects, but it needs to be set up.

Safflower (Carthamus tinctorius L.)

Safflower can be cultivated as a winter crop in the South while as a spring crop in the North (but experiments are carried out to study the suitability of winter sowing also in the North).

Thanks to the deep roots, safflower has a good tolerance to drought conditions and it has low requirements for fertilisers and irrigation. Recent field experiments proved that safflower could be grown with a low input agro-technique and using machinery normally available on the farm.

The quality of oil depends mainly on the genotype. Oleic and linoleic acids together represent almost 90% of all the fatty acids and different varieties can be either high in oleic acid (up to 80%) or in linoleic acid (up to 75%). Safflower can be interesting both for food and for non food applications. Grain yields vary from 0.5 to 2.5 t ha^{-1} (with 33-38% oil content) in the North and in the South.

Crambe (Crambe abyssinica Hochst ex R.E. Fries)

In the last 8 years, crambe has been investigated in different Italian environments. In the North and central regions crambe produced interesting yields only in spring sowings due to its low resistance to cold temperatures. The mild climate of the southern regions would allow winter sowings of crambe. Furthermore in southern conditions spring crops provide low yields also with irrigation as a consequence of the high temperatures after flowering.

In the North, sowing date can vary from early March till April: early sowings produce higher yield but temperatures below 2°C might damage the crop. The growing season is usually quite short, flowering starts approximately 50-60 days after sowing and lasts 20 days, seeds maturity occurs in 25-35 days.

Crambe sowings can be carried out with a normal wheat seeding machine, the seeds shouldn't be placed below 3 cm of depth it is suggested, 30 cm between rows. A stand of 100 plants m^{-2} can be obtained with 10 kg of entire seeds per hectare; entire seeds are used because the fibrous capsule favour the germination at low humidity.

Crambe did show a good tolerance to the most common rape pathologies. It is affected by weeds mainly in the first growing phases.

In the experimental conditions of North and Central Italy, crambe yielded on average more than 3.0 t ha^{-1} of seeds with a good oil content (35% of the entire seed) whose percentage in erucic acid exceeds 55%.

In 1996 and 1997 almost 100 ha of crambe were sown in the North of Italy (Po Valley) on set-aside lands. Cultivation results were good (2.8 t ha^{-1}) and in line with the indications of field experiments. Oil produced in these two years was used by private industries of lubricants and lipochemistry with technical results which can be considered very satisfactory.

Ethiopian mustard (Brassica carinata A. Braun)

Experiments on Ethiopian mustard were carried out in many Italian regions. Grain yield in fall-sown crops reached 3.5 t ha^{-1} in the North, varied between 2.7 a 3.1 in the Centre and from 1.8 till 3 in the South. In every condition its grain production overcame the one of *Brassica napus*.

In the southern and central areas, winter sowing reduced yields by 25-30%. With spring sowing, in the North, grain yield varied from 2.5 to 3.0 t ha^{-1}.

In full field conditions yield varied from 1 to 2 t ha^{-1}.

Cameline or Gold of pleasure (Camelina sativa L. Cranz)

It was cultivated in the North on very small surfaces. In the frame of PRisCA Project, field trial have been recently carried out: grain yield exceeded consistently 1.5 t ha^{-1} and 35% of oil content. Fall and early spring sowings determine an increase in oil content and in saturated amino acids.

Coriander (Coriandrum sativum L.)

It was used in the past as medicinal plant due to the essences present in the fruit; recently it has been studied for the industrial use of its oil.

In the Mediterranean climate, coriander is a annual plant and it has a cropping cycle of about 180-200 days. Considering spring sowing, the cycle can be reduced to only 90 days due to the shortest interval between emergence and flowering (40 days in spring sowing, 120 in winter or fall sowings). In central and southern regions, the crop can yield up 3 t ha^{-1} in winter sowing, while only 1.5 t ha^{-1} in spring sowing.

Other minor oil crops

A dozen minor species were tested comparing for each one 2 to 16 accessions of different origin and provenience.

The genetic and environmental variability was evaluated in connection to the main production components. Among the problems there was the limited availability of genetic material, often with low germination on field. In synthesis:

- Loosestrifes (*Cuphea* P. Browne), interesting for the short-chain acidic composition. Content in oil ranges from 34-37% of the *C. laminuligera* to 15-25% of the *C. lutea*, respectively with 55-60% and 40% of lauric acid. Both present a percentage of 21-27% of capric acid. The very low germination allowed evaluation only at the level of single plants and not of crops. Yield, in the degree of 0.5-4.5 g for plant, presents a moderate variability among genotypes and a remarkable different feedback to the hydric availability.

  This species is to be considered in a domestication phase.

- Gopher plant or Caper spurge (*Euphorbia lathyris* L.). It was tested in the South with yields from 0,5 to 2 t ha^{-1}. Its oil content varying from 42 to 53%, it produced oil from 0.3 to 1.0 t ha^{-1}.

The average acidic composition was: 85% oleic acid+vernolic acid, 7.5% palmitic acid, 3.9% linoleic acid, 2.0 stearic acid.

The variability among genotypes was remarkable for seed production but limited for oil content.

Modest were the effects of sowing density but the answer to irrigation was excellent. (up to 300 m^3 ha^{-1}).

The problem of urticant substances during the harvest can be overcome with annual genotypes allowing the plant drying on the field.

Harvesting can be mechanised as the first fruits are about 40 cm high from the soil and the plant presents little dehiscence.

- Lesquerella (*Lesquerella fendleri*), the very low germination allowed only an evaluation for single plant (0.5-4 g with great variability among genotypes). The oil content varied between 14 and 26% with about 50% of lesquerolic acid. The species showed a reduced adaptability to Italian conditions.

- Meadowfoam (*Limnanthes alba* Hartw. ex Benth). According to the genotypes, it can yield 0.2 to 0.8 t ha^{-1} of seed with 18-20% of oil. The latter is characterized by 62-63% of gadoleic acid, 16-26% of erucic acid and 10-18% of docosadienoic acid (22:2) depending on the cultivar.

- Tarweed (*Madia sativa* Molina) produces from 1.0 to 2.0 t ha^{-1} and its oil content is of 34-40%, of which 58% is linoleic acid and 10% palmitic acid.

  The acidic composition is affected by climatic factors, foremost temperature. In autumn sowing, linoleic acid reaches 66% against 47% in spring sowing; drawing a parallel the oleic acid changes from 17% to 38%.

- Oenotera (*Oenothera biennis*). It is a biennial plant which needs vernalisation and therefore autumn sowing. The tested genotypes were not able to resist winter temperatures.

- Rocket or Hedge mustard (*Eruca sativa* Mill). In spring sowing it yields about 1.5 t ha^{-1} with a percentage of 30% in oil, whereas in autumn sowing it exceeds 2 t ha^{-1} with 27% of oil. The erucic acid, main component of the oil, is constantly about 45%, while in autumn sowing it rises the content in glucosinolate to 140 micromols which must be compared to the spring sowing results of 125.

- White mustard (*Sinapis alba* L). With 57-58% of erucic acid, it produces 1 t ha^{-1} in autumn sowing and 2 in spring, but higher it is the content of oil in autumn (26 against 24%).

- Lunaria (*Lunaria annua* L.). It was impossible to test the yield level. The seeds contain 25-30% of oil with 45-46% of erucic acid and about 25% of nervonic acid.

- Ironweed (*Vernonia galamensis* Less.). The best results were obtained with a spring-summer cycle characterised by 20-30% of oil content, of which 65-75% is vernolic acid. The panel contains about 40% of raw protein.

The above overview shows how most of the species, although of great interest for the acidic composition, have a very low yield level and therefore a low possibility to be introduced in farming systems in a short time.
In spite of this, the resistance to illness, dryness and high temperature must be considered as it foresees some advantages for tarweed and coriander in marginal soils, also owing to the low requirement of farming inputs. The particular short cycle of lepidium and cameline might permit these crops as second harvest. Eruca, mustard and gopher plant seem to be in a more advanced phase of domestication.
For almost all the minor species, the considerable genetic variability and the opportunity to set suitable farming techniques are the background for promising future perspectives.

Conclusions

In the frame of PRisCA Project, all the previous crops have been investigated in many Italian regions. The basic agrotechnique was set up for most of them. Some information on these crops is reported in tab. 3a-b.
Nowadays, the cultivation of oil crops for technical application represents one of the possible options to manage set-aside policy. In the long period, these crops might become an important chance to increase farmers' choices, to diversify traditional crop rotations and consequently to improve the use of farm resources (Vannini and Venturi, 1998).

1.2. Industry and market

The Italian global production of oils obtained from oleiferous seeds and fruits is 580,000 tonnes; little more than 50% derives from the national production, while the remaining part is imported (tab. 4).

Table 3a. Some information about oil crops (source: Results of PRisCA Project).

Usual name	Latin name	Cycle	*Requirements*		Genotype availability	Yield range (t ha^{-1})	*Feasibility*		*Industrial* use	*Areas*	
			thermic	hydric			farming technique	mechani-sation		cultivated	suggested
Rape	*Brassica napus* L.	A, S	l, m	m	h	1-4	a	a	r	N-C-S	C-S
Sunflower	*Helianthus annuus* L.	S	m	m	h	1-4	a	a	r	N-C-S	N-C-S
Flax	*Linum usitatissimum* L.	W, S	m	m, h	h	1-3	a	a	r		N-C
Castor	*Ricinus communis* L.	W, S	m	l	h	1-2.5	a	ip	r	C	C-S
Ethiopian mustard	*Brassica carinata* A. Braun	A, S	m	m	l	1-2	a	a	r		N-C-S
		S	m, l	l	l	0.5-1.5	ip	ip	p		N
Cameline	*Camelina sativa* L . Crantz	A, S	m	l	h	0.5-2.5	a	a	r	S	N-C-S
Safflower	*Carthamus tinctorius* L.	A, S	m	l	m	1.5-3.0	a	ip	p		C-S
Coriander	*Coriandum sativum* L.	A, S	m	m	m	1-3	a	a	r	N-C	N-C-S
Crambe	*Crambe abyssinica* Hochst	S	m	m, l	m	0.3-1.2 (?)	na	na	p		S
Loosestrifes	*Chupea.* P. Browne	S	m	m, h	l	0.5-2	ip	ip	p		C-S
Gopher plant	*Euphorbia lathyris* L.	A, S	m, h	l	l	1.0-1.5 (?)	na	na	p		C-S
Lesquerella	*Lesquerella fendleri*	A, W	l	l	l	0.5-1.5	na	na	p		N
Meadowfoam	*Limnanthes alba* Hartw	A, S	l	l	l	1.0-2.0	ip	ip	p		C-S
Tarweed	*Madia sativa* Molina	A, S	l	l	l	1.5-2.2	ip	ip	p	N-C-S	N-C-S
Rocket	*Eruca sativa* Mill.	A, S	l, m	l	l	1.8-2.3	a	a	r		N-C-S
Indian mustard	*Brassica juncea* (L.) Czern	A, S	m	m	m	05-2.0	a	a	r		N-C
White mustard	*Sinapis alba* L.	S	h	m	m	1.0-1.8	a	a	r		C-S
Sesame	*Sesamum indicum* L.	S	h	l	l	na	na	na	p		S (?)
Ironweed	*Vernonia galamensis* Less.										

Sowing: autumnal = A; spring = S; winter = W
Thermic and water requirements: high = h; medium = m; low = l
Feasibility: available = a; in progress = ip; not available = na

Industrial use: real = r; potential = p
Areas: North = N; Centre = C; South = S

Table 3b. Oil content and prevalent fatty acid (source: Results of PRisCA Project).

Species	Oil (%)	Prevalent fatty acid (%)	
Helianthus annuus	47.4±3.3	Oleic	84.5±2.1
Brassica napus var. *oleifera*	40.1±5.7	Erucic	43.0±6.9
Brassica carinata	34.6±4.1	Erucic	38.7±4.8
Brassica juncea	35.7±4.1	Erucic	27.6±9.9
Crambe abyssinica	34.6±2.2	Erucic	55.5±1.0
Lunaria annua	30.7±1.6	Erucic	46.0±0.2
Eruca sativa	27.1±0.6	Erucic	45.2±0.2
Lesquerella sp.	26.4±1.4	Lesquerolic	48.6±2.3
Calendula officinalis	14.5±1.9	Calendic	51.6±2.4
Limnanthes alba	19.9±0.8	Eicosanoic	63.4±0.4
Euforbia lagascae	42.1±2.3	Vernolic	58.6±1.1
Coriandrum sativum	17.0±0.5	Petroselinic	83.8±0.1
Cuphea laminuligera	36.1±1.4	Lauric	57.7±2.9
Cuphea lutea	20.6±3.6	Lauric	39.9±0.5
		Capric	25.1±1.0

Table 4. Productions, imports, exports and availability of oil seeds and fruits in Italy in 1994 (source: Vannini L., Venturi G., 1998).

	Equivalent raw materials (t x 10^3)			Oil (t x 10^3)		
	imported	national yield	total	imported	exported	available
Groundnut	3.8	0	3.8	43.6	3.4	47.0
Rapeseed or rape	3.8	8.8	12.6	84.4	4.1	92.9
Cotton seed	0	0	0	0.2	0.1	0.1
Maize germ	8.7	20.2	28.9	64.0	2.1	90.7
Sunflower	56.9	135.3	192.2	40.2	36.5	195.9
Sesame	1.8	0	1.8	*	*	1.8
Soyabean	205.7	65.6	271.3	18.1	49.9	239.5
Grape pips	0	15.0	15	*	*	15.0
Unnamed seeds	0.6	0	0.6	24.0	19.6	5.0
Total	281.3	244.9	526.2	274.5	112.7	687.9
Flax	2.2	0	2.2	8.4	0.2	10.4
Castor	0	0	0	6.9	0.1	6.8
Tung. etc.	0	0	0	0.4	0	0.4
Rapeseed (biodiesel)	0	1.0	1.0	0	0	1.0
Sunflower (biodiesel)	0	50.4	50.4	0	0	50.4
Total	2.2	51.4	53.6	15.7	0.3	69.0
Coconut	0	0	0	45.7	0.1	45.6
Palm tree	0	0	0	181.9	14.4	167.5
Palmist	0	0	0	16.9	0.2	16.7
Unnamed fruits	0	0	0	0	2.9	-2.9
Total	0	0	0	244.5	17.6	226.9
General total	**283.5**	**296.3**	**579.8**	**534.7**	**130.6**	**983.8**
of which:	281.5	244.8	526.0	147.5	49.8	623.7
Raw food liquids	0	0	0	107.2	59.9	47.3
Other food liquids	2.2	51.5	53.7	24.3	2.9	75.1
Raw industrial liquids	0	0	0	11.2	0.3	10.9
Other industrial	0	0	0	140.0	0.3	139.7
liquids	0	0	0	18.3	0.1	18.2
Raw food solid						
Raw industrial solid						

Implied within the unnamed seeds.

The most produced oils are the soybean and sunflower ones and they represent respectively 47 and 33% of the total. About 25% of soybean oil and 70% of sunflower oil are obtained from national seeds. Other outstanding national productions are those deriving from grape-seeds and corn.

Italy is a high oil consumer (tab. 5) and it can be considered an oil importer. Indeed, 200,000 tonnes of palm and palm-kernel oil together with 45,000 tonnes of coconut oil are imported. Besides this import of seeds oil, Italy imports olive oil, about 300-350,000 tonnes a year, mainly from Spain, Greece, Tunisia and Morocco.

Table 5. Olive and seeds oil consumption in Italy (sources: FEDIOL and AISO).

	1990-94	1995	1996
Total (t x 10^3):			
Olive oil	666	682	677
Seeds oil (*)	647	773	780
Pro-capita (kg):			
Olive oil	11.6	11.9	11.8
Seeds oil	13.6	13.5	13.6

(*) Implied margarines and hydrogenated fatty.

About 50,000 tonnes of sunflower oil and 1,000 tonnes of colza oil produced by the national industry are assigned to biodiesel.

The Italian industry's grinding capability exceeds 2 million tonnes of seeds (tab. 6), three quarter of which are soybean seeds, providing a production of about 0.5 million tonnes of oil (tab. 7). The import of oleiferous seeds is high as much as the export is exiguous (tab. 8).

As for seeds oils, the Italian agriculture distinguishes itself from the other EU countries on the basis of the higher influence of national production obtained foremost from soybean.

The three main oil crops are arranged as follows: soybean 99% in the North; sunflower 74% in the Centre, 13% in the North, 13% in the South; colza 80% in the Centre, 13 in the North, and 6 in the South.

The main Italian grinding industries are listed in tab. 9.

Table 6. Oil seeds (t x 10^3) yearly grinded by the Italian industry (sources: FEDIOL and AISO) for obtained oil of:

Oil	1990-94	1995	1996
Soya	1,746	1,527	1,432
Rape	36	62	39
Sunflower	387	454	504
Cotton	18	0	0
Maize germ	57	80	79
Grape pips	88	89	51
Total	2,332	2,214	2,108

Table 7. Production of raw vegetable oils and fats in Italy (t x 10^3) (sources: FEDIOL and AISO).

	1990-94	1995	1996
Groundnut	1	0	0
Soya	295	260	241
Rape	15	25	16
Sunflower	181	186	205
Total liquid oils	492	471	462
Linseed oil	1	1	1
Maize germ oil	21	28	28
Grape pips oil	5	12	7
Total	519	484	498

Vegetable oils find different technical applications in the chemical industry in order to produce a variety of goods, from detergents to cosmetics, from plastic materials to dyeings and resins, etc.

Another important area for the application of vegetable oils is that of lubrification in the sectors of cars, metallurgical industry, hydraulic systems, and of cooling fluids, etc.

As for motor oils, it is very important the presence of fat acids capable of resisting high temperatures and granting a low oxidization and good viscosity. With regard to industrial uses it prevails the importance of viscosity.

Table 8. Imports and exports of oil seeds in Italy (sources: FEDIOL and AISO).

	Imports (t x 10^3)			Exports (t x 10^3)		
	1990-94	1995	1996	1990-94	1995	1996
Groundnut	22	28	0	0	0	0
Soya	1,023	1,266	870	27	4	8
Rape	18	9	0	0	0	2
Sunflower	196	117	162	1	2	11
Cotton	97	109	130	0	0	0
Others	8	10	9	0	0	1
Total liquid oils	1,364	1,539	1,171	28	6	22
Linseed oil	6	5	3	0	0	0
Maize germ oil	15	21	21	0	0	0
Total	1,385	1,565	1,195	28	6	22

Table 9. Oil seeds processing Italian factories (sources: FEDIOL and AISO).

Factory	Place	Potentiality (t daily)	Raw material
Cereol Italia	Livorno	1,000	sunflower/rapeseed
Cereol Italia	Ravenna	1,300	soyabean
Cereol Italia	Ancona	800	sunflower/soyabean
Nuova Sawma	Porto Marghera (VE)	1,300	soyabean
Saroc/Galaxy Grain/ Cereol Italia	Vignole Borbera (AL)	700	soyabean
Italgreen Oil	Cisterna di Latina (LT)	700	sunflower/rapeseed
Italgreen Oil	S.Pietro di Morubio (VR)	800	soyabaen
Tampieri	Faenza (RA)		sunflower/rapeseed
Neri	Faenza (RA)		sunflower/rapeseed
Italcol	Castelfiorentino (FI)		sunflower/rapeseed
Gisol	S.Martino in Campo (PG)		sunflower
Olea	Palo del Colle (BA)	700	sunflower
Olearia Pugliese	Modugno (BA)		sunflower
Oleificio Medio Piave	Oderzo (TV)		soyabean

The total prinding potentiality amounts to 4.5 10^6 t yearly.

Up to now, the Italian industry has been interested foremost in the production of oil assigned only to the food sector. Indeed, the demand for non food uses is quite low.

The several sectors using oils with non food goals are not directed yet to the employment of vegetable raw material.

It can be reckoned a replacement of at least 10% of presently used technical oils with vegetable oils in a very short time.

It derives the necessity of rulings enhancing riproducibility, biodegradability, non-toxicity, and disposable capability of the vegetable oils in comparison with the mineral and synthetic ones.

It is deemed that the well informed consumer might accept prices increased by 10-12% compared to the traditional product. Such a difference could be even higher in function of an effective and demonstrated feed back onto environmental and human health safeguard.

In Italy, the amount of oil for non food uses is of about 100,000 tonnes, 75% of which for biodiesel. Colza and sunflower seeds farmed in the Country provide about 30,000 tonnes of the whole.

Vegetable oils are employed for industrial uses in 33 officially recognized industries:

- 7 produce biodiesel (they could consume up to a maximum of 125,000 tonnes in a regime of tax removal);
- 8 produce lubricants. The biodegradability of vegetable oils is a factor for the probable increase of the sector;
- 3 produce fat acids. This sector is subject to a development;
- 5 produce additives and products for the leather tanning industry. A development factor is that of low environmental impact;
- 10 produce different goods, from alkyl resins to soaps for cooling lubricant industries, paints and plastic materials, etc..

The oil industry should look at non food vegetable oils as a new chance to increase the use of existing plans, to find new products and markets (Vannini and Venturi, 1998).

Specific cases of non food are castor and crambe.

Castor

Olchima of Porto Torres in Sardinia is the only castor's grinder known to be active in Italy. It treats all the castor produced in Italy and France and imported seeds.

Considering the whole production chain of castor oil, the industrial part is already present or rather under-utilised, as the scarce availability of castor seeds on the market caused many castor's grinders to close.

The potential use of castor seeds is extremely wide. Castor oil has numerous advantages also compared with mineral oils. Indeed, the presence of the double link and the high

molecular weight allow both a low fusion point (5°C) and a very low solidification point(from -12 to -18°C in function of the purity). The oil viscosity is higher and more stable than in any other oil. Besides, it presents very high lubricant features and it is not dessicative. Hence, it can be used in very cold climates and in the aeronautic industry. It can be mixed with water in any proportion, it is heat resistant, and it is matchable with many resins, polimeres and vaxes. The residue of oil extraction, panels, which represent from 50 to 55% of seed weight, could be a source of proteins in animal feed (30-36% of proteins) but an expensive treatment to extract toxins would be required. More interesting would be the use of panels as organic fertiliser, in this case, aside from the organic input, it would bring also a natural geo-disinfestant action.

Crambe

Oil of crambe has the highest erucic acid content (55%) among the cultivated species. Moreover the percentage of erucic acid proved to be constant in varying cultivars and conditions of cultivation. This characteristic corresponds to the requirements of industry regarding stability of quality.

Due to the high content of erucic acid, crambe oil would find its main utilisation in the industry of lubricants. In other industrial applications it could be a valuable substitute for fish oil, mainly imported from non EU countries.

A part from the oil, crambe seeds can be a potential source of proteins (25%) and fibre (22%). The panels obtained as residual from the extraction of oil are used in the USA as a cattle fodder in mixtures. The high content of glucosinolates, which is a limit for the utilisation of crambe panels in the cattle breeding, might become another source of raw material for the production of bioactive molecules or in the sector of biopolymers.

The capsule of the seed being rich in lignin and cellulose might be used to produce absorbent material.

The Italian crambe production is completely adsorbed by Società Hougton of Genova. This same industry can use much higher quantities.

1.3. Environmental

Vegetable oils assigned to non food uses can be considered as a typical environmentally friendly chain. This is due to both the processing methods and the characteristics of the final product.

As to this, considerations must be made on the environmental impact of mineral and synthetic products that can be replaced by vegetable oils.

Particularly, besides to the reduction in the use of by-products of petrol, vegetable oils can co-operate to the environmental safeguard as follows:

a) in the farming phase, oil crops improve:

- the global management of rotations for a better crops complementarity;
- the management of set aside soils as they decrease, as a catch crop, the leaching of nitrogen, hydric and aeolian erosion, and the use of weedkillers;
- the contribution of inputs, being less demanding than traditional crops;

b) in the final employment, if compared to synthetic and mineral products, they assure some health and environmental:

- renewable, they don't interact with the CO_2 balance and they don't increase the pressure on finite resources;
- biodegradable;
- atoxic, they cause less problems of health and allergy during their use;
- disposable capability, they can be carried off easily compared to other raw materials (Vannini and Venturi, 1998).

2. Barriers to progress

The instability of prices, the uncertainty of the offer and the inhomogeneous qualitative standards are the main disadvantages in the competition of vegetable oils against animal, mineral and synthetic oils (Vannini and Venturi, 1998).

2.1. Scientific

Considering the major oil crops, there are not important scientific barriers to progress. Research could only bring limited improvements. The situation is different for minor crops, for which further investigations and research are necessary to improve actual yield and quality.

2.2. Technical issues

All the information collected in the last years on mayor oil crop should be provided to farmers in order to improve the cultivation technique. Regarding minor crops, further

research should be carried out to enlarge the knowledge available on these crops and to produce improved cultivars.
Some peculiar aspects must be remembered.

Rape

The high temperature, typical of the environments of rapeseed cultivation in Italy, determines a considerable risk of fast dehiscence of silique. Consequently the results would be a loss of product and a potential infestation of the soil with rape seeds which could become a weed in the next years. Dehiscence can be prevented by an anticipated harvest but this would increase costs due to the drying process.
Rapeseed hosts the nematode *Heterodera schachtii* and for this reason it has been excluded from the areas where the traditional crop rotation includes sugarbeet.

Castor

Part of the "impasse" in the castor's production chain is due to the inefficient agricultural production. One of the main agronomic problems is caused by the heavy losses of seeds during mechanical harvest (from 12% up to 18%) mainly due to the uneven maturity of seeds on the inflorescence. Breeding new varieties with uniform maturity and improving mechanical harvest would make castor cultivation profitable. The new dwarf varieties with simultaneous flowering are expected.

2.3. Environmental

Environmental barriers seem not to be a problem for industrial oil crops. In fact, due to their agro-technique and transformation processes together with the characteristics of their end products, this group of crops could be defined as environmentally friendly.

2.4. Legislative issues

Notwithstanding bio-oils are normally advantageous compared to traditional oils, their economic balance is often negative. Thereafter, bio-oil production chain seems very much depending on legislative actions which could favour environment protection (carbon tax, etc).

2.5. Economic issues

Yield varies from one year to the other; moreover the actual destination of technical oils is not exactly defined. These two factors determine a lack of balance between offer and demand and consequently on prices. A safer market for technical vegetable oils should be achieved by a more stable offer and by defining specific destinations for the raw material (Vannini and Venturi, 1998).

Sunflower

As already said, the cultivation of non food sunflower showed a drastic reduction from 1996 to 1997 (72%) and again in 1998. This situation can be imputed to a series of factors. A three year inter-professional agreement was signed between industries and farmers to define sunflower seed's price. A minimum price was fixed, while base prices were defined following the price of gas oil. Since the price of gas oil showed a significant decrease, the price of sunflower was reduced by 3.5% according to the agreement.

Another determinant factor was the reduction of the obligatory set-aside land and the possibility of choice between rotational set-aside and fixed set-aside without penalisation. As a consequence, non food sunflower was often grown on the marginal soils of the farm either because on these soils it is often more convenient the non cultivation or because of the heaviness of bureaucracy linked to non food crops.

This situation seems particularly negative for the future of this crop considering also the increasing interest of petrol industry in sunflower oil, in order to hinder the decline of non food sunflower, AISO (Italian Association for Oil Seeds) proposed to bring obligatory set-aside back to 10%, to penalise "non cultivated" set-aside compared to non food cultivation, and to simplify the bureaucracy needed to obtain EU contribution.

Of course this strategy would work only on the short term, while on the mid term the application of Agenda 2000 and the consequent abolition of obligatory set-aside would make non food sunflower totally unprofitably compared to the food crop.

2.6. Other items

Oil crops GMO were never used in Italy for industrial purposes.

3. PRIORITISATION

- Legislation to favour the start of oil crops chains (tax reduction, prices for low environmental impact).

- More research on minor crops. This research will be effective because it starts from a low level of knowledge.

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Part II FIBRE CROPS

1. Opportunities

Fibre crops traditionally cultivated in Italy were hemp, flax, cotton and, on a lesser extent, giant reed. In the last years, the large interest in non food agriculture has stimulated research and investigations on new and alternative crops like kenaf, fibre sorghum, Spanish broom, cardoon etc..

Some of these crops are more suitable for textile or different applications, others for cellulose production, although many of them can be grown for both purposes. As for the final use (textile or cellulose), the agro-technique is often the same or slightly different, while industrial processes and technologies can be very different. For this reason it seems advisable to treat separately fibres for textile and "various" destination from cellulose for paper production. Other potential uses, like biocomposites, geotextiles, non woven, or insulating material are still under examination.

A. Paper sector

During the last years numerous national and international investigations have been carried out upon technical and market perspectives of annual crops for paper pulp production. Research conclusions pointed out that single compartments of the cellulose production chain don't present unsurmountable problems, notwithstanding some obstacles arose in the connection among different compartments, in particular between the industrial and the agricultural ones.

A part from these aspects, the whole sector appears to be controlled by paper pulp price and offer which are usually determined by the market of conifers.

A.1. Paper and paper pulp market

Considering the market perspective, up to now paper does not have valid succedanea while different raw materials can be used for its production. Paper is traditionally produced from poliannual trees (conifers and broadleaved trees) but it might also be obtained from annual crops as well as from waste material.

In the case of annual crops, there are such differences in the raw materials derived from different species that it is difficult to compare them. Their commercial perspectives seem dependent on market conditions and, in particular, on the condition of paper pulp offer. National production of paper pulp (almost 500.000 t per year) covers only 10% of the internal consumption. From 1991 and 1995, foreign trade balance was negative with a yearly increase by 7%, except for 1993 when it increased only by 1%. During the same period NBSK prices decreased from 715 $/t in 1991 to 390 $/t in 1993 and subsequently

increased up to 1000 $/t in 1995, price which was halved in 1996. This proves that prices are mainly dependent on the paper pulp offer, while paper demand is usually related to the state of economy and income trend. As an example, in 1993 despite of the low price of paper pulp and the increase of export due to local currency devaluation, the crisis of economy, the decrease of PIL by 1.2% and of industrial production by 2.3% determined a shrinkage in paper consumption. This situation appears to be conjunctural: in the future the paper demand will hopefully increase together with the general economy, while price level will always be dependent on paper pulp offer. In this scenario the availability of an alternative source of raw materials (i.e. annual fibre crop) represents one of the possible solutions to peg paper market.

A.2. Paper industry

In Italy paper pulp production is quite limited, paper industries transform imported raw material and utilise a high percentage of recycled cellulose.

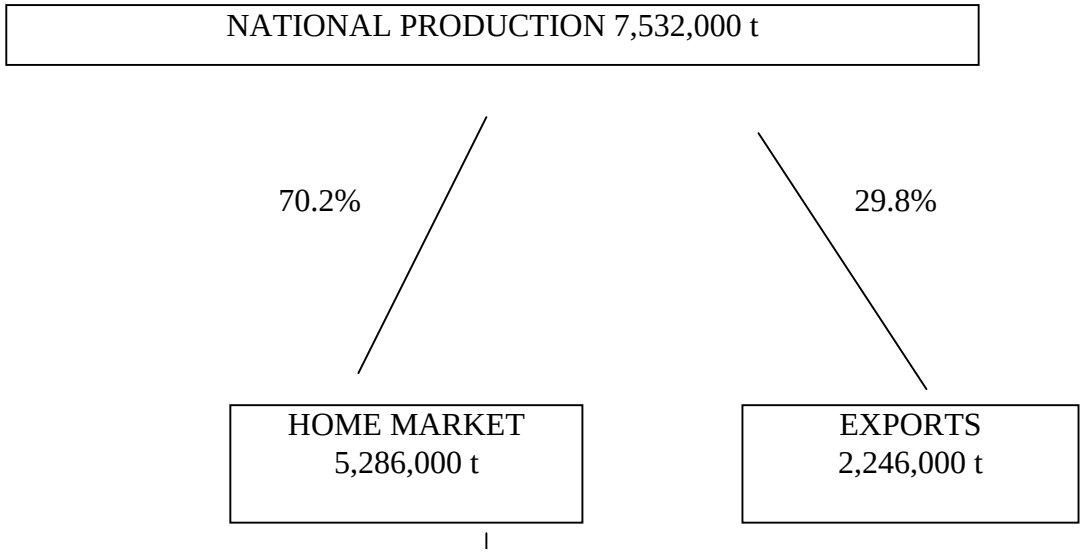
In 1997, the European paper production reached the record production of 78.9 million tonnes. with an increase by 8.4% compared to the previous year. The Italian increase by +8.3 % re-enters within the average.

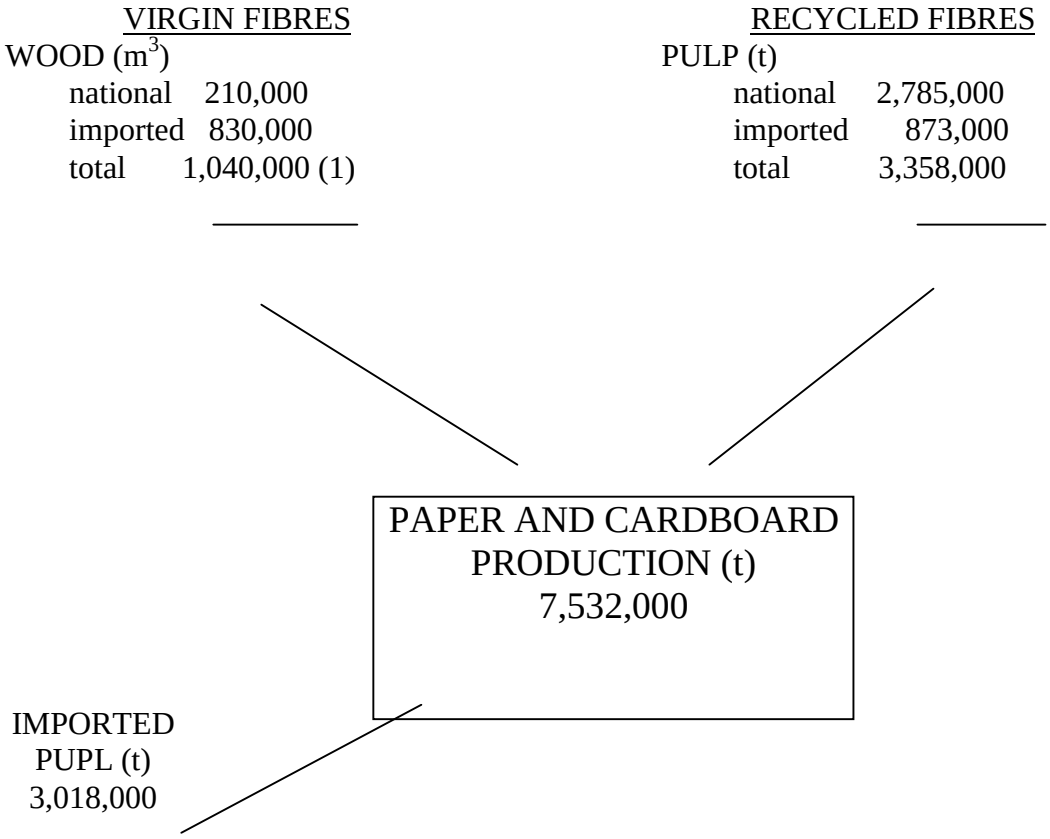
Last year (1998) trend confirmed the growth of the previous years.

Probably this trend might be slackened by the economic crisis in the Asian South-East characterized by a demand reduction in that area.

In 1997, the Italian paper and cardboard production reached 7.5 million tonnes with an invoice of 10,450 billion lire (15,397,797 EURO). In spite of the production growth, there was also a growth in the import, which reached 3.8 million tonnes (Fig. 1 and 2).

The apparent consumption of paper and cardboard exceeded 9.1 million tonnes in 1997 (tab. 10).





(1) From wood it is obtained an amount of 385,000 tonnes of mechanical pulp and 43,000 m^3 of

Figure 2. Italian paper mills industry (1997) (source: ASSOCARTA).

Production of paper and cardboard in Italy (1997)

166	Firms
209	Plants
5,397,727	EURO of output
25,600	Employees

Consumption:

Water	355,000,000 m^3
Electricity	6,140,000 Gwh
Natural gas	2,173,000,000 m^3
Fuel oil	200,000 t
Additives, glues, etc.	1,200,000 t

Table 10. Share of papers and cardboards Italian consumption (1997) (source: RESS elaboration of ISTAT data).

	t x 10^3	%
Newsprints	632	6.9
Printing, writings, etc.	3,393	37.2
Corrugated cardboard	2,797	30.7
Cases and boxes	784	8.6
Packing	784	8.6
Others (hygienic sanitary, industrials)	734	8.0
	9,124	100

The main raw material for the national paper industry was the pulping (3,658,000 tonnes) derived mainly from national collection (2.8 million tonnes). In Italy, the collection rate (relation between the collection amount and the apparent consumption of paper and cardboard) has reached 31% in the last years (tab. 11).

The growth of paper production has brought about a wider use of cellulose paste, the national production of which is limited to 427,000 tonnes, representing only 12.4% of the national need.

The Italian balance of trade in the paper sector results negative both for paper pastes and for the various papers and cardboard's (tab. 12).

Table 11. Pulp (t x 10^3) (source: RESS elaboration of ISTAT data).

	Years				
	1976	1984	1990	1991	1992
Consumption	1,835.5	2,038.3	2,643.8	2,806.3	2,909.0
User rate % (consumption/ Production of paper and cardboards)	41.2	43.2	46.1	47.8	48.5
Import	617.7	645.8	747.8	691.9	726.9
Export	0.2	0.7	6.4	2.7	4.6
Home collection (*)	1,236.0	1,393.2	1,902.4	2,117.1	2,206.7
Rate collection % (collection/ apparent consumption of papers and cardboards)	27.7	26.3	26.9	29.4	28.6
Self-sufficiency % (collection/ consumption of pulp)	66.7	68.4	72.0	75.4	75.3

(*) Consumption – import+export.

Table 12. Italian balance of trade in the paper sector. Average in the two year period 1991-92 (Lit x 10^3) (source: RESS elaboration of ISTAT data).

	Average 1991-92		
	import	export	balance
Paper pulp			
mechanical pulp	65,525	3,188	-62,337
chimical pulp	1,467,383	24,040	-1,443,343
semichimical pulp	25,369	287	-25,082
Total paper pulp	**1,538,277**	**27,515**	**-1,530,762**
Pulp for textile fibres	10,817	50	-10,767
Pulp	119,595	1,214	-118,381
Paper and cardboard			
Newsprints	333,565	13,216	-320,350
Writing	1,346,053	1,053,196	-292,857
Kraft	678,344	149,597	-528,747
Wrapping paper	174,132	466,112	291,980
Ondograph paper	133,270	11,481	-121,790
Cardboards	437,308	519,704	82,396
Other types	452,257	752,108	299,851
Total paper and cardboard	**3,554,927**	**2,965,412**	**-589,516**

The trade gap depends on the structural insufficiency of raw materials produced in our country, but also on the distance of Italy from those foreign countries offering the best trade conditions. Therefore, Italy results dependent for product quantity and it is dangerously open to market variations.

The cellulose import is from North America (45%) and Western Europe (35%).

The Italian paper industry is characterized by a high number of enterprises with a manifold range of offers so to fit the similarly manifold and lively demand. The latter has an increasing trend. This is justified by the fact that the average pro-capita consumption is still inferior to the European average.

There is a sharp gap among the different regions in the total and pro capita paper consumption (tab. 13).

The Italian paper industry employs about in the same measure pastes from Virgin fibres and pulp paper.

The share of recovered or recycled paper material classified as pulp paper has a very differentiated composition.

Papers and cardboard in Italy represent about 20% in weight of the urban solid waste resulting from processing industries, publishing houses, and families.

Companies collecting paper to be recycled are more than 600 in Italy, and over 60% are in the North (tab. 14).

In Italy, paper mills are over 300 and almost 80% process pulp paper in different proportions (tab. 15).

In opposition to a very high number of farms using paper paste, it is very low (only 5: 1 in Friuli; 2 in Emilia; 1 in Apulia; 1 in Calabria) that of those producing cellulose paste. Besides, these industries do not own a plant engineering and technological specialization in order to use raw materials different from wood. Anyway, it must be considered the impact of transport costs on the supply of raw materials.

Notwithstanding these negative aspects, it must be considered with interest the possibility to use no wood vegetal fibres of local production with the aim of lowering import.

Some information about Italian paper and cardboard industry is reported in tables 16 to 32.

Table 13. Paper consumption in each Italian region. Estimates 1991 (t x 10^3) (source: RESS elaboration of ISTAT data).

Regions	Papers for cultural uses	Papers for trading and industrial uses	Paper and cardboard total	Pro-capita Consumption (kg)
Piemonte	269	358	627	143.9
Valle d'Aosta	8	11	19	168.8
Lombardia	614	828	1,442	161.8
Trentino-Alto Adige	51	75	126	142.2
Veneto	260	373	633	144.3
Friuli Venezia Giulia	73	107	180	149.4
Liguria	108	116	224	130.0
Emilia-Romagna	282	320	602	153.4
Toscana	232	264	496	139.5
Umbria	43	65	108	131.1
Marche	79	94	173	121.2
Lazio	299	322	621	120.0
Abruzzo	61	79	140	110.2
Molise	13	17	30	89.6
Campania	225	244	469	80.7
Apulia	158	210	368	90.5
Basilicata	22	30	52	83.2
Calabria	74	86	160	74.3
Sicily	190	269	459	88.9
Sardegna	70	122	192	115.9
Total	**3,131**	**3,990**	**7,121**	**123.3**
	1,665	2,188	3,853	151.0
Northern Italy				
of which:	999	1,313	2,312	153.0
North-western	666	875	1,541	148.2
North-eastern	653	745	1,398	127.3
Central Italy	813	1,057	1,870	88.7
Southern and Insular Italy				

Table 14. Pulp collectors according to the geographical share (1991)
(source: RESS elaboration of ISTAT data).

Regions	Papermills (n°)	(%)
Piemonte	65	10.8
Valle d'Aosta	-	-
Lombardia	175	29.1
Trentino-Alto Adige	6	1.0
Veneto	72	12.0
Friuli Venezia Giulia	13	2.2
Liguria	15	2.5
Emilia-Romagna	54	9.0
Toscana	44	7.3
Umbria	8	1.3
Marche	23	3.8
Lazio	54	9.0
Abruzzo	8	1.3
Molise	2	0.3
Campania	21	3.5
Apulia	19	3.2
Basilicata	1	0.2
Calabria	5	0.8
Sicily	10	1.7
Sardegna	6	1.0
Total	**601**	**100.0**
	400	66.5
Northern Italy		
of which:	255	42.4
North-western	145	24.1
North-eastern	129	21.5
Central Italy	72	12.0
Southern and Insular Italy		

Table 15. Structure of the paper mill industry (source: ASSOCARTA).

Years	Firms (n° *)	Plants							Employe (n°)
		from 1,000 to 5,000 t	from 5,001 to 10,000 t	from 10,001 to 25,000 t	from 25,001 to 50,000 t	from 50,001 to 100,000 t	over 100,000 t	total (n° *)	
1988	175	43	56	60	31	20	18	228	27,90(
1989	176	40	58	59	32	20	18	227	27,90(
1990	175	39	58	57	30	21	19	224	27,90(
1991	175	37	58	55	31	22	19	222	27,90(
1992	174	36	55	56	33	20	19	219	27,30(
1993	169	35	53	55	33	21	16	213	26,50(
1994	167	35	52	54	33	21	16	211	26,00(
1995	166	35	52	54	33	21	15	210	25,90(
1996	166	32	52	55	32	22	17	210	25,70(
1997	166	33	52	55	35	22	21	209	25,60(

Firms and plants with a production lower than 1,000 t years^{-1} are note implied.

Table 16. Output and value of paper and cardboard foreign trade (source: ASSOCARTA).

Years	Output		Export		Import		Balance	
	Lit x 10^9	Index 1990	Lit x 10^9	Index 1990	Lit x 10^9	Index 1990	Lit x 10^9	Index 1990
1988	6,500	86.1	1,440	83.5	2,229	75.6	-789	64.5
1989	7,200	95.4	1,647	95.5	2,717	92.2	-1,069	87.4
1990	7,550	100.0	1,724	100.0	2,947	100.0	-1,223	100.0
1991	7,450	98.7	1,860	107.9	2,859	97.0	-999	81.7
1992	7,250	96.0	1,993	115.6	3,041	103.2	-1,048	85.7
1993	7,100	94.0	2,415	140.1	3,036	103.0	-621	50.8
1994	8,700	115.2	2,805	162.7	3,036	103.0	-231	18.9
1995	12,500	165.6	4,139	240.1	5,602	190.1	-1,463	119.6
1996	10,300	136.4	3,772	218.8	4,366	148.2	-594	48.6
1997	10,450	138.4	3,928	227.8	4,668	158.4	-740	60.5

Table 17. Production and distribution of paper and board in 1990 and 1997 (source: ASSOCARTA).

	1990		1997	
	t x 10^3	%	t x 10^3	%
Newsprint	233.1	9	179.7	6
Uncoated mechanical	307.3	12	188.8	6
Uncoated woodfree	534.2	22	724.5	23
Coated mechanical	901.6	36	1,077.7	35
Coated woodfree	497.5	20	936.8	30
Total grafic papers	2,473.7	100	3,109.4	100
Sanitary and household	353.3	100	636.4	100
Case materials	1,395.9	52	1,866.6	56
Folding boxboards	724.6	27	849.2	25
Other wrapping and packaging	561.4	21	623.6	19
Total packaging	2,681.9	100	3,339.4	100
Others	251.0	100	447.3	100
Total paper and board	5,759.9	100	7,532.5	100

Table 18. Import-export distribution of paper and board (source: ASSOCARTA).

	Import (t x 10^3)		Export (t x 10^3)		Export/Prod. (%)	
	1990	1997	1990	1997	1990	1997
Newsprint	384.9	460.8	10.4	8.0	4.5	4.5
Uncoated mechanical	271.0	259.0	24.4	41.7	8.3	22.1
Uncoated woodfree	201.0	395.2	48.0	91.0	9.0	12.6
Coated mechanical	106.0	280.8	335.0	526.4	37.2	48.8
Coated woodfree	276.0	498.5	134.0	310.6	26.9	33.1
Total grafic papers	1,238.9	1,894.2	555.4	977.7	22.5	31.4
Sanitary and household	36.0	51.9	142.0	437.2	40.2	68.7
Case materials	692.0	1,135.1	31.0	204.8	2.2	11.0
Folding boxboards	261.0	296.5	241.0	361.8	33.3	42.6
Other wrapping and packaging	290.0	383.1	137.0	222.6	24.4	35.7
Total packaging	1,243.0	1,814.8	409.0	789.2	15.3	23.6
Others	83.0	76.9	62.0	41.4	24.7	9.3
Total paper and board	2,600.9	3,837.8	1,168.4	2,245.5	20.3	29.8

Table 19. Distribution of apparent consumption and of its percentage due to paper and board import (source: ASSOCARTA).

	Apparent consumption (t x 10^3)		Import/apparent consumption (%)	
	1990	1997	1990	1997
Newsprint	607.6	632.4	63.3	72.9
Uncoated mechanical	550.3	406.1	49.2	63.8
Uncoated woodfree	687.2	1,028.6	29.2	38.4
Coated mechanical	672.6	832.1	15.8	33.7
Coated woodfree	639.5	1,126.7	43.2	44.2
Total grafic papers	3,157.2	4,025.9	39.2	47.1
Sanitary and household	247.3	251.1	14.6	20.7
Case materials	2,056.9	2,797.0	33.6	40.6
Folding boxboards	744.6	783.9	35.1	37.8
Other wrapping and packaging	714.4	784.2	40.6	48.9
Total packaging	3,515.9	4,365.0	35.4	41.6
Others	272.0	482.7	30.5	15.9
Total paper and board	7,192.4	9,124.7	36.2	42.1

Table 20. Paper and board - total (source: ASSOCARTA).

Years	Production		Import		Export		Apparent consumption	
	t x 10^3	Index 1990	t x 10^3	Index 1990	t x 10^3	Index 1990	t x 10^3	Index 1990
1988	5,512.4	95.7	2,013.0	77.4	1,116.0	95.5	6,409.4	89.1
1989	5,735.1	99.6	2,328.8	89.5	1,155.7	98.9	6,908.2	96.0
1990	5,759.9	100.0	2,600.9	100.0	1,168.4	100.0	7,192.4	100.0
1991	5,932.2	103.0	2,694.0	103.6	1,247.6	106.8	7,378.6	102.6
1992	6,131.9	106.5	3,151.1	121.2	1,330.7	113.9	7,952.3	110.6
1993	6,188.2	107.4	3,121.7	120.0	1,616.0	138.3	7,693.9	107.0
1994	6,729.3	116.8	3,563.9	137.0	1,739.8	148.9	8,553.4	118.9
1995	6,810.5	118.2	3,501.5	134.6	1,877.9	160.7	8,434.1	117.3
1996	6,953.9	120.7	3,310.3	127.3	2,004.8	171.6	8,259.4	114.8
1997	7,532.4	130.8	3,837.8	147.6	2,245.5	192.2	9,124.7	126.9

Table 21. Graphic papers - total (source: ASSOCARTA).

Years	Production		Import		Export		Apparent consumption	
	t x 10^3	Index 1990	t x 10^3	Index 1990	t x 10^3	Index 1990	t x 10^3	Index 1990
1988	2,472.1	99.9						
1989	2,535.2	102.5	1,118.8	90.3	572.7	103.1	3,081.3	97.6
1990	2,473.7	100.0	1,238.9	100.0	555.4	100.0	3,157.2	100.0
1991	2,485.5	100.5	1,269.8	102.5	564.1	101.6	3,191.2	101.1
1992	2,498.5	101.0	1,571.7	126.9	606.7	109.2	3,463.5	109.7
1993	2,502.1	101.1	1,575.5	127.2	742.6	133.7	3,335.0	105.6
1994	2,745.9	111.0	1,767.4	142.7	842.8	151.7	3,660.5	115.9
1995	2,777.2	112.3	1,756.0	141.7	874.3	157.4	3,659.0	115.9
1996	2,839.9	114.8	1,571.5	126.8	893.0	160.8	3,518.4	111.4
1997	3,109.4	125.7	1,894.2	152.9	977.7	176.0	4,025.9	127.5

Table 22. Newsprint (source: ASSOCARTA).

Years	Production		Import		Export		Apparent consumption	
	t x 10^3	Index 1990	t x 10^3	Index 1990	t x 10^3	Index 1990	t x 10^3	Index 1990
1988	264.1	113.3						
1989	252.5	108.3	363.8	94.5	11.7	112.5	604.6	99.5
1990	233.1	100.0	384.9	100.0	10.4	100.0	607.6	100.0
1991	196.2	84.2	363.8	94.5	6.1	58.7	553.9	91.2
1992	101.0	43.3	486.8	126.5	9.7	93.3	578.1	95.1
1993	83.1	35.6	467.6	121.5	6.8	65.4	543.9	89.5
1994	154.0	66.1	471.4	122.5	4.3	41.3	621.1	102.2
1995	183.0	78.5	462.6	120.2	5.2	50.0	840.4	138.3
1996	178.4	76.5	394.3	102.4	15.4	148.1	557.3	91.7
1997	179.7	77.1	460.8	119.7	8.0	76.9	632.4	104.1

Table 23. Uncoated mechanical (source: ASSOCARTA).

Years	Production		Import		Export		Apparent consumption	
	t x 10^3	Index 1990	t x 10^3	Index 1990	t x 10^3	Index 1990	t x 10^3	Index 1990
1988	372.6	121.2						
1989	373.7	121.6	230.0	84.9	28.0	100.0	575.7	104.6
1990	307.3	100.0	271.0	100.0	28.0	100.0	550.3	100.0
1991	294.5	95.8	236.8	87.4	24.4	87.1	506.9	92.1
1992	277.3	90.2	263.9	97.4	24.0	85.7	517.2	94.0
1993	192.0	62.5	289.6	106.9	38.6	137.9	443.0	80.5
1994	181.4	59.0	321.5	118.6	33.2	118.6	469.8	85.4
1995	187.9	61.1	329.5	121.6	27.9	99.6	489.5	89.0
1996	199.2	64.8	286.2	105.6	32.8	117.1	452.6	82.2
1997	188.8	61.4	259.0	95.6	41.7	148.9	406.1	73.8

Table 24. Uncoated woodfree (source: ASSOCARTA).

Years	Production		Import		Export		Apparent consumption	
	t x 10^3	Index 1990	t x 10^3	Index 1990	t x 10^3	Index 1990	t x 10^3	Index 1990
1988	537.5	100.6						
1989	554.5	103.8	190.0	94.5	48.0	100.0	696.5	101.4
1990	534.2	100.0	201.0	100.0	48.0	100.0	687.2	100.0
1991	555.0	103.9	275.0	136.8	45.0	93.8	785.0	114.2
1992	568.9	106.5	323.9	161.1	52.6	109.6	840.2	122.3
1993	570.1	106.7	354.3	176.3	48.9	101.9	875.5	127.4
1994	595.9	111.5	410.9	204.4	68.1	141.9	938.7	136.6
1995	611.2	114.4	370.2	184.2	68.7	143.1	912.7	132.8
1996	634.7	118.8	332.0	165.2	76.6	159.6	890.2	129.5
1997	724.5	135.6	395.2	196.6	91.0	189.6	1,028.6	149.7

Table 25. Coated mechanical (source: ASSOCARTA).

Years	Production		Import		Export		Apparent consumption	
	t x 10^3	Index 1990	t x 10^3	Index 1990	t x 10^3	Index 1990	t x 10^3	Index 1990
1988	877.1	97.3						
1989	920.3	102.1	97.0	91.5	348.0	103.9	669.3	99.5
1990	901.6	100.0	106.0	100.0	335.0	100.0	672.6	100.0
1991	863.6	95.8	123.9	116.9	333.2	99.5	654.3	97.3
1992	881.0	97.7	159.4	150.4	342.4	102.2	698.0	103.8
1993	965.0	107.0	146.9	138.6	435.1	129.9	676.8	100.6
1994	999.9	110.9	179.0	168.9	471.2	140.7	707.8	105.2
1995	993.2	110.2	172.8	163.0	610.4	182.2	655.7	97.5
1996	982.5	109.0	155.0	146.2	499.9	149.2	637.7	94.8
1997	1,077.7	119.5	280.8	264.9	526.4	157.1	832.1	123.7

Table 26. Coated woodfree (source: ASSOCARTA).

Years	Production		Import		Export		Apparent consumption	
	t x 10^3	Index 1990	t x 10^3	Index 1990	t x 10^3	Index 1990	t x 10^3	Index 1990
1988	420.8	84.6						
1989	434.2	87.3	238.0	86.2	137.0	102.2	535.2	83.7
1990	497.5	100.0	276.0	100.0	134.0	100.0	639.5	100.0
1991	576.1	115.8	270.3	97.9	155.4	116.0	691.0	108.1
1992	670.3	134.7	337.7	122.4	178.0	132.8	830.0	129.8
1993	692.0	139.1	317.1	114.9	213.2	159.1	795.9	124.5
1994	814.7	163.8	374.6	135.7	266.1	198.6	923.1	144.3
1995	801.9	161.2	421.0	152.5	262.1	195.6	960.7	150.2
1996	845.1	169.9	403.9	146.3	268.3	200.2	980.7	153.4
1997	938.8	188.7	498.5	180.6	310.6	231.8	1,126.7	176.2

Table 27. Sanitary and household (source: ASSOCARTA).

Years	Produzione		Import		Export		Apparent consumption	
	t x 10^3	Index 1990	t x 10^3	Index 1990	t x 10^3	Index 1990	t x 10^3	Index 1990
1988	264.4	74.8						
1989	326.5	92.4	33.0	91.7	133.0	93.7	226.5	91.6
1990	353.3	100.0	36.0	100.0	142.0	100.0	247.3	100.0
1991	409.4	115.9	29.3	81.4	147.7	104.0	291.0	117.7
1992	466.9	132.2	24.7	68.6	178.5	125.7	313.1	126.6
1993	499.3	141.3	30.6	85.0	243.4	171.4	286.5	115.9
1994	514.2	145.5	28.4	78.9	240.5	169.4	302.0	122.1
1995	544.7	154.2	27.6	76.7	310.5	218.7	261.9	105.9
1996	548.5	155.3	48.9	135.8	354.9	249.9	242.5	98.1
1997	636.4	180.1	51.9	144.2	437.2	307.9	251.1	101.5

Table 28. Packaging - total (source: ASSOCARTA).

Years	Production		Import		Export		Apparent consumption	
	t x 10^3	Index 1990	t x 10^3	Index 1990	t x 10^3	Index 1990	t x 10^3	Index 1990
1988	2,490.0	92.8						
1989	2,584.7	96.4	1,088.0	87.5	384.0	93.9	3,288.7	93.5
1990	2,681.9	100.0	1,243.0	100.0	409.0	100.0	3,515.9	100.0
1991	2,771.3	103.3	1,320.8	106.3	460.2	112.5	3,631.9	103.3
1992	2,861.2	106.7	1,472.1	118.4	492.0	120.3	3,841.3	109.3
1993	2,874.9	107.2	1,435.0	115.4	588.4	143.9	3,721.5	105.8
1994	3,125.8	116.6	1,681.1	135.2	613.3	150.0	4,193.6	119.3
1995	3,136.0	116.9	1,605.4	129.2	648.0	158.4	4,093.4	116.4
1996	3,206.7	119.6	1,614.1	129.9	716.9	175.3	4,103.8	116.7
1997	3,339.4	124.5	1,814.8	146.0	789.2	193.0	4,365.0	124.2

Table 29. Case materials (source: ASSOCARTA).

Years	Production		Import		Export		Apparent consumption	
	t x 10^3	Index 1990	t x 10^3	Index 1990	t x 10^3	Index 1990	t x 10^3	Index 1990
1988	1,223.4	87.6						
1989	1,290.4	92.4	583.0	84.2	24.0	77.4	1,849.4	89.9
1990	1,395.9	100.0	692.0	100.0	31.0	100.0	2,056.9	100.0
1991	1,429.5	102.4	747.0	107.9	32.5	104.8	2,144.0	104.2
1992	1,517.8	108.7	845.7	122.2	30.1	97.1	2,333.4	113.4
1993	1,527.9	109.5	815.6	117.9	71.2	229.7	2,272.3	110.5
1994	1,668.0	119.5	1,011.1	146.1	92.6	298.7	2,586.5	125.7
1995	1,686.3	120.8	944.5	136.5	142.3	459.0	2,488.5	121.0
1996	1,798.4	128.8	995.4	143.8	171.5	553.2	2,622.2	127.5
1997	1,866.6	133.7	1,135.1	164.0	204.8	660.6	2,797.0	136.0

Table 30. Folding boxboards (source: ASSOCARTA).

Years	Production		Import		Export		Apparent consumption	
	t x 10^3	Index 1990	t x 10^3	Index 1990	t x 10^3	Index 1990	t x 10^3	Index 1990
1988	697.5	96.3						
1989	725.6	100.1	211.0	80.8	238.0	98.8	698.6	93.8
1990	724.6	100.0	261.0	100.0	241.0	100.0	744.6	100.0
1991	769.5	106.2	260.2	99.7	284.2	117.9	745.5	100.1
1992	771.0	106.4	261.7	100.3	264.0	109.5	758.7	101.9
1993	771.9	106.5	231.7	88.8	319.2	132.4	684.4	91.9
1994	844.4	116.5	252.0	96.6	315.4	130.9	781.0	104.9
1995	840.0	115.9	297.3	113.9	314.6	130.5	822.8	110.5
1996	815.0	112.5	292.5	112.1	345.7	143.4	761.7	102.3
1997	849.2	117.2	296.5	113.6	361.8	150.1	783.9	105.3

Table 31. Other wrapping and packaging (source: ASSOCARTA).

Years	Production		Import		Export		Apparent consumption	
	t x 10^3	Index 1990	t x 10^3	Index 1990	t x 10^3	Index 1990	t x 10^3	Index 1990
1988	569.0	101.4						
1989	568.7	101.3	294.0	101.4	122.0	89.1	740.7	103.7
1990	561.4	100.0	290.0	100.0	137.0	100.0	714.4	100.0
1991	572.4	102.0	313.6	108.1	143.5	104.7	742.5	103.9
1992	572.4	102.0	374.7	129.2	197.9	144.5	749.2	104.9
1993	575.1	102.4	387.7	133.7	198.0	144.5	764.8	107.1
1994	613.3	109.2	418.0	144.1	206.2	150.5	826.1	115.6
1995	609.7	108.6	363.6	125.4	191.1	139.5	782.2	109.5
1996	593.4	105.7	326.2	112.5	199.7	145.8	719.9	100.8
1997	623.6	111.1	383.1	132.1	222.6	162.5	784.2	109.8

Table 32. Other (source: ASSOCARTA).

Years	Production		Import		Export		Apparent consumption	
	t x 10^3	Index 1990	t x 10^3	Index 1990	t x 10^3	Index 1990	t x 10^3	Index 1990
1988	285.8	113.9						
1989	288.7	115.0	89.0	107.2	66.0	106.5	311.7	114.6
1990	251.0	100.0	83.0	100.0	62.0	100.0	272.0	100.0
1991	266.0	106.0	74.1	89.3	75.6	121.9	264.5	97.2
1992	305.3	121.6	82.6	99.5	53.5	86.3	334.4	122.9
1993	311.9	124.3	80.6	97.1	41.6	67.1	350.9	129.0
1994	343.6	136.9	97.0	116.9	43.2	69.7	397.4	146.1
1995	352.6	140.5	112.4	135.4	45.2	72.9	419.7	154.3
1996	358.8	142.9	75.8	91.3	39.9	64.4	394.7	145.1
1997	447.3	178.2	76.9	92.7	41.4	66.8	482.7	177.5

B. Textile sector

In Italy the textile industry is one of the leading sectors of the national economy. Fibre crops for textile applications were widely cultivated before and during II World War: hemp was grown on more than 100.000 ha mainly in the North, flax on more than 35.000 ha while cotton was mainly grown in Sicily on about 80.000 ha. In total in Italy about 220.000 ha were cultivated with fibre crops. After II World War these surfaces progressively decreased, the main factors being the backwardness of agrotechnics and the demand for new textile products, but mainly the downfall of the autarchic policy which was maintained in Italy in the first half of this century. The opening up to new markets, the discovery of synthetic fibres, the evolution of consumer taste and fashion were the cause of the abandonment of cultivations which were no longer economically and socially sustainable.

Nowadays, with the passing of time, welfare and the general transformation of the civil society have contributed to develop a new scale of values, new tastes, new preferences and in general a different perspective and sensibility in the consumer society, which is also more and more conscious of environment sustainability. The salubrity of natural fibres, the healthfulness of cotton or the freshness of flax and hemp have been rediscovered by consumers who prefer the quality to quantity.

This new trend towards a moral sensibility and the evolution of taste bring a new opportunity for textile crops, mainly in the market of clothes and interior decoration.

B.1. Market of natural textile fibres

Italy is among the largest importers of natural fibres like wool, silk, cotton etc. In 1994 the Italian textile industry had an export trade value of about 13 billion ECU with a credit balance of 7 billion ECU. Natural fibres have a great importance in textile industry with an export trade value of more than 3 billion ECU and almost 2 billion ECU of credit balance.
Other applications are studied for different industrial sectors. Many SMI seem interested, but operative project have not started yet. It seems that the big automobile industry would be interested in natural fibres as well as the building industry.

1.1. Science and technology

In the last years, research has been carried out also on crops which were largely grown in the past with the general aim of improving the agrotechnique and specifically of reducing inputs, environmental impact and production costs. Research on minor and new crops had the same objectives, and in most cases large interest was centred on genotype evaluations.

Hemp

In 1998, for the first time after almost 30 years, the Ministry of Agriculture took legislative measures to favour the cultivation of 1000 ha of fibre hemp, provided that many limitations were observed by farmers.
Since hemp has not been grown in Italy for over 30 years, many aspects of its agrotechnics must be reconsidered in view of the modern technologies. On this regard different experiments and field trials have been carried out in the last years.
The general results of these trials are in line with the knowledge deriving from the tradition of hemp cultivation in Italy.
Hemp proved to be a very good weed competitor without chemical treatments.
It has low requirements in phosphorus and potassium and also in nitrogen considering the good availability of this element in the soils where hemp is usually grown. The effect of nitrogen on fibre quality seems negligible, while the effect of phosphorus and potassium on quality parameters has still to be investigated.
Usually, irrigation is not necessary in the North of Italy, while 1500-3000 m^3 ha^{-1} satisfy the exigencies of the crop in the South.
Therefore hemp can be considered a low input crop. It is well adapted to many different Italian environments provided that the right varieties are chosen. Considering the actual

availability of hemp varieties on the market, some French monoecious strain included in the EU variety list, seems suited for the Italian condition.

Recent experiments indicate that the choice of the most suitable variety is extremely important, in fact the most yielding variety can perform up to 4 times better than the least one.

The above mentioned experiments point out that, on average, the dioecious cultivars produce more than the monoecious ones. Unfortunately the old Italian dioecious varieties are not commercialised anymore; it is recommendable for the future that the Italian cultivars, still present in small quantities, will be reproduced on a large scale and made available on the market.

Flax

In the past centuries flax fibre used to be important in the northern region of Lombardia and in the central region of Marche. Nowadays and in the last 50 years, it has been practically abandoned. Thereafter some aspects of its cultivation and of the industrial processing must be renewed and improved in order to provide the textile industry with a high quality raw material.

In good condition stem yield can reach 6-7 t ha^{-1} but higher production can be obtained in a healthy crop. Yield is positively correlated with plant density which is usually set on 1800-2000 plants per square meter. In this growing condition seed production is poor ranging from 0.8 to 1.2 t ha^{-1}. Both in Piemonte and in Apulia, the research was directed towards the modernisation of agro-technique and to the improvement of the retting process.

Kenaf

Kenaf was cultivated in Italy in 1993 on 178 ha. This attempt to introduce this fibre crop in Italy was either the consequence of PAC in favour of non food crops than the result of a

many experiments on kenaf were carried out in different locations all over Italy. From their results some information on the agro-technique can be drawn. Considering the wide range of Italian environmental conditions, the cultivation technique should vary according to the region: in the North the most appropriate period for sowing seems the first week of May while in the South it can be anticipated by two weeks; sowing time and variety choice have a great importance both on biomass yield and on the fibre quality. Plant density proved to be another important factor for kenaf production. In particular plant populations ranging from 40 to 70 plants per square meter gave the best results in the North while 40 plants per square meter seemed to represent the best solution in the southern regions.

High stem yield, ranging from 14 to 16 t ha^{-1}, can be reached both in the South and in the North provided that water is not a limiting factor. For this reason irrigation is necessary in

the South (up to 80% of ETP restitution) and it is only in the Po Valley that kenaf cultivation could be possible without irrigation.
Weed control seems necessary in the first phases of the cropping cycle due to the slow growth of kenaf in these phases and to the distance between rows (50 cm proved to be the best distance).

Cotton

In Italy cotton cultivation reached its maximum diffusion in 1864 when 88.000 ha of this crop were grown in the South. Lack of political interest, low income for farmers, poor harvest organisation and lack of first industrial transformation were the main causes of the progressive disappearance of this crop from the official statistics.
Nowadays the crisis of southern Italian agriculture, mainly due to the surplus of traditional products, might offer a new spur to cotton cultivation, which could represent a valuable contribution to farm's economical balance especially in the areas where irrigation is possible.

All the following crops have been studied, in particular in the frame of PRisCA Project, in different Italian environments. In most cases all the available cultivars were tested and the best agro-technique was studied. Some information about minor fibre crops are reported in tab. 33.

1.2. Industry and market

Hemp

In Italy, hemp cultivation and transformation had a great importance in the past. It reached its maximum expansion at the beginning of XIX century when over 100,000 ha of hemp were grown, mainly in Emilia-Romagna (North) and Campania (South). After second world war, the concurrence of cotton and synthetic fibres together with the high cost of fibre extraction, determined a progressive contraction of hemp acreage. In the nineteen sixties, despite of the new surge of scientific research, hemp cultivation had been completely ceased.
Recently, the interest of industries and customers in natural fibre and in "green" products offered a new chance to hemp cultivation.

Table 33. Some information about fibre crops (source: Results of PRisCA Project).

Usual name	Latin name	Economic product	Cycle	*Requirements*		Genotype availability	Yield range	*Feasibility*		*Industrial* use	*Areas*	
				thermic	hydric		(t ha^{-1})	farming technique	mechani-sation		cultivated	suggested
Coton	*Gossypium sp.*	fruit	A	h	h	h	1-3#	a	a	t,o	S	S
Hemp	*Cannabis sativa* L.	stems	A	l	l	m	10-12+	a	ip	t,p,b,nw,ip,o	N-S	N-C-S
Flax	*Linum usitatissimum* L.	stems	A	l	m	h	5-8+	a	a	t,ip	N	N
Kenaf	*Hibiscus cannabinus* L.	stems	A	m	m	m-l	8-12+	a	ip	p,b,nw,ip		N-C
Rosella	*Hibiscus sabdariffa* L.	stems	A	m	m	m-l	6-10+	a	ip	p,b,nw,ip		N-C
Fiber sorghum	*Sorghum bicolor (L) Moench*	stems	S	h	m, l	m	11-25+	a	a	p		N-C-S
Giant grass	*Miscanthus sinensis Anders.* var. *giganteus*	stems	S	l	m	h	12-25+	a	a	p,ip		N
Urena	*Urena lobata* L.	stems	A	m	m	l	(?)	na	ip	-		N
Jew's Mallow	*Corchorus sp.*	stems	A	h	h	l	1.3-1.5*	na	na	t,p		-
Reed	*Arundo donax* L.	stems	S	m	m	h	8-25+	a	na	p		N-C-S
Common Reed	*Phragmites communis* Trin.	stems	S	m	m	h	4-6+	a	na	p,b		N-C-S
China grass	*Bohmeria nivea* (L.) Gaud.	stems	S	m	m	l	20-40°	a	ip	t,p		S
Spanish Broom	*Spartium junceum* L.	branching	S	m	m	m	30-35°	a	na	t,p		C-S
Sunn Hemp	*Crotolaria juncea* L.	leaves	A	m	m	l	(?)	na	na	t,p		(?)
Sisal	*Agave sisalana* Perr.	leaves	S	m	m	m	1.2-1.4°	na	na	t,p		S
Halfa	*Stipa tenacissima* L.	leaves	S	m	l	l	1.5-2.0°	na	na	p		(?)
New Zealand flax	*Phormium tenax* J.G. Forst. et G. Forst.	leaves	S	m	l	l	1.6-2.0°	na	na	t,p		(?)

Sowing: autumnal = A; spring = S; winter = W
Thermic and water requirements: high = h; medium = m; low = l
Feasibility: available = a; in progress = ip; not available = na
Industrial use: textile = t; pulp and paper = p; biocomposites = b; non woven = nw; oil = o; building = bu; isolating panel = ip
fiber and seed (1 not irrigated; 3 irrigated)
* Fiber
° Fresh biomass
+ Dry matter
Areas: North = N; Centre = C; South = S

In the last years, much has been said on hemp and its potential markets. Textile industries are still the main potential purchasers of hemp fibre, both in the field of eco-fashion and in the one of interior decoration. Hemp bed linen, which were once linked to the poverty of rural areas, nowadays have a natural and ecological connotation; their freshness and "roughness" represent perfectly the comeback to the country style and to the idea of natural and healthy product.

Another industrial sector which seems interested in hemp is the paper industry. The long hemp fibres could be used either for the production of fine paper (cigarette, bible, money, etc.) or to reinforce recycled paper pulps.

Car industry seems also very interested in hemp and in natural fibres. FIAT, the main car industry in Italy, does not seem to be an immediate purchaser for hemp fibre, but it is showing interest for vegetable fibre, and this could represent a huge market for hemp and other fibre crops.

New perspective for hemp use arise from the building industry and from the industry of composite materials and geotextile.

Aside from the good quality of hemp fibre, it must be mentioned the aggressive impact of hemp on the market. The ambiguity of this crop, which comes from the similarity between fibre and drug strains, might play an essential role in the marketing of its products. This can be easily proved by the high number of clothes factories which are currently using hemp fibre for some of their fashion lines, the commercialisation of their products being clearly linked with the image of *Cannabis*.

Flax

All over the world the 90% of flax is still subjected to the natural process of "dew retting", while the rest is artificially treated in warm water with or without the addition of enzymes. In Italy, especially at the moment of harvest, the weather conditions are not favourable to dew retting; experiments carried out in the North proved that this technique is possible but it is very difficult to obtain a good standard of quality. For this reason artificial retting has to be preferred in most of Italian environments.

After the retting, which causes an average loss of 20-22% of green material, the process of fibre separation produces: 12-15% of long fibres and 10-15% of tows which are both used by the textile industry; 50% of material which could be used for the production of energy, of pannels and boards or for animal bedding; 6-7% of fine straw possibly used in animal feeding; 6-7% of dust and waste.

The long fibres are the most valuable raw material obtained in this process. They are used to produce yarns, 80% of which are employed by the cloth industry while the rest is used to produce linen. Tows are used in mixture with other fibres to obtain various materials.

Kenaf

Some experiments were carried out to study the effect of processing and cultivation techniques on kenaf paper pulp. A preliminary evaluation of paper pulp quality showed high mechanical resistance, the paper produced was compact, with low porosity and of limited opacity; practically no differences were detected between paper pulps obtained from the whole stem or after decortication.

The influence of agro-technique was remarkable only in the case of different harvest times, in particular the quality decreased postponing harvest. Effects of irrigation and fertilisation were not significant while Tainung 1 and Tainung 2 resulted the best cultivars for fibre quality.

Cotton

Within the European Community cotton production is far from being able to satisfy the internal demand. For this reason the Community tries to boost this crop by means of direct subventions to farmers. In Italy the financial help of the Community is not enough to provide a good incentive to farmers. The future of cotton cultivation seems linked to the possibility of integrating agricultural production to first transformation industry. This would cut mobility costs and would provide farmers with a higher share of added values.

Field research carried out in the last years improved the agrotechnique and showed that high yield and good quality can be obtained in some southern Italian areas. The future of cotton cultivation in Italy seems dependent on the political willingness of increasing the maximum area of cotton cultivation in Europe and on the co-operation between the agricultural and the industrial sectors.

1.3. Environmental

Hemp and kenaf can be both considered "curative" crops, in particular they are very effective weed competitors and therefore reduce the use of weedkillers for the following crops. They don't need chemical treatments against pest and they have low nutrient requirements. For these reasons, especially hemp, can be considered an environment friendly crop, as well as the products of its fibre.

2. BARRIERS TO PROGRESS

2.1. Scientific

The main fibre crops for Italian environments (hemp, kenaf, flax and cotton) are all well known and only minor aspects of agro-technique should be revised or reconsidered. However, many new or alternative fibre crops exist (fibre sorghum, mischantus, spanish broom, etc.) and should be studied to provide a basic knowledge on their cultivation and to foresee their possibilities in Italian environments.

2.2. Technical issues

Unavailability or scarce disposability of seeds from the best cultivars seems the major problem for the cultivation of the main fibre crops.
In many cases mechanisation of harvest should be improved to lower costs and increase quality and yield.

Hemp

One of the main barriers to a fast development of hemp cultivation is represented by the availability of hemp seeds and their cost. In Europe hemp cultivation is limited to the use of genetic material included in the EU official variety list (at least in order to take advantage of hemp subsidies). Many of the cultivars indicated in the EU list are difficult to find if not completely extinguished. The majority of varieties available on the market are of French origin and they are produced and commercialised by FNPC. This situation has brought the hemp seed market to a state of almost monopoly, where the farmers are subjected to the price fixed by FNPC. Moreover, seeds are usually available in limited quantity and they should be booked with a great advance. Prove of this situation, it is the fact that in 1998 in Italy were grown only 350 ha of hemp, while the available surface could have been three times higher when hemp seeds were available.
Furthermore, French varieties have been bred to suit French conditions and to allow the "double production" of stems (for paper industry) and seeds (for animal feed, for oil extraction, etc). These cultivars tend to be too precocious in many Italian environments, therefore stem production is often limited compared to the potential of the environment.
Anyway, the old Italian cultivars have been partially lost and the remaining ones (Carmagnola, CS, Fibranova) are present in limited stock. Moreover, the breeding work which has been done in the last years on these cultivars, has never been really focussed on productive or qualitative aspects, the main aim being the linkage between easy distinguishable phenological markers with low THC content.

Flax

Flax is well adapted to a wide range of environments, but the best quality fibre is obtained in fresh climate, with foggy and misty weather and light soils. In general, Italian environmental conditions are not the most favourable for fibre flax cultivation; the hot temperatures and the dry periods are not suitable for fine and soft fibre production, while clay soils in the North of Italy might allow a fast and high biomass production with a high risk of logging and poor fibre quality.

In order to solve the above mentioned problems, it is important to choose an appropriate location and to sow the crop in the most favourable season to avoid dry periods.

Kenaf

Field experiment results enabled to outline a general technique for kenaf cultivation in Italy, notwithstanding some problems along the whole production chain seem unresolved.

Considering the cultivation, one of the major problems is still the availability of seed lots of cultivars suited for Italian environments. Moreover seed lots have usually poor germinability and low germination power.

The availability of well adapted genetic material is also important to solve some of the problems related to harvesting and storage. In order to decrease transport costs and to improve its storability, kenaf, as well as other biomass crops, should have a low water content at harvest time, otherwise it should be dried artificially or in the field. The first solution is generally too expensive, the second could be possible with short-cycle varieties.

Compared to hemp, kenaf is more sensitive to low temperatures and to water shortage. This second point is however linked to the first as hemp can be sown earlier compared to kenaf and it can take advantage of more humid periods.

2.3. Environmental

For the agricultural phase of fibre crops, there are no environmental problems. Indeed, for some of their the cultivation has a positive environmental impact. Problems arise, however, from the polluting discharges of paper pulp factories. Less polluting process (i.e. NACO) are still very expensive.

2.4. Legislative issues

Hemp cultivation is still problematic due to the difficult application of the law which rules the cultivation of species bearing psycho-active compounds.

Fibre hemp is very similar to drug hemp and the official organs in charge of controlling the cultivation can be led to mistakes. A strict application of the law might cause serious problems to farmers which would be considered guilty till the THC analysis would prove the contrary.
Each crop would need special fiscal advantages in order to develop.

Hemp

If industrial and commercial problems were the main causes for hemp cultivation to be abandoned, legislative issues should be addressed as the first responsible for the difficult reintroduction of this crop.
In Italy, hemp regulation is still very confused. The law does not clearly distinguished fibre hemp from the drug. Furthermore it is not clear which public institution is in charge for controlling the hemp cultivation, and what kind of safety measures should be followed by farmers in order to avoid justice problems. The first attempt to reintroduce hemp in 1998 clearly showed all the above mentioned problems, and few farmers had to face justice courts to defend their position as fibre hemp growers.
Even though in the future hemp regulation could be finally defined, the ambiguity between fibre and drug hemp will probably continue and police controls might represent a limiting factor to the expansion of this crop.

2.5. Economic issues

The whole fibre crops production chain should involve more directly the end user. The "ecological" face of the crop should be taken in higher account in order to calculate costs and to define prices.

3. PRIORITISATION

Major points to be taken into account to favour the development of the production chains are:

- To have a closer relation between demand and offer of agricultural products in order to determine a reciprocal commitment to deliver and buy the goods at a fixed price and in fixed quantities.
- To make the consumer aware of the ecological value of natural production chains.

- To create intermediate structures to stock the natural product and to carry out the first transformation.
- To improve the complete mechanisation of harvest for different products use.
- To improve the availability of genotypes adapted to different environmental conditions.

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Part III CARBOHYDRATE CROPS

1. Opportunities

In Italy crops exploitable as carbohydrates sources are: cereals, sugarbeet, and potato. Cereals globally about 60% of the Italian arable surface; sugarbeet (280,000 ha) together

with soybean is the industrial crop with the highest importance, whereas potato (90,000 ha) is the second horticultural crop after tomato (over 100,000 ha).
The farming technique of all these species has been known for a long time, even if it is not sistematically applied, foremost with regards to small size farms and marginal areas. This explains the productive inequality not only between different areas (in particular North-South, level ground-hill), but also between each farm in the same area.
Starch with different destination is essentially obtained either from corn and wheat or rice, respectively in 3 big and 2 small starch processing industries all operating in the North.
Sugar, with almost exclusively a food destination, derives from sugarbeet.

1.1. Science and technology

The first chain ring (i.e. the primary production) connected to carbohydrates production has always been object of research in Italy. A very deepened and modern farming technique is available for carbohydrates crops assigned to the food sector, like winter and summer cereals, sugarbeet and potato. Nonetheless, such a technique is not always applied, especially in small farms.
On the contrary, sweet sorghum, inulin chicory and topinambur are relatively new and scarcely known crops.
Up to now, there have been only a experimental level and a first divulgative phase for these crops.
As for traditional crops, it must be remembered that normally cereals re-enter in two or four year rotations in the North, whereas they are often farmed in monosuccession in the South.
Sugarbeet is grown for 70% in the Po Valley, normally in 4 year rotations.
Potato is farmed exclusively for food use and it is divided into common and early potato. The latter is less fruitful but it can reach higher prices during the period it is on the market.

Traditional crops (cereals, sugarbeet, potato)

For the above mentioned crops, the non food destinations do not need techniques different from those applied to the traditional use. As for corn, in consideration of possible non food destinations, studies were carried out on the structural features of the starch, like granule morphology, molecular structure, relation between amilose and amilopepctine. The most productive commercialised hybridis were analysed in their characteristics, and the combined effects of genetic, environmental and technical factors were studied.

It seems unnecessary to deal with traditional crops, while it is proper to report some information about crops resulting new for the Italian environment.

Industrial chicory (Cichorium intybus L.)

It is sown in spring, and it basically prefers sandy soils, which allow on the one hand a good emergence, on the other an easy root extraction during the harvest. The best temperatures for the growth are 15-18°C; at 6-8°C the growth stops. Low temperatures at the initial phase can cause pre-flowering.

The farming technique is very similar to that of sugarbeet. It is different as for plant density (about 15 for m^2) and for sowing time (middle March in the Po Valley). This time comes early compared to that of the countries traditionally producers of chicory (Belgium, France, Holland).

The trials carried out in Italy demonstrated a root production of about 40-50 t ha^{-1} and with an inulin content of 15-17%.

Jerusalem artichoke (Helianthus tuberosus L.)

Different farming techniques with harvesting of both tubers and stalks were studied. The tubers harvested at an agronomic ripeness contain about 20% of dry matter (d.m.), 70-80% of which is made of inulin.

Near flowering time, stalks have a sugar content of about 50% of d.m.. In correspondence with tuber ripeness, the stalks have 90% of d.m. but a very low sugar content (only 5-8% on d.m.).

The yields vary from 20-50 t ha^{-1} of fresh tubers to 30-60 t ha^{-1} of fresh stalks.

Sweet sorghum (Sorghum bicolor L. Moench)

The stalk, up to 5.0 m high and with a basal diameter of 2-5 cm, inside hard bark contains a very sweet and juicy pith. The latter is made of soluble carbohydrates, glucose, saccharose and fructose, in the percentage of 8-12% on fresh matter and of 25-35% on d.m..

The concentration of non structural carbohydrates is linked to the biological phase. After flowering time, it increases the concentration of total sugars. From flowering to physiological ripening there is an decrease in glucose, fructose, and an increase in saccharose, the latter reaching the peak with vexing ripening. Total sugars are more concentrated in the middle part of the stalk, decreasing both upward and downward. Upside-down it is the concentration of the inverted sugars.

Biomass production is around 50 t ha^{-1}, with a sugar content of 14-15%, and therefore with a yield of ethanol around 45 hl ha^{-1}. Given hydric availability, in the South it was obtained up to 10 tonnes of fermentable carbohydrates.

It is a very fruitful species as for water use (evaporation and transpiration coefficient: 170-200 l kg^{-1}). Compared to corn, it requires less water, it loses a lesser quantity under stress, and it recovers faster after hydric stresses.

Sowing must be done between middle April and middle May. Early sowing would be proper given genotypes capable of low-temperature endurance during the early phases.

Row distance is of about 50 cm with a density of 10 plants every m^2. Waxing ripening is reached 100-140 days after sprouting, according to the cycle of the cultivar. Harvesting can be performed in September.

The harvesting method has a fundamental importance. As sugar is contained in the stalks, useless parts like leaves or panicles must be thrown away.

If the pith comes in touch with air, it ferments very quickly with consequent loss of sugars.

A solution is the carriage of the whole stalk so that the surface of contact between pith and air becomes the slightest. However, being the specific density of the whole stalk very low, the carriage results quite expansive.

A compromise is the employment of sugar cane harvesting machines. A reaping bar at the desired height eliminates panicles, while stalks are defoliated and fractioned in 30-40 cm wide portions. The product can be stored inside in September for no more than 3-4 days. Longer periods imply loss, as after 7-8 days it is lost 8-10% on the total content of sugar.

Alternative storing systems might be based on the production of juice to be concentrated.

Factors limiting a possible spread of these crops are:

- scarcely cold resistance during the initial phases of the cycle
- scarcely resistance to flattening
- the bulky volumes of mass to collect and carry together with its reduced preservable qualities.

1.2. Industry and market

As already said, in Italy the carbohydrates for non food or non energetic use are starch and in a much lesser way sugars. Starch is obtained from soft wheat and corn; sugar from sugarbeet.

Only three big starch processing industries (Cerestar, Rocchette, Sedamyl) are active using complexively 700,000 tonnes of grinded product (corn and wheat) a year. Besides them,

there are other two small ones processing rice (globally 80 tonnes). It must be underlined that Italy does not produce potato starch. In the EU the allowed share for the years 1998-2000 exceeds 1,864,000 tonnes.

The production is assigned for 40% to the food industry, for 30% to the paper industry, and for the remaining 30% to the hydrolyzed industry. Starch deriving from different crops have different features (tab. 34).

Table 34. Main features of starch deriving from different crops (source: Pedrina, 1996).

Features	Corn	Waxy corn	High amylose corn	Wheat	Rice	Potato
Granules size (micron)	8-25	8-25	8-25	8-40	2-10	40-180
Granules shape	poligonals	poligonals	poligonals	spherical	poligonals	ovoidals
Amylose/Amylopectin (%)	spherical	spherical	spherical	elliptical		24/76
Gelatinisation temperature °C	s 26/74	s 1/99 58-70	s 75/25 130-140	s 25/75 61-78	17/83	56/69
Starch water appearance	62-74	transparent	opaque	52/64	opaque	transparent
	opaque			opaque		

Non food sectors for the use of starch products are numerous. From the most traditional ones like paper and paper pulp industry or pharmaceutical and textile industries, etc., to the most innovative like that of the biodegradable plastics. Starchy raw materials can replace petrolchemical products in the fermentative processes to obtain alcohol, aldeids and ketones.

The use of starch for biodegradable plastics is a very brilliant goal as the piling up of practically undestroyable plastic waste is a very difficult problem. The piling up of plastics is almost exponential, as their average life is of many centuries.

In order to ensure biodegradability, it is necessary pure starch, and therefore a strong decrease in the cost of both raw material and industrial process is fundamental.

The first generation biodegradable plastics incorporate 5-15% of starch. They are photodegradable and chemodegradable with a slow but ongoing improvement of their features.

New ways are studied in order to obtain thermoplastic starches characterised by the union, at a molecular level, of starch with fast and completely degradable synthetic polymers or with biopolymers. However, at present these solutions seem very expansive. At the same time, it seems impossible to replace plastics with other packaging materials, as there would be an increase in the consumption of paper and paper pulp by 54%, of glass by 21%, and of metals by 23%. The

production energetic costs would double, and the waste bulk would increase by 250% in volume and by 400% in weight.

Italy is a great producer of plastics polymers, and with a yearly potentiality of 4 million tonnes it ranks itself at the fourth place in the world after USA, Japan, and Germany.

Among urban solid waste, plastics represent a continuously increasing percentage, by over 15% in weight and by over 25% in volume. At present, it is reckoned that plastic waste is piled up in dumps for 70%, burnt down for 20%, and recycled for only 10%.

The burning down of plastics, resulting interesting for their high caloric power (30-40 MJ kg^{-1}), is dangerous for the emission of dioxine and cadmium in the atmosphere, mainly because of the combustion of PVC.

Recycling results extremely complex because of the difficulty to organize a separate collection of rubbish, which can turn the costs for raw material uneconomical.

From the above drawn picture, it becomes clear the great interest in the use of starch to produce biodegradable materials.

Some materials have been already put on the market, among which Mater-B made by Novamont. The applicable range is very wide, but at the moment the possibilities of development are limited due to higher costs compared to the synthetic homologues. More favorable results a niche market with specialist uses, like surgery or pharmaceutics ones, characterized by a high added value.

Together with the use of starch expressly made, other projects are in progress, like "New raw materials from agricultural residuals and industrial emissions" (Life 1995/IT/A13/IT/393/VEN).

From the vegetable leftowers of food stoofs as exhausted sugarbeet pulp; from the remains of squeezed citrus fruit; from corn-flour processing residuals (bran, cob, leaves and stalk or leftowers of grape pressing) are obtained raw materials capable of replacing equivalent parts of cellulose fibres to produce papers and cardboards.

Polymers market (up to 2000 t $year^{-1}$) for packaging is potentially highest but it depends on political decisions.

Maize and wheat starches are mainly used for their good degree of extractability (maize 65%, wheat 50%).

In Italy, sorghum starch is not used; the degree of extractability and the size of the starch grain are similar to those of maize, but the residual concentration of proteins is different.

By fermentation of molasses and/or glucose derived bulk chemicals, like organic acids (citric, lactic, itaconic) and amino-acids lysine, serine, histidine, tryptophane, monosodium glutamate.

Citric acid is the most important compound in the detergent sector and lactic acid is required for hygienic purpose.

Surfactants and thensioactive biodegradable products will have an increasing market demand. Sugarbeet and wheat may be used to supply the necessary raw materials.

Starch use perspectives are good as for the technical aspects, although in general synthetic products are still the cheapest alternative.

In all the 5 categories of the use of starch and its derivatives (auxiliary materials, primary raw materials, functional additives, components, active materials) innovative aspects have been set up. In particular, several patents, both on product and process, have been presented for the category of the functional additives.

Sucrose from sugarbeet is utilized primarily in the food sector. It is foreseen that sucrose will be increasing by used also with regards to non food sector. In fact sucrose can be chemically changed into many other products, but the current market makes costs prohibitively high.

Sucrose could be used in production of polymer plastics, surfactants or even drying oils. The whole sector depends on costs.

In Italy , the sugar industry plays a very important role. Although it is formally divided into 10 societies, it is in fact represented by 3 big industrial Groups (Eridania Béghin-Say, SADAM, and SFIR) and a Cooperative (CO.PRO.B.)

Sugar mills are globally 23 but the trend is towards a reduction in order to foster an increase in the daily working power (tab. 35).

Table 35. Development of surfaces, productions, yields, consumption, etc., in Italy (sources: ISTAT, ANB, Assozucchero and MiPA).

Years	Surface	Production ($t \times 10^3$)		Yields ($t\ ha^{-1}$)		Polari-zation	Campaign's length	Active sugar factories	Daily capacity	Industrial yield	National consumption	Pro-capita yearly
	(ha)	roots	sugar	roots	sugar	(%)	(d)	(n°)	($t\ 10^3$)	(%)	($t \times 10^6$)	(kg)
1960-64	216,496	7,302	914	32.7	4.8	14.9	52	78	1.8	80.4	1.1	23.1
1965-69	274,295	10,866	1,276	36.1	5.2	14.3	60	77	2.3	79.2	1.3	25.5
1970-74	235,180	8,965	1,116	38.1	5.6	14.8	59	60	2.6	79.6	1.6	29.6
1975	261,742	12,086	1,474	46.2	6.3	13.6	66	54	2.6	78.9	1.5	26.0
1976	293,696	14,849	1,613	50.6	6.7	13.1	90	51	2.6	82.4	1.6	28.7
1977	242,552	11,018	1,246	45.5	6.1	13.5	59	51	2.6	84.1	1.6	28.0
1978	255,472	11,084	1,500	43.4	6.8	15.8	57	50	2.6	85.9	1.6	28.7
1979	274,871	12,964	1,563	47.2	6.8	14.4	78	49	2.6	83.6	1.7	29.9
1980	282,378	13,241	1,779	46.9	7.4	15.7	68	49	2.6	85.5	1.8	30.6
1981	319,908	17,339	2,048	54.2	7.5	13.8	87	47	2.6	85.4	1.8	30.5
1982	256,000	11,055	1,180	43.2	5.6	13	67	45	2.6	82.4	1.6	28.5
1983	220,000	9,770	1,244	44.4	6.7	15	51	38	2.3	84.9	1.6	28.2
1984	215,290	11,182	1,275	51.9	7	13.5	71	38	2.3	84.7	1.6	28.1
1985	221,271	9,212	1,242	41.6	6.7	16.1	46	40	2.3	83.9	1.6	29.0
1986	301,257	14,729	1,719	48.9	7	14.3	66	39	2.5	81.9	1.5	27.3
1987	295,639	15,137	1,718	51.2	7.4	14.4	75	36	2.6	78.8	1.6	28.0
1988	244,177	13,106	1,480	49.6	7.3	14.7	64	33	2.6	76.8	1.5	26.4
1989	288,973	16,553	1,729	57.3	7.4	12.9	76	33	2.6	81.3	1.6	27.5
1990	270,107	11,629	1,458	43.1	6.6	15.4	57	31	2.6	81.2	1.7	29.5
1991	259,480	11,380	1,509	43.9	6.9	15.8	61	29	2.3	84.0	1.7	29.0
1992	292,203	14,692	1,869	50.3	7.7	15.3	90	25	2.1	82.9	1.6	28.0
1993	255,872	10,576	1,414	40.4	6.4	15.8	66	24	2.2	85.5	1.6	27.2
1994	285,211	11,905	1,492	41.8	6.2	14.9	71	23	2.2	83.7	1.5	27.1
1995	291,139	12,940	1,491	45.3	6.2	13.6	80	23	2.2	85.1	1.5	26.5
1996	253,275	11,348	1,435	45.5	6.7	14.8	79	23	2.7	85.5	1.5	25.7

With regards to the market, starch processing industries buy cereals according to periodic bargaining both for national and foreign products. As to sugar, sugar industry buys on the contrary only nationally produced sugarbeet roots according to strictly defined contractual regulations. The latter are previously discussed between industries and the sugarbeet farmers' Associations and with the commitment of the MiPA.
Contracts define the product characteristics, on the basis of which the price is determined.
The product qualities are defined in discussion between industry and farmers in laboratories recently improved and renovated.

1.3. Environmental

In Italy, the carbohydrate sector does not present problems different from those of other countries.
Considering starch, processes are strictly within closed cycle, therefore reducing to the slightest any pollution problems.
Molasses dumping imply the mandatory use of basins next to every sugar factory. In the same way, the restitution soil is heaped near the sugar factory so to prevent the spread of nematodes and rizomania.
As to farming techniques, in the recent years both for cereals and sugarbeet there has been a reduction in the average amount of nourishment, in particular nitrogen and phosphor, due to the rationalization of the spreading technique.
Accordingly, there has been a lowering in the amount of weeding active principles by applying reduced doses fractionated in time.
The possibility to use genetic material endowed with tolerance and endurance has allowed also a reduction in the use of pesticide.
This goal has been reached also owing to an overall control on the efficiency of the pesticide spraying machines.

2. BARRIERS TO PROGRESS

2.1. Scientific and technical

Research on this kind of crops is well advanced and with remarkable connections at an international level. Technical progress is continuous. In Italy, it is necessary a more

widespread and specific assistance to farms, thus allowing many marginal situations to reach the same level of those farms enjoying a sufficient technical assistance. This will be realized with a more widespread use of computer technology all over the territory.

O.G.M. are at an experimental phase on corn and sugarbeet.

The use of sorghum to obtain starch might represent an innovative factor. Indeed, as sorghum can be grown also in conditions of water shortage- differing in this from corn- crops for starch will be possible also in the South, where starch processing farms might be activated, too. From this point of view, other complementary uses can be remembered, like isoglucose, etc..

3. PRIORITISATION

- Decreasing of costs production in the agricultural phase.
- Developing of processing technologics which reduce costs.

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Part IV CROPS WITH SPECIALIST USES

1. Opportunities

In the last years, the change of agricultural policy combined with a general need for safer products, a consequent diversification of actual cropping systems, and the environmental concern have brought about an increasing interest for minor crops. These could be either old crops which were abandoned, or tropical and sub-tropical species, but also traditional crops which can be grown for new purposes.

Obviously, the market of these "niche" crops is extremely heterogeneous as well as the different aspects which regard their production.

Some of these crops have already a market and an efficient production chain, others have been preliminarily investigated but they are not commercialised yet, some others are still tested in field trials. Concerning all the crops to be introduced and therefore preventively evaluated, among the problems to cope with there is on the one hand the great genetic variability connected to origin and provenience, on the other the difficulties to get the very same germoplasm.

1.1. Science and technology

In the last years, crops for special uses have been studied mainly in the frame of two Projects: PRisCA (Research Project on Alternative Crops) of the Italian Ministry of Agricultural Politics and ABSOV (Biological Activity of Substances of Vegetable Origin) of the Italian National Research Council (tab. 36).

Some sub-unit of the PRisCA Project studied in particular biocide crops, sweetening crops, dyeing crops, crops for resins and gums and multi-use plants.

In the frame of ABSOV, plants with biocide, anti-mycotic, anti-microbic and anti-oxidant activity were studied. Field trials were set up to determine crop yield and content of active compounds. Besides, laboratory tests were carried out to determine the activity of plant compounds.

Table 36. Some information about niche crops (source: Results of PRisCA Project).

Usual name	Latin name	Economip roduct	Cycle	*Requirements*		Genotype availabili ty	Yield range	*Feasibility*		*Industrial* use	*Areas*	
				thermic	hydri c		(t ha^{-1})	farming techniq ue	mechani -sation		cultivated	suggest ed
Woad	*Isatis tinctoria* L.	leaves	A	m, l	l	l	50-60°	a	ip	p		N-C
Oil radish	*Rafanus sativus* L.	biomass	A,S	m	m	m	5-15°	a	a	r	N-C	N-C-S
White mustard	*Sinapis alba* L.	biomass	A, S	m	m	m	6-18°	a	a	r	N	N-C
Marigold	*Tagetes* spp.	root	S	m	m	m	(?)	a	a	r		N-C-S
Industrial chicory	*Cichorium intybus L.*	roots	A, S	m, l	m	m	30-45°	a	ip	r		N-C-S
Liquorice	*Glychyrrhiza glabra L.*	roots	W,	m, h	l	l	12-20°	ip	na	r	C-S	C-S
Stevia	*Stevia rebaudiana* Hemsl.	leaves	S	m, h	h	l	2.0-3.0+	a	ip	p		S
Jerusalem artichoke	*Helianthus tuberosus* L.	tubers, steams	S W,S	m, h	m, h	m	20-50° 30-60°	a	ip	r		N-C
	Cyamopsis tetragonoloba	seed		h	h	l	(?)	ip	ip	p		S
Cluster bean	Tanb. L.	biomass	S	l, m	h	l	0.5-2.0	ip	ip	p		S
Guayule	*Parthenium argentatum* Gray.		S				(rubber)					
		fruit	S	m, h	h	l	10-15# 30-50*	a	ip	r	S	N-C-S
Sponge	*Luffa cylindrica* (L.) M.J. Roem											

Sowing: autumnal = A; spring = S; winter = W
Thermic and water requirements: high = h; medium = m; low = l
Feasibility: available = a; in progress = ip; not available = na
Industrial use: real = r; potential = p
° Fresh biomass

+ Dry matter
# Without support
* With support
Areas: North = N; Centre = C; South = S

Biocides crops

Referring to the eight major crops in the world, it was estimated that on an average pests, weeds and parasites reduce production by 42%. Without the different means of crop protection, the losses would be much higher, up to 70%. Chemical products represent an important resource to control many pathogens and diseases, but their impact on the environment, on the animals and finally on the human being has to be taken in great consideration.

Recently, the consciousness of the damages on the environment and ourselves caused by the large use of chemical products has induced researchers to study alternative forms of crop protection.

Different natural means of defence are known to be present in many species. Some plants are able to change pH, osmotic pressure and chemical composition of certain tissues in order to fight parasites. Some secondary chemical products are present in every species, i.e. phenol, others in thousands of species, i.e. alkaloids, some others only in few species, i.e. glucosinolates.

Glucosinolates are a class of about 100 glicosidic compounds, they are mainly present in the *Cruciferae* family, and they can be considered among the most interesting active compounds for the Italian environment.

The biocide action might be released either by man, after extraction of the active principles to be used against insects and fungi, or directly, growing plants with a high content of glucosinolates on the infected soil. An example of the latter is the use of oil radish or white mustard to control the nematode *Heterodera schactii* which affects sugarbeet in many Italian areas.

The biocide species which could be used in Italian environments are only in an early phase of introduction (about 2,000 ha have been tried in rotation with sugarbeet). In this phase, research is involved either on the agronomic aspects of biocide plants cultivation or on the activity and potential use of biocide principles.

Woad (*Isatis tinctoria* L.)

The woad is well know has a dyeing plant (see). Recently, it has been tested for its biocide properties, due to the presence of glucosinolates in every plant portion.

The agrotechnic of woad is quite simple. The soil has to be laboured at 40-45 cm of depth to allow a good growth of roots; 50 kg ha^{-1} of N, 70-80 kg ha^{-1} of P_2O_5 and 40-50 kg ha^{-1} of K_2O should be provided to the crop. Sowing should be realised in rows distant 30-35 cm with 1 plant every 8-10 cm. Sowing time could be either mid-October or end of February-

beginning of March. In the first case the plant has to be ploughed in April-May when it is in full blooming or anyway before the phase of seed maturity in order to avoid woad seed to fall on the soil. In the second case the crop will bloom only in the next year, therefore the leaves could be harvested in different cuttings and used to extract indigo, except for the last cutting which will be left for plough in. The possibility of growing woad as a dual purposes crop is also suggested by the fact that the main biocide activity against nematodes is performed by the roots.

Woad can yield up to 50-60 t ha^{-1} of root to plough in and 40-50 t ha^{-1} of leaves for indigo extraction.

Oil radish (*Raphanus sativus* L. var. *oleiformis* (Pers.)

Oil radish has been recently studied as a potential “bait” crop for the nematode Heterodera schachtii which affects sugarbeet production in most of the Italian areas where this crop is grown. According to Muller and Stendel, oil radish cultivars have been classified on the basis of their tolerance to the nematodes; many cultivars available on the market can reduce the nematode’s population by 70-90% (class 2).

The results of field experiments carried out in Italy pointed out that two different agrotechnics could be followed to grow oil radish in Italian environments.

In the first case, oil radish could be included in actual cropping systems where sugarbeet and wheat are also present. Oil radish would be sown in July immediately after wheat harvest. Wheat rests and possible straw have to be chopped up and ploughed in together with 50-100 kg ha^{-1} of nitrogen to favour the humification of wheat residues; potassium and phosphorus could also be included for the sugarbeet crop of the following year.

All these operations have to be carried out immediately after wheat harvest in order to sow oil radish as soon as possible. The main problem of this technique is the lack of rain in July and consequently the difficult if not impossible germination of the "bait" crop. An irrigation of 30 mm would be suitable but not economically convenient.

Oil radish is usually harvested at flowering, therefore 5-6 week after emergence, with an average production varying from 5 to 15 t per hectare. The crop can either be plough in or removed to be employed in combination with other forrage crops as animal fodder.

The economical and agronomic advantage of oil radish sowed before sugarbeet is however quite limited. During field experiments, a significant difference between the ploughing in of oil radish and its removal on soil characteristics was not reported. Moreover, comparing the traditional deep labour carried out after wheat harvest and preceding the sugarbeet one with the above mentioned cultivation of oil radish, a large effect on soil structure was never reported. Anyway, the cultivation of oil radish was always positive for the production of sugarbeet, but to a larger extend when the infestation of nematodes in the soil was higher.

The cost of oil radish, as inter-crop between wheat and sugarbeet, is however totally paid back by the increase of sugarbeet production when the level of nematodes in the soil is quite high (1000 egg - larvae per 100 g of soil).

In the second case, oil radish can be grown on the land put in set-aside. In this situation the economical balance is much more favourable, in fact the "bait" crop can be sown earlier and can germinate without irrigation; apparently it doesn't need fertilisation (in case of heavy spring rains 50 kg ha^{-1} of nitrogen can be provided to the crop) and soil labour can be reduced to a minimum tillage. The crop is usually harvested and ploughed in 50-60 days after emergence.

The possibility of growing oil radish in winter sowing (September-October) before spring crops like maize, sorghum, soybean, sunflower etc. is actually under investigation. Main problems of this technique are the tolerance to cold of oil radish and its effectiveness on the nematodes over the winter.

In the last years, the possibility of extracting glucosinolates from the plant in order to spread them directly on the soil have been investigated.

White mustard (*Sinapis alba* L.)

White mustard is grown for the oil, as animal fodder and as green manure. Recently, it has mainly been studied for this last destination. It is known as insect repellent and especially for its capacity of reducing the nematode *Heterodera schachtii* in the soil. For these reasons it is grown in areas where sugarbeet is cultivated, either as inter-crop or as main crop in land put in set aside. Also for White mustard, many cultivars available on the market can reduce the nematode's infection. Regarding the agrotechnique, mustard has more or less the same needs and characteristics of oil radish (see), but on average it has proven to be less affective in controlling the nematode.

Marigold (*Tagetes* spp.)

Tagetes it is a wide gender which includes about 50 species all original of Central America. It was imported in Italy in the XVI century as ornamental plant. Nowadays, it is studied for some active compounds which are effective against parasites and pathogens.

Marigold is usually sown in controlled environment and then transplanted in the field. Due to its capacity of regrowth it can be harvested many times, and according to the climatic conditions harvest can be carried out from August till November. *Tagetes erecta* produces 20 t ha^{-1} of fresh capitula while *T. patula* about 15 t ha^{-1}. In recent experiments carried out in the North of Italy *T. erecta* produced up to 40-50 t ha^{-1} of capitula in many subsequent harvests (up to 6 for certain genotypes).

The biological activity of marigold's extracts is due to the presence of tiophens (extracted from the roots) whose activity is reported on many parasites and pathogens like *Pratylenchus penetrans* which affects artichoke, *Ditylenchus* on strawberry and also on *Musca domestica*, etc.. An extract of the leaves is repellent for *Aphis craccivora*. The efficacy of *T. erecta* essential oils are proven on some fungi like *Fusarium solani* and *Aspergillus* spp.. Some flavonoids present in the capitula are interesting for pharmaceutical purposes.

Dyeing plants

Recently, the interest for vegetable dyeing plants has been growing thanks to either an expansion in the traditional sectors, the prospect of new employments, and the consumer trend towards environmental friendly products.

The interested industrial sectors are foremost the food, textile, cosmetic ones, and, more recently, the one regarding ceiling paints in the building trade.

Both in the cosmetic and textile fields the vegetable dyes should contribute to the reduction of allergies and of the refluent water pollution caused by synthic dyes-employing processes. The current dyes in the building paints are a polluting cause and sometimes might result dangerous for both the dwellers and the manufacturers (Mosca, 1998).

Presently, the regulation does not distinguish between natural and synthetic dyes considered therefore equivalent.

The EU regulation is acknowledged in Italy without particular changes (Carinelli, 1998). In particular:

- for the food sector: rule CEE 94/36 of 30.06.94, acknowledged with D.M. 27/02-96 n. 209, suppl. G.U. 24.04.96
- for the cosmetic sector: rule CEE 76/768 of 27.07.76, acknowledged with rule 713 of 11.10.86
- for the pharmaceutical sector: rule CEE 78/25 of 12.12.77
- for the zootechnical sector: rule CEE 70/524 of 23.11.70, acknowledged with D.P.R. 228 of 01.03.92.

In Italy the synthetic dyes are imported for over 5 billions Euro and exported for almost 1 billions Euro, resulting in a negative balance of over 4 billions Euro. It is really less important the economic role of natural dyes. The volume of trade in physical terms is of about 6,200 tonnes for a value of over 18 millions Euro.

The vegetable pigments represent 95% of the physical trade and 91% in economic terms, with a trade surplus of about 9 millions Euro.

The Italian consumption of vegetable dyes keeps increasing especially in the food industry for cheese, yogurt, margarine, ice-creams, sauces and marmalades (for a total amount of over 5,000 tonnes, 35% of which of natural origin) and in the wide-spread drink sector. Also the niche sectors are expanding like the cosmetic, pharmaceutical, textile and building ones.

The most used dyes are the yellow and red ones, the employment of which will be respectively of 2,130 tonnes and 900 tonnes in the 2000.

By 2000, the request for natural dyes should be of 2,540 tonnes, for an amount equal to 50% of the totality of the food demand.

Dyeing plants of a certain interest are numerous, particularly *Isatis tinctoria, Tagete* spp., *Carthamus tinctorius, Calendula, Reseda luteola, Rubia tinctorum*.

In Italy a remarkable research activity has been realized on the genetic material of many species for the adaptability to different areas (tab. 37), and on the main aspects of cultural techniques as for the species of major interest. To the interest shown by different sectors only sporadic and limited initiatives have followed.

Crops for resins and gums

The world production of natural gums is practically entirely covered by the cultivation of one species, the *Hevea brasiliensis*, which is a tropical species and therefore can be grown only in a limited environment. This situation has always been considered strategically dangerous either because the main countries consumers of gum are in a condition of completely dependence, or for the fact that the whole sector depends on a single specie which could be severely affected by specific diseases.

Notwithstanding the situation has been changed since the synthetics gums were produced, it seems advisable to carry out research on alternative gum crops.

In Italy, two potential gum crops have been recently studied: cluster bean and guayule.

Cluster bean (*Cyamopsis tetragonoloba* (L.) Taub.)

In Italy it could be grown only in the South where, starting from June, the weather conditions are suitable for its germination.

Table 37. Some information about dyeing plants (source: Results of PRisCA Project).

Usual name	Latin name	Economic product	Cycle	*Requirements*		Genotype availability	Yield range	*Feasibility*		*Areas*	
				thermic	hydric		(t ha^{-1})	farming technique	mechani-sation	cultivated	suggested
Amaranth	*Amaranthus tricolor* L.	leaves	S	h	h	l	(?)	a	ip	N-C-S	C-S
Red Beet	*Beta vulgaris* L. (var.	root	S	m	m	m	20-50°	a	a	N-C-S	N-C-S
Marigold	*rubra*)	capitula	S	m	m	m-h	1.5-2.0+	a	ip	N-C-S	C-S
Golden	*Calendula officinalis* L.	capitula	S	m	h	m	1.5-2.0+	a	a	-	C-S
Marguerite	*Anthemis tinctoria* L.	flowers	S	h	h	l	(?)	ip	na	-	S
Roselle	*Hibiscus sabdariffa* L.	flowers	A-S	l	l	m	0.5-0.9+	a	na	S (*)	C-S
Safflower	*Carthamus tinctorius* L.	leaves	A-S	m	h	m	40-50°	a	a	N-C	N-C
Red Cabbage	*Brassica oleracea* L. Thell.	fruits	S	l	m	l	5-8+	a	na	(X)	N
Pokeberry	*Phitolacca americana* L.	leaves	S	m	m	m	40-50°	a	a	-	N-C
Woad	*Isatis tinctoria* L.	leaves	P	h	h	l	0.5-1.2°	na	na	-	S
Henna	*Lawsonia alba* Lam. et *L.*	(1)	P	m	m	l	0.3-0.5+	ip	na	-	N-C
Florentine Iris	*inermis* L.	rhizome	-	-	-	-	-	-	-	N-C	N-C
Stinging Nettle	*Iris pallida*. Lam.	leaves	S	h	h	l	4-5+	ip	na	-	S
Eastern Knot-	*Urtica dioica* L. et *Urtica*	leaves	P-A	h	m	l	1-4+	ip	ip	-	C-S
Grass	*urens* L.	whole	P-S	m	m	l	3-4+	ip	ip	-	C-S
Weld	*Polygonum tinctorium* Ait.	plant	A-S	m	m	h	(?)	a	a	-	N-C-S
Madder	*Reseda luteola* L. et *Reseda*	root	S	m	m	h	15-20°	a	ip	N-C-S	C-S
Spinach	*lutea* L.	leaves	P	m	m	m	(?)	ip	ip	(X)	N-C-S
Marigold	*Rubia tinctorium* L.	capitula	S	h	m-h	l	4-5 t°	a	ip	N-C-S	C-S
Pissabed	*Spinacia oleracea* L.	leaves					10-15			-	
Saffron	*Tagetes* spp.	(2)					kg°			C-S	
	Taraxacum officinale Weber	capitula									
	Crocus sativus L.	stigma									

Sowing: autumnal = A; spring = S; winter = W P = Pluriennal

Thermic and water requirements: high = h; medium = m; low = l
Feasibility: available = a; in progress = ip; not available = na
° Fresh product
+ Dry matter product
(*) For oil
(x) Orticole
Areas: North = N; Centre = C; South = S
(1) and stems; (2) and root

Being part of the *Leguminosae* family, it can fixate the atmospheric nitrogen, thereafter it does not need nitrogen fertilisation when its specific bacterium has been inoculated.
It can be easily included in the actual crop rotation. Moreover previous experiences proved that it can improve the production of wheat, while in India it is used in arid and semi-arid climate to preserve soil conditions and to prevent erosion.
The gum, whose presence in the seed varies between 19% and 43%, can be used in different industrial processes as condensator, binder, flocculant, lubricant and filtrant.

Guayule (*Parthenium argentatum* Gray)

Guayule is one of the most interesting crops to substitute *Hevea brasiliensis*. It has been grown world-wide, in particular in pre-war and war periods when the exchange of goods with the main producers of natural gums were difficult if not impossible. In 1944, 600 ha of guayule were grown in the South of Italy (Cerignola - FG) to face the lack of import due to World War II. After the war, the guayule production was completely ceased and only recently some fields experiments were carried out on this crop.
Due to its poor germination, guayule is usually sown in controlled environment and then transplanted in the field. Frequent irrigation is necessary to allow a good establishment of the young plants. On the contrary, during the growing period water should be supplied (from 650 to 1500 mm, according to the irrigation method) in long irrigation cycles because short periods of water stress increase the gum production.
After 3-5 years the crop can be harvested following two methodologies. In one case the whole plant is uprooted and this gives the highest yield, otherwise the plants are cut at 5 cm from the soil. This second methodology yields 30% less but allows for another harvest in 2-3 years time without the expenses of another plantation.
Main raw material provided by the plant is the gum which is very similar to the one extracted from *Hevea brasiliensis*, and thereafter can be used in the industry of tyres. The largest percentage of gum is accumulated in the main branches and roots. Falls and especially winter are the periods of maximum gum production. Its maximum production can reach 2.5 t ha^{-1}.
On the contrary the resin is accumulated in the small branches and its production doesn't vary along the year. On average the resin content of the whole plant is 7-8 %.
Guayule leaves contain 2.5 % of wax, which has a high point of fusion (75°C).

Multi-use crops

Smooth loofah (*Luffa cylindrica* (L.) M.J. Roem. = *L. aegyptiaca* Mill.)

Smooth loofah is cultivated in Asia, Africa and South America where it is used either for human consumption or especially for its fibre.

Some experiments were carried out in the North and in Sardinia to test the adaptability and the potential yield of this crop in different Italian environments.

In the North, sowing with seeds can take place in April-May, plantlets can be transplanted in May. The crop can be grown either on soil or on supports. This second technique allows higher yields (30-35 t ha^{-1} on average and 50-60 t ha^{-1} as a maximum; only 10-15 t ha^{-1} when the crop is grown without support). The water need of the crop has been calculated to be approximately 1000 m^3 ha^{-1}.

The advantage of growing smooth loofah on supports does not stand only on the higher production but also on the quality of the fruits, which are usually longer and well shaped.

A good crop of loofah can produce 0.6-0.7 t ha^{-1} of seeds.

After harvest, the fruits are peeled with special machines and then washed to remove rests of mucilage and the seeds. The fibre is composed by 60% cellulose, 30% emicellulose and 10% lignin and can be used by the industry in different ways: as packing material, to built phono-absorbent and thermo-isolate panels, as a filling material for couches, as a sponge for cosmetic purposes, in agriculture as substrate for hydroponics cultures.

Recently, researches have been carried out to study the biological activity of certain compounds present in the seed and which seems to have a high anti-cancer activity.

Smooth loofah is also used as a food. In Asia and Africa leaves, flowers and young fruits are used in special dishes.

Other crops

It was also carried out a study concerning the biological activities of substances of vegetable origin (ABSOV, CNR).

Species belonging to the families of *Brassicaceae*, *Capparidaceae* and *Resedaceae* were taken into consideration.

The factors analyzed concerned adaptability, cycle and phenophases, productive potential, essential oils content in the different parts of the plants sensitivity to pests and diseases.

It was managed to set up methodologies for estraction, analysis and characterization of the active principles.

The effects of the different active principle were studied following different goals in order to detect the best methodological mix for the most fruitful answer.

The herbicide effects of some glucosinalates were found in connection with the limitation of both germination and vigour of some pests. The fungicide (antimycotic) activity of essential oils is limited by the extreme volatility. It is of more interest the inhibiting effects towards microbiotic strains like *Streptococcus, Lactobacyllus* and *Henterococcus*, or those stocks like *Ervigna*, *Xanthomonas* and *Agrobacterium* and towards some kinds of yeast. In particular the oil of *Santoreggia* seems to inhibit some kinds of mutageneticity.

There is a study in progress about certain metabolites which might give interesting directions on the new potential uses of non food crops.

Naturally it is a matter of limited niches.

2. BARRIERS TO PROGRESS

Until now, all the above mentioned crops have been considered mainly in the frame of research projects. However, some small scale cultivation have been started (i.e. oil radish before sugarbeet or loofah for small industries).

Barriers of technical, scientific and economical nature still exist for most of these crops.

Rules and laws on the cultivation or transformation of these minor crops are totally lacking while environmental barriers seem not to be a problem.

3. PRIORITISATION

More research should be carried out on these crops. The knowledge already available should be extended to farmers and small industries.

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EXECUTIVE SUMMARY

This report, which does not consider energy producing destination, has been divide into five parts: general, oil, fibre, carbohydrates, crops with specialist uses.

Focus for each group of crops has been:

- opportunities in science and technology of primary production, industry and market, environment;
- barriers to progress;
- prioritisation.

The focus is on the aspects of the primary production of crops presumably directed to specific areas of the non food sector. For this reason, traditional and innovative crops for oil, fibre and special use are analyzed. As for carbohydrate crops, references are only to the innovative ones, skipping both cereals and sugarbeet, basic crops of the Italian agriculture, and potatoes, the destination of which keeps being almost wholly in the food sector.

In Italy there is a tradition for non food crops, specifically for fibres and to a minor extent for dyeing plants. These crops have almost disappeared, as they do not stand the competition of synthetic production.

Recently, a strong interest of the agriculture world has aroused for alternative crops. Also industry has shown a potential interest for vegetable raw material. However, some initiatives of a certain interest have been realized only in the oils field.

Contemporarily, national research projects, in particular those of the Ministry of Agriculture, and international ones allowed to evaluate a high number of species with different destinations. As for the new species, the evaluation has been on genetic material according to adaptability to different environments, resistance to adversities, productive level, and qualitative features.

The most important aspects of cultivation techniques have been set up for the most interesting species.

Notwithstanding the strong interest of the agricultural world and the know how provided by the research, non food crops haven't reached a remarkable position in Italy.

First of all, the chain lacks. The relations between farmers and industry are only occasional in several sectors or even conflictual rather than collaborative in others.

Basically, non food crops cannot provide yet the farmers with an income competitive with that resulting from traditional crops.

The industry is unwilling to face innovative initiatives and still prefers to turn to the cheaper international market for vegetable products, semi-manufactured and by-products.

In this situation, it becomes necessary to focus also on the environmental and human friendly aspects when replacing conventional or synthetic materials with vegetable ones.
In other terms, the start of non food production must be supported by an evaluation of the environmental added value.
In order to develop non food production it is necessary:

1. to complete researches on primary production connecting them to the industrial processing system
2. to know the real needs of industry as for the required qualitative features
3. to encourage links among agriculture, industry and consumer
4. to set for each kind of production qualitative standards and respective regulations
5. to take common legislative measures that support the development of non food crops considering either environment, human health and also the income of rural areas
6. long lasting measures for the removal of exention to support the start of the chains
7. the above mentioned measures must be set and realized at a collaborative national and European level.

Particularly, the Italian situation for the 4 considered sectors is the following.

Contraints and proposals regarding development of non food uses of oil crops in Italy.

Sector	Focus	Proposals
Scientific and technical	Primary production (sunflower, rape seeds, safflower, crambe, castor, brassica carinata)	- Improve genetic materials - Optimise agronomic production systems of minor species - Improve and ensure continuity of supply - Improve fatty acid profiles and other molecules of industrial interest
	Industrial processes and products	- Improve more efficient industrial processes - Extend uses in order to substitute fossil raw materials - Improve oxidative stability of oils - Improve process for new products
Environmental	Impact of activity	- Improve environmentally sustainable cultivation practices - Improve life cycle analysis of chain - Measure and standardise biodegradability and ecotoxicity
	GMO	- Avoid pollen transfers between crops
Economic	Primary production and industry	- Improve more economic production and logistic systems - Find markets for by-products
Legislative	European and national laws	- Improve legislation in order to standardise product qualities - Improve durable agricultural policy framework - Impose a mandatory use of biolubricants in sensitive areas - Found legislation in order to increase environmental value

Contraints and proposals regarding development of non food uses of fibre crops in Italy.

Sector	Focus	Proposals
Scientific and technical	Primary production (hemp, cotton, flax, kenaf and minor species)	- Improve genetic materials - Optimise agronomic production - Improve continuity of supply - Improve quality and reduce variability - Improve harvesting and fibre decortication technologies - Stimulate enterprises for first manufacturing at farming level
	Industrial processes and products	- Find new application areas for different fibre qualities - Improve logistics of processing chain - Optimise preparation of raw materials to the specific requirements of different applications - Improve by-products utilisation - Optimise conversion processes - Obtain materials with specific and stable characteristics
Environmental	Impact of activity	- Improve life cycle analysis of chain - Assess CO_2 balance of chain - Preserves biodiversity by means of diversification of crops - Preserves soil fertility by means of large rotations
Economic	Primary production	- Improve more economic production, harvest, transport, storage
	Industry	- Find markets for by-products - Find high added value markets - Optimise industrial process
Legislative	European and national laws	- Improve legislation regarding material standards - Measure and standardise raw material and final product qualities - Promote labelling of eco-friendship for final products - Promote defiscalization considering the environmental added value - Exclude fibre hemp from narcotics legislation - Found legislation in order to increase environmental value

Contraints and proposals regarding development of non food uses of carbohydrates crops in Italy.

Sector	Focus	Proposals
Scientific and technical	Primary production (traditional: cereals, sugarbeet, potato) (new crops: chicory, topinambur, etc.)	- Improve new quality of industrial interest (designer starches, etc.) - Improve genetic materials - Optimise agronomic production systems
	Industrial processes and products	- Improve integrated production and processing units - Improve new applications
Environmental	Impact of activity	- Improve environmentally sustainable cultivation and processing practices - Improve life cycle analysis of chain
Economic	Primary production and industry	- Find more economic systems - Find high added value markets - Find markets for by-products
Legislative	European and national laws	- Develop a durable agriculture policy and market contracts structure

Contraints and proposals regarding development of non food crops with specialist uses in Italy.

Sector	Focus	Proposals
Scientific and technical	Primary production	- Improve genetic materials - Optimise agronomic production systems - Study adaptability to specific environmental areas
	Industrial processes and products	- Improve production chain - Find new high added value applications - Investigate secondary metabolites
Environmental	Impact of activity	- Improve life cycle analysis of chain - Develop environmentally sustainable cultivation and processing practices - Improve benefits of biodiversity from new crops
Economic	Primary production and industry	- Study more economic cultivation processing and logistic systems - Find high value markets
Legislative	European and national laws	- Develop sustainable agricultural policy and trading framework - Improve legislation in order to standardise product qualities - Found legislation in order to increase environmental value

Table a. Area (ha x 10^3) of mains crops (source: ISTAT).

	average 1970-74	average 1975-79	average 1980-84	average 1985-89	average 1990-94	1995	1996	1997	1998
Cereals microtherms (1)	4,312	3,889	3,910	3,655	3,121	3,003	2,909	2,841	2,820
Cereals macrotherms (2)	1,111	1,126	1,172	1,046	1,115	1,215	1,303	1,298	1,222
Pulse (3)	458	281	225	175	133	98	70	66	69
Sugarbeet	243	276	288	284	281	283	273	288	277
Potato common	190	149	122	101	79	62	64	65	65
Soybean	-	-	12	343	328	195	223	294	351
Sunflower	10	26	57	109	136	230	248	239	233
Rape	2	1	1	19	11	46	65	68	64
Green crops* (4)	4,330	4,088	3,754	3,155	2,737	2,341	2,297	2,320	2,324
	347	387	408	402	411	405	342	349	425
Horticulture crops	?	?	?	?	?	403	474	472	445
Others	9,390	9,333	9,210	8,374	8,115	8,283	8,332	8,300**	8,300**
Total cultivated areas									

* Intercrops areas included.
** Estimated.
(1) Wheat, Barley, Rye, Common oat, Tritical.
(2) Maize, Rice, Grain sorghum.
(3) Broad bean, Common bean, Pea, Chickpea-Grasspearine, Lentil, Lupine, Common vetch.
(4) Temporary grassland, Leys.

Table b. Share of the cultivated areas (%) among the main groups of crops.

	average 1975-79	average 1980-84	average 1985-89	average 1990-94	1995	1996	1997	1998
Cereals microtherms (1)	41,7	42,5	43,7	38,5	36,3	34,9	34,2	34,0
Cereals macrotherms (2)	12,1	12,7	12,5	13,7	14,7	15,6	15,7	14,7
Pulse (3)	3,0	5,3	2,0	1,6	1,2	0,8	0,8	0,8
Sugarbeet	3,0	3,1	3,4	3,5	3,4	3,3	3,5	3,3
Potato common	1,6	1,3	1,2	1,0	0,8	0,8	0,8	0,8
Soybean	-	0,1	4,1	4,0	2,4	2,7	3,5	4,2
Sunflower	0,3	0,6	1,3	1,7	2,8	3,0	2,9	2,8
Rape	-	-	0,2	0,1	0,6	0,8	0,8	0,8
Green crops* (4)	43,8	40,8	37,6	33,7	28,2	28,0	28,0	28,0
Horticulture crops	4,1	4,4	4,8	5,0	4,9	4,1	4,2	5,1
Others	?	?	?	?	4,8	5,8	5,7	5,4
Total cultivated areas	109,6	110,8	110,8	102,8	100,0	100,0	100,0	100,0

* Intercrops areas included.
(1) Wheat, Barley, Rye, Common oat, Tritical.
(2) Maize, Rice, Grain sorghum.
(3) Broad bean, Common bean, Pea, Chickpea-Grasspearine, Lentil, Lupine, Common vetch.
(4) Temporary grassland, Leys.

Table c. Area's trend (1970-74 = 100) (source: ISTAT).

	average 1975-79	average 1980-84	average 1985-89	average 1990-94	1995	1996	1997	1998
Cereals microtherms (1)	90,2	90,7	84,8	72,4	69,6	67,5	65,9	65,4
Cereals macrotherms (2)	101,4	105,5	94,1	100,4	109,4	117,3	116,8	110,0
Pulse (3)	61,4	49,1	38,2	29,0	21,4	15,3	14,4	15,1
Sugarbeet	113,6	118,5	116,9	115,6	116,5	112,4	118,5	114,0
Potato common	78,4	64,2	53,2	41,6	32,6	33,7	34,2	34,2
Soybean	100,0	1,200,0	34,300,0	32,800,0	19,500,0	22,300,0	29,400,0	35,100,0
Sunflower	260,0	570,0	1,090,0	1,360,0	2,300,0	2,480,0	2,390,0	2,330,0
Rape	50,0	50,0	950,0	550,0	2,300,0	3,250,0	3,400,0	3,450,0
Green crops* (4)	94,4	86,7	72,8	63,1	54,1	53,1	53,6	53,7
Horticulture crops	111,5	117,6	115,9	118,4	116,7	98,6	100,6	122,5

* Intercrops areas included.
(1) Wheat, Barley, Rye, Common oat, Tritical.
(2) Maize, Rice, Grain sorghum.
(3) Broad bean, Common bean, Pea, Chickpea-Grasspearine, Lentil, Lupine, Common vetch.
(4) Temporary grassland, Leys.

Table d. Production (t x 10^3) of mains crops (source: ISTAT).

	average 1970-74	average 1975-79	average 1980-84	average 1985-89	average 1990-94	1995	1996	1997	1998
Cereals microtherms (1)	10,469	10,010	10,915	10,611	10,730	9,783	9,915	8,289	10,136
Cereals macrotherms (2)	5,744	6,895	7,934	7,506	8,568	10,085	11,308	11,865	20,762
Pulse (3)	509	363	304	233	211	160	122	107	240
Sugarbeet	9,314	12,903	12,994	14,223	12,785	13,423	12,211	13,566	13,419
Potato common	2,816	2,567	2,253	2,010	1,828	1,552	1,695	1,581	1,670
Soybean	-	-	36	1,160	1,121	735	846	1,135	1,255
Sunflower	20	49	105	239	316	540	540	529	478
Rape	6	1	1	44	29	97	91	80	61
Green crops* (4)(5)	26,055	145,055	226,023	88,375	77,063	68,505	68,129	68,394	69,279
Horticulture crops	10,577	10,808	11,964	12,308	12,525	11,855	12,288	11,863	13,171

* Intercrops areas included.
(1) Wheat, Barley, Rye, Common oat, Tritical
(2) Maize, Rice, Grain sorghum
(3) Broad bean, Common bean, Pea, Chickpea-Grasspearine, Lentil, Lupine, Common vetch
(4) Temporary grassland, Leys
(5) 1970-74 forage crops, following years green hay.

Table e. Area harv (ha x 10^3) (source: ISTAT).

	average 1970-74	average 1975-79	average 1980-84	average 1985-89	average 1990-94	1995
Wheat	3,831	3,361	3,319	3,014	2,525	2,481
soft	2,258	1,795	1,589	1,198	957	858
hard	1,573	1,565	1,729	1,816	1,569	1,623
Rye	23	16	12	8	8	7
Barley	195	283	367	458	441	381
Common oat	261	230	212	175	147	134
Rice	182	183	177	194	220	239
Maize	926	936	975	835	863	942
Grain sorghum	3	7	20	17	32	34
Triticale	-	-	-	5	3	3
Others	2	1	2	3	0	1
Broad bean	284	182	152	119	89	63
Common bean	115	63	45	33	20	14
Pea	6	4	3	5	10	7
Chickpea+Grasspearine	26	16	13	8	4	3
Lentil	4	2	1	1	1	1
Lupine	9	5	4	3	3	3
Common vetch	14	9	7	6	6	7
Potato	216	176	149	130	104	90
early	26	27	27	29	26	28
common	190	149	122	101	79	62
Poir	1	1	1	1	1	1
Horticulture crops	537	536	530	503	490	467
Sugarbeet	243	276	288	284	281	283
Tobacco	46	60	67	85	67	49
Hemp	0	0	-	-	-	-
Flax	2	5	1	0	1	3
Cotton	4	3	1	0	0	-
Groundnut	1	1	1	0	0	-
Rape	2	1	1	19	11	46
Sunflower	10	26	57	109	136	230
Bird rape	1	0	-	-	-	-
Wild mustard	1	0	0	-	-	-
Sesame	2	0	0	0	-	-
Soybean	0	0	12	343	328	195
Green crops	4,330	4,088	3,754	3,156	2,737	2,341
Temporary grassland	1,514	1,506	1,504	1,314	1,161	1,033
Pure annual forage crops	820	854	880	757	667	601
Mixture annual forage crops	694	652	624	557	494	432
Leys*	2,816	2,582	2,250	1,841	1,576	1,308
pure	2,492	2,191	1,883	1,520	1,293	1,081

mixture	324	391	367	322	282	227
Permanents	5,279	5,225	5,120	4,938	4,628	4,405
Grassland	1,176	1,164	1,121	1,110	1,031	983
Pasture	4,103	4,060	3,999	3,828	3,596	3,422

* Intercrops areas included.

Table f. Area harv 1995 compared with average years former (source: ISTAT).

	1995 average 1970-74 (%)	1995 average 1975-79 (%)	1995 average 1980-84 (%)	1995 average 1985-89 (%)	1995 average 1990-94 (%)
Wheat	65	74	75	82	98
soft	38	48	54	72	90
hard	103	104	94	89	103
Rye	30	45	56	85	90
Barley	195	135	104	83	86
Common oat	51	58	63	77	91
Rice	132	130	135	123	109
Maize	102	101	97	113	109
Grain sorghum	1,063	459	172	202	108
Triticale	-	-	-	67	94
Others	28	60	28	16	208
Broad bean	22	35	41	53	71
Common bean	12	22	31	43	69
Pea	109	184	233	146	71
Chickpea+Grasspearine	11	19	24	38	75
Lentil	23	45	83	100	100
Lupine	33	60	71	94	100
Common vetch	49	76	97	109	121
Potato	42	51	60	69	86
early	109	103	103	97	109
common	33	42	51	61	79
Poir	60	60	64	107	94
Horticulture crops	115	115	113	108	105
Sugarbeet	116	102	98	100	101
Tobacco	106	82	73	58	73
Hemp	0	0	-	-	-
Flax	150	65	429	625	306
Cotton	0	0	0	0	0
Groundnut	0	0	0	0	0
Rape	1,917	7,419	8,214	245	404
Sunflower	2,255	885	406	211	169
Bird rape	-	-	-	-	-
Wild mustard	-	-	-	-	-
Sesame	-	-	-	-	-
Soybean	65,000	232,143	1,563	57	60
Green crops	52	57	62	74	86
Temporary grassland	68	69	69	79	89
Pure annual forage crops	73	70	68	79	90
Mixture annual forage crops	62	66	69	78	87

Leys		46	51	58	71	83
	pure	43	49	57	71	84
	mixture	70	58	62	71	80
Permanents		83	84	86	89	95
Grassland		84	84	88	89	95
Pasture		83	84	86	89	95

Table g. Production (t x 10^3) (source: ISTAT).

	average 1970-74	average 1975-79	average 1980-84	average 1985-89	average 1990-94	1995
Wheat	9,544	8,787	9,308	8,599	8,674	8,043
soft	6,630	5,647	5,699	4,574	4,291	3,876
hard	2,914	3,141	3,609	4,025	4,383	4,167
Rye	47	36	30	21	21	20
Barley	419	746	1,177	1,627	1,688	1,413
Common oat	459	441	400	364	347	307
Rice	905	942	996	1,141	1,303	1,374
Maize	4,828	5,917	6,840	6,273	7,080	8,491
Grain sorghum	11	36	98	92	185	220
Triticale	-	-	-	15	11	13
Others	4	2	6	12	1	1
Broad bean	317	225	195	148	128	101
Common bean	129	98	75	54	33	24
Pea	7	5	5	11	33	20
Chickpea+Grasspearine	26	17	15	9	5	3
Lentil	4	2	1	1	1	1
Lupine	12	7	6	4	4	5
Common vetch	13	9	8	6	6	6
Potato	3,145	2,984	2,720	2,499	2,302	2,135
early	329	416	468	489	474	583
common	2,816	2,567	2,253	2,010	1,828	1,552
Poir	24	23	19	12	15	15
Horticulture crops	10,577	10,808	11,964	12,308	12,525	11,855
Sugarbeet	9,314	12,903	12,994	14,223	12,785	13,423
Tobacco	86	116	144	171	155	124
Hemp	1	2	0	-	-	-
Flax	1	5	1	0	1	3
Cotton	2	1	0	0	0	0
Groundnut	2	2	1	1	0	0
Rape	6	1	1	44	29	97
Sunflower	20	49	105	239	316	540
Bird rape	1	0	-	-	-	-
Wild mustard						
Sesame	1	-	-	-	-	-
Soybean	-	-	36	1,160	1,121	735
Green crops (1)	26,055	145,055	226,023	88,735	77,063	68,505
Temporary grassland	9,043	37,335	45,979	38,641	33,731	30,513
Pure annual forage crops	5,393	24,971	32,024	36,442	23,484	21,697
Mixture annual forage crops	3,651	12,364	13,976	11,758	10,248	8,816
Leys	16,832	54,946	60,043	75,639	42,932	37,993
pure	14,310	47,639	50,890	42,054	36,525	32,646

mixture	1,783	7,328	9,152	8,050	6,555	5,347
Permanents	9,105	28,662	33,495	31,032	27,808	25,827
Grassland	5,948	18,669	21,671	20,605	18,345	16,946
Pasture	3,357	9,994	11,824	10,427	9,463	8,881

(1) 1970-74 forage crops, following years green hay.

Table h. Production 1995 compared with average years former (source: ISTAT).

	1995 average 1975-79 (%)	1995 average 1980-84 (%)	1995 average 1985-89 (%)	1995 average 1990-94 (%)
Wheat	92	86	94	93
soft	69	68	85	90
hard	133	115	104	95
Rye	56	66	95	92
Barley	189	120	87	84
Common oat	70	77	84	88
Rice	146	138	120	105
Maize	144	124	135	120
Grain sorghum	614	224	239	119
Triticale	-	-	87	118
Others	67	18	9	183
Broad bean	45	52	68	79
Common bean	24	32	44	71
Pea	409	409	176	60
Chickpea+Grasspearine	20	23	38	75
Lentil	46	78	94	100
Lupine	72	85	131	117
Common vetch	70	81	100	104
Potato	72	78	85	93
early	140	125	119	123
common	60	69	77	85
Poir	63	79	120	96
Horticulture crops	-	-	-	-
Sugarbeet	104	103	94	105
Tobacco	108	87	73	80
Hemp	-	-	-	-
Flax	64	341	682	306
Cotton	-	-	-	-
Groundnut	-	-	-	-
Rape	7,462	7,132	221	334
Sunflower	1,095	512	226	171
Bird rape	-	-	-	-
Wild mustard	-	-	-	
Sesame	-	-	-	-
Soybean	-	2,029	63	66
Green crops	47	30	77	89
temporary grassland	82	66	79	90
pure annual forage crops	87	68	60	92
mixture annual forage crops	71	63	75	86
Leys	69	63	50	88

pure	69	64	78	89
mixture	73	58	66	82
Permanents	90	77	83	93
grassland	91	78	82	92
Pasture	89	75	85	94

List of involved industries, associations or research Institutions

Section 1: Oils

Company name	**DE.FI.LU. (srl)**
Activity	Biodiesel, oli lubrificanti a base vegetale
Address	Via Mantova, 7 – CERNUSCO S/N (MI) Tel: 02 92103478, 02 92103893

Company name	**DOMUS CHEMICALS Spa**
Activity	Alcanollamidi (saponi per lubrorefrigeranti), esteri e fluidi idraulici, fluidi industriali per lubrificazione
Address	Via Mazzini 1 - 24066 PEDRENGO (BG) Tel: 035 661363

Company name	**NOVARIA Spa**
Activity	Ausiliari per l'industria conciaria
Address	Via Alessandro Volta, 44 - 20090 CUSAGO (MI) Tel: 02 9039911

Company name	**D.I.C.A.**
Activity	Oli lubrificanti ed industriali
Address	Via Gallonio Antonio, 18 00161 ROMA (RM) Tel: 06 44290941

Company name	**OLEIFICI ITALIANI**
Activity	Estere metilico
Address	Strada Statale 16 Km 841.700 70043 MONOPOLI BA Tel: 080 6901789 – fax: 080 6901767

Company name	**LEVENIT CHEMICAL**
Activity	Oli lubrificanti, stampaggio, distaccanti per l'industria
Address	Strada Fornacino, 85/D - 10040 LEINI' (TO) Tel: 011 9981417, 011 9989886

Company name	**NUOVA ODO**
Activity	Stabilizzazione olio colza raffinato
Address	Via Crispi, 3 - 25034 ORZINUOVI (BS) Tel: 0309941321

Company name	**UNILEVER ITALIA**
Activity	Pasta dentifricia da sorbitolo
Address	Viale Lombardia, 1 - 20083 GAGGIANO (MI) Tel: 02 908471

Company name	**CESALPINA CHEMICALS**
Activity	Ausiliari chimici per industrie tessili, conciarie, cartarie, petrolifere, ceramica, depurazione acque
Address	Via Marsala, 34/A – 21016 GALLARATE VA

Company name	**OLEIFICIO VERONESI V. SAVERIO & C.**
Activity	Grezzi da semi oleosi di brassica
Address	Via Fincato Colonnello Giovanni, 278 - 37131 VERONA Tel: 045 526310

Company name	**MAGNETI MARELLI s.p.a.** **Div. Lubrificanti**
Activity	Lavorazione addittivi e oli mierali per lubrificanti
Address	Via G. Griziotti, 1 – 20100 MILANO

Company name	**LUBRITALIA**
Activity	Oli grassi, prodotti chimici e ausiliari destinati all'industria in genere
Address	Loc. S.Marco dei Lupini – Casella Postale, 46 – 74019 PALAGIANO (TA) Tel: 099 8885353

Company name	**BARLOCHER**
Activity	Stabilizzanti e lubrificanti per PVC
Address	Via San Colombano, 62/A – LODI (MI)

Company name	**ILCO IND.LE**
Activity	Lubrificanti
Address	Via Fratelli Rossetti, 2 – 20090 PREMENUGO DI SETTALA (MI)

Company name	**DEACOLOR**
Activity	Ausiliari per l'industria conciaria
Address	Via dei Campacci, 11 – 20010 BUSCATE (MI) Tel: 0331 800254

Company name	**FOX PETROLI**
Activity	Estere metilico
Address	Zona Industriale, 1 – 66054 VASTO CH Tel: 0873 310576

Company name	**COOP. TOSCHI**
Activity	Acidi grassi, solfonazione, ossidazione e solfitazione dell'olio di colza
Address	Via della Stazione, 44 – PORCARI (LU)

Company name	**OLEIFICIO ZUCCHI**
Activity	Raffinazione oli vegetali grezzi, olio di lino cotto
Address	Via Acquaviva, 12 – 26100 CREMONA Tel: 0372 532111

Company name	**HOUGHTON ITALIA**
Activity	Ausiliari chimici per industria metalmeccanica, cartaria e

	conciaria
Address	Via F.lli Bronzetti, 22 – 16100 GENOVA TEGLIA

Company name	**GIOMA VARO**
Activity	Lubrificanti VAROIL
Address	Via Talete, 38 – 20047 BRUGHERIO (MI) Tel: 0392 871479

Company name	**COMLUBE**
Activity	Biocombustibili e biolubrificanti
Address	Via Industriale, 13 – 25014 CASTENEDOLO (BS) Tel: 030 2130440

Company name	**MIRACHEM Div. Mira Lanza**
Activity	Acidi grassi
Address	Via Pradazzo, 7 – 40012 CALDERARA DI RENO (BO) Tel : 051 6467211

Company name	**I.G.S.**
Activity	Transesterificazione oli vegetali
Address	Via Milano, 201 – SAMARATE (VA)

Company name	**FUCHS L.**
Activity	Oli lubrificanti
Address	Via Riva, 16 – 14021 BUTTIGLIERA D'ASTI AT Tel: 011 9922811

Company name	**REAGENS COMIEL**
Activity	Addittivi per materie plastiche e vernici
Address	Via III Giugno, 14 – 20020 ROBECCHETTO CON INDUNO (MI)

Company name	**ESTERECO**
Activity	Biodiesel e glicerina
Address	Zona ind.le Pian d'Assino – 06019 UMBERTIDE (PG) Tel: 075 9413097

Company name	**CASTROL ITALIANA**
Activity	Lubrificanti, lubrorefrigeranti ed affini
Address	Via Palazzetto, 9 – 10071 BORGARO TORINESE (TO) Tel: 011 2225311

Company name	**HENKEL**
Activity	Esteri da olio di colza
Address	Via Scalabrini, 34 – 22073 FINO MORNASCO (CO) Tel: 031 884111

Company name	**I.C.A.I.**
Activity	Ausiliari per concia ed addittivi lubrorefrigeranti
Address	Viale A. Cruto, 27 – 10090 BRUINO (TO)

	Tel: 011 9048260

Company name	**A.FORTE**
Activity	Oli ed ingrassi per concia e tessile
Address	Loc. Al Frizzone – Fraz. Paganico – CAPPANORI (LU)

Company name	**ROLOIL**
Activity	Oli lubrificanti
Address	Via Volpedo, 2 – 15050 CASTELLAR GUIDOBONO (AL) Tel: 0131 898592

Company name	**NOVAOL**
Activity	Transesterificazione di oli vegetali
Address	Via Leonardo da Vinci, 35/A – 57123 LIVORNO Tel: 0586 429439 – fax: 0586 425254

Company name	**LUBRA**
Activity	Lubrificanti e prodotti chimici
Address	Via Edison, 4 – 20010 CORNAREDO (MI) Tel: 02 9361171

Company name	**ECOPETROLIA**
Activity	Combustibili ad uso riscaldamento
Address	Via Pantaneto – 55054 MASSAROSA (LU)

Company name	**SPIGA NORD**
Activity	Trasformazione glicerina grezza in glicerina distillata
Address	Via Pontevecchio, 55 – 16042 CARASCO (GE) Tel: 0185 352511

Company name	**UNICHEMA ITALIA**
Activity	Acidi grassi industriali, settore oleochimico
Address	Via Bergamo, 66 – 26100 CREMONA Tel: 037 24871

Company name	**BAYER**
Activity	Resine alchidiche
Address	Via delle Groane, 126 – 20024 GARBAGNATE MILANESE (MI) Tel: 02 99021065

Company name	**BIASI TERMOMECCANICA**
Activity	Oli vegetali per radiatori in ghisa per riscldamento
Address	Viale Leopoldo Biasi, 1 – 37100 VERONA

Company name	**S.O.D.A. INDUSTRIALE**
Activity	Ausiliari oleanti per l'industria
Address	Via Faliero Vezzani, 19 – 16159 GENOVA Tel: 010 7410011

Company name	**N. BENASEDO**
Activity	Resine per vernici
Address	Via Asiago, 332 – 21042 CARONNO PERTUSELLA (VA) Tel: 029 639921

Company name	**L.A.C.S.A.**
Activity	Ausiliari per l'industria conciaria
Address	Strada Antica di Alpignano, 46 – 10090 ROSTA (TO) Tel: 011 9540304

Company name	**BAKELITE ITALIA**
Activity	Biodiesel
Address	Via Mazzini, 79 – 21058 SOLBIATE OLONA (VA) Tel: 0331 355111

Company name	**KOMEST s.r.l.**
Activity	Tensioattivi per detergenza e cosmetica
Address	Via Ticino, 86/F – 20014 NERVIANO (MI)

Company name	**S.I.L.O. s.r.l**
Activity	Acidi grassi distillati per resine, vernici e saponi
Address	Via San Bartolo a Cintoia, 104 – 50142 FIRENZE Tel: 055 780676

Company name	**FACI s.p.a.**
Activity	Prodotti chimici tramite depurazione, scissione, distillazione e salificazione
Address	Via Privata Devoto, 36 – 16042 CARASCO (GE) Tel: 0185 36141

Company name	**SOGRAF s.r.l.**
Activity	Prodotti ausiliari per concia mediante miscelazione di oli
Address	Via Don Luigi Spotti, 213/T – 21050 MARNATE (VA) Tel: 0331 366018

Company name	**DERMOCHIMICA**
Activity	Trasformazione di olio di colza raffinato in prodotti ausiliari per l'ingrasso e la concia del cuoio
Address	Via Euripide, 27 – 20041 AGRATE BRIANZA (MI) Tel: 039 6898761

Company name	**A.& A. F.LLI PARODI**
Activity	Oli vegetali per produzione di lubrificanti e prodotti per cosmesi
Address	Via Valverde, 53 – 16014 CAMPOMORONE (GE) Tel: 010 790005

Company name	**VISCOL s.a.s.**
Activity	Oli e grassi lubrificanti per l'industria
Address	Via Isolabuona, 24 – 16019 RONCO SCRIVIA (GE) Tel: 010 9657011

Company name	**SYNTECH Div. ICS**
Activity	Resine sintetiche
Address	Via Morozzo, 27 – 12040 SANT'ALBANO STURA (CN)

Company name	**SYNTECH Div. Novaresine**
Activity	Resine sintetiche per vernici
Address	Località Confine – 37010 COLA' DI LAZISE (VR)

Company name	**RESOL**
Activity	Resine alchidiche
Address	Via Alta, 10/A – 30020 MARCON (VE)

	Tel: 041 5951144

Company name	**SOLDA' VLADIMIRO**
Activity	Miscelazione con addittivi addensanti
Address	Via Pasubio, 39 – 36051 CREAZZO (VI) Tel: 0444 232300 – fax: 0444 340530

Company name	**I.P. Italiana Petroli**
Activity	Oli lubrificanti
Address	Strada Statale 33 del Sempione – 20017 RHO (MI)

Company name	**C.O.I.M.**
Activity	Resine alchidiche per vernici su legno
Address	Via Ricengo, 21 – 26010 OFFANENGO (CR) Tel: 0373 2481

Company name	**LAMBERTI**
Activity	Addensanti sintetici per stampa tessile mediante l'impiego di olio di colza come eccipiente. Ausiliari chimici e altre materie prime per tessile, concia, petrolifero, catario, ceramica e depurazione acque
Address	Via Piave, 18 – 21041 ALBIZZATE (VA) Tel: 0331 985354

Company name	**TECNOVO**
Activity	Lubrificanti per trafilatura fili metallici
Address	Via Damiano Chiesa, 43 – 20026 NOVATE MILANESE (MI) Tel: 02 542903

Company name	**CRAY VALLEY**
Activity	Resine per vernici
Address	Zona industriale – Traversa "B" – 66052 GISSI (CH) Tel: 087 394521

Company name	**OLEIFICIO BARBI**
Activity	Raffinazione olio grezzo di girasol
Address	Via Crotte, 5 – 25127 BRESCIA Tel: 030 2410428

Company name	**BASF s.p.a**
Activity	Inchiostri da stampa e vernici
Address	Via Milano, 264 – 20021 BARANZATE DI BOLLATE (MI) Tel: 02 350071

Company name	**DMS ITALIA**
Activity	Resine alchidiche per vernici
Address	Via Rodi, 5 – 24040 FILAGO (BG)

Company name	**SUN CHEMICAL**
Activity	Inchiostri da stampa
Address	Via delle 2 Case, 2 – 50127 FIRENZE Tel: 055 450265

Company name	**FRATELLI RICCI Prodotti chimici**
Activity	Prodotti finiti per l'industria conciaria
Address	Via A. Colombo, 128 – 21055 GORLA MINORE (VA) Tel: 0331 365385

Company name	**VE – PI s.p.a.**
Activity	Oli di colza per uso conciario
Address	Via Provinciale, 1 – 24059 URGNANO (BG) Tel: 035 893016

Company name	**KRABE CHEMIE ITALIA**
Activity	Miscelazione oli ad uso conciario
Address	Via dell'Artigiano, 12 – 21057 OLGIATE OLONA (VA)

Section 2: PAPER MILL

Company name	**ALTIMONTI F.LLI SNC**
Activity	Carta e cartone - produzione e commercio
Address	Via Empolitaria, km 9.6 - 00024 Castelmadama (RM) Tel: 0774 447558 – fax: 0774 447452

Company name	**CARTIERA APUANA SRL**
Activity	Carta e cartone - produzione e commercio
Address	Via del Molino - 54020 Gassano (MS) Tel: 0585 99028 – fax: 0585 99282

Company name	**NUOVA CARTIERA DI ALBATAX SPA IN A.S.**
Activity	Carta e cartone - produzione e commercio
Address	Loc. Baccasara - 06041 Albatax Tortoli (NU) Tel: 0782 667054 – fax: 0782 651220

Company name	**CARTIERA G. BARTOLUCCI DI A.M. BERTOLUCCI**
Activity	Carta e cartone - produzione e commercio
Address	Via delle Cartiere, 199 - 55010 Pracando (LU) Tel: 0572 43046 – fax: 0572 43204

Company name	**CARTIERA DI CALAVORNO DEI F.LLI CALAMARI & C.**
Activity	Carta e cartone - produzione e commercio
Address	Via della Cartiera Calavorno - 55024 Coreglia Antelminelli (LU) tel: 0583 779098

Company name	**CARTIERA CARLO & ANTONIO CAMERA SRL**
Activity	Carta e cartone - produzione e commercio
Address	Via Pioppi, 1 - 84010 Manori (SA) tel: 089877127 - fax: 089853333

Company name	**CARTIERA CAPOSTRADA SRL**
Activity	Carta e cartone - produzione e commercio
Address	Via dei Barbi, 32 - 51033 Capostrada (PT) tel: 0573401135, 0573401215

Company name	**CARTIERA DI CARBONERA SPA**
Activity	Carta e cartone - produzione e commercio
Address	Borgo Padova, 89 - 35012 Camposampiero (PD) tel: 0495790744

Company name	**CARTIERA CERMA SRL**
Activity	Carta e cartone - produzione e commercio
Address	Via Mammianese, 70 - 51010 Pietrabuona (PT)
Company name	**CARTOSTRONG ITALIA SRL**

Activity	Carta e cartone - produzione e commercio
Address	Via Baradello, 15 - 20052 Monza (MI) Tel: 039 73911 – fax: 039 736190

Company name	**CARTIERA ENRICO CASSINA SNC**
Activity	Carta e cartone - produzione e commercio
Address	Piazza Sesto Frayria, 4-7 - 10064 Pinerolo (TO) tel: 0121 397297

Company name	**CARTIERA DI CASTELFRANCO EMILIA SpA**
Activity	Carta e cartone - produzione e commercio
Address	Via Cartiera 5 - 41013 Castelfranco Emilia (MO) tel: 059923155

Company name	**COOP. CARTIERA CASTELVECCHIO PASCOLI SRL**
Activity	Carta e cartone - produzione e commercio
Address	Via Cartiera 1 - 55051 Barga (LU) tel: 0583766098

Company name	**CARTIERA FRANCESCANTONIO CERRONE SPA**
Activity	Carta e cartone - produzione e commercio
Address	Via delle Antichità 1 - 03031 Aquino (FR) tel: 0776728012

Company name	**FIGLI DI CHECCHI GIOACCHINO – CARTIERA S. GIOVANNI**
Activity	Carta e cartone - produzione e commercio
Address	Via Mammirocce Nord 148 - 51017 Pesola (PT) Tel: 0572 408086 – fax: 0572 408055

Company name	**CARTIERA CONFALONE SRL**
Activity	Carta e cartone - produzione e commercio
Address	Via San Pietro, 147 - 48010 Maiori (SA) tel: 089877059

Company name	**CARTIERA DI CONSELICE SRL**
Activity	Carta e cartone - produzione e commercio
Address	Via Selice, 289/291 - 48017 Conselice (RA) tel: 054585242, 0545986511

Company name	**CARTIERA DOMUS SRL**
Activity	Carta uso igienico e domestico
Address	Piazza Salento, 7 - 09100 Cagliari (CA) tel: 070400151

Company name	**CARTIERE E. MAGNANI SPA**
Activity	Carta e cartone - produzione e commercio
Address	Località Calamari Aramo - 51017 Pescia (PT) tel: 0572405486

Company name	**CARTIERA MARCHIGIANA SRL**
Activity	Carta e cartone - produzione e commercio
Address	Via E. Fermi, 29-31 - 62010 Montelupone (MC)

	tel: 0733224020

Company name	**MERATI A. & C. CARTIERA DI LEVANTO SPA**
Activity	Carta e cartone - produzione e commercio
Address	Via S. Pellico 5 - 21014 Laveno Mobello (VA) - tel: 0332658011

Company name	**NATIONAL PAPER SRL**
Activity	Carta e cartone - produzione e commercio
Address	Via Romana Ovest, 244 - 55016 Porcari (LU) Tel: 0583 211221 – fax: 0583 211107

Company name	**CARTIERA DI NAVE SPA**
Activity	Carta e cartone - produzione e commercio
Address	Via Trento 85 - 25075 Nave (BS) tel: 0302530020, 0302530040

Company name	**CARTIERA DI NEBBIUNO DI ANGELO DONATI & C.**
Activity	Carta e cartone - produzione e commercio; Carte speciali;
Address	Via Privata Cartiera - 28010 Nebbiuno (NO) tel: 032258103 - fax: 0322589784

Company name	**CARTIERA NICCOLI**
Activity	Fabbricazione di cartoncino grigio, bianco, patinato in rotolo e fogli; cartoncino duplex.
Address	Via Cal di Breda 37 - 31030 Pezzan di Carbonera (TV) tel: 0422445037

Company name	**CARTIERA OLONA SAS**
Activity	Carta e cartone - produzione e commercio
Address	Via Galileo Galilei 6 - 21055 Gorla Minore (VA) tel: 0331601173

Company name	**CARTIERA ONDULATO UMBRO SPA**
Activity	Carta e cartone - produzione e commercio
Address	Via Flaminia Ternana km 88 - 05035 Narni (TR)

Company name	**ORMEA spa**
Activity	Carta e cartone - produzione e commercio
Address	Viale Piaggio - 12076 Ormea (CN) tel: 0174391055

Company name	**PAPIRO SARDA SRL**
Activity	Cartiere - macchine
Address	Zona Industriale 10A, - 09032 Assamini (CA) tel: 070247248

Company name	**CARTIERA PERINI PLACIDO SAS**
Activity	Carta in rotoli per macchine da ufficio

Address	Via delle Cartiere 167 - 55010 Botticino (LU) - tel: 057243027

Company name	**INDUSTRIA CARTARIA PIERETTI SPA**
Activity	Carta e cartone - produzione e commercio
Address	Via del Fanuccio 128 - 55014 Marlia di Capannori (LU) tel: 0583407575
Company name	**CARTIERA PAOLO PIGNA SPA**
Activity	Produzione e distribuzione di carta naturale o speciale per ogni uso tipografico e per stampa Carta e cartone
Address	Via Daniele Pesenti 1 - 24022 Alzano Lombardo (BG) tel: 035519111 - fax: 035513693
Company name	**CARTIERA DEL POLESINE SRL**
Activity	Carta e cartone - produzione e commercio
Address	Via Julia 12 - 30030 Favaro Veneto (VE)

Company name	**CARTIERA PONTE D'ORO SNC DI ANSALDI M. & FIGLI**
Activity	Carta uso igienico e domestico
Address	Via delle Cartiere, 271 - 55019 Villa Basilica (LU) tel: 057243034 - fax: 057243518

Company name	**CARTIERA RODOLFO REGUZZONI SRL**
Activity	Carta e cartone - produzione e commercio
Address	Via Canonico Pio Rolle 78 - 10094 Giaveno (TO) tel: 0119376112, 0119378869

Company name	**S.A.F.A. Cartoni fibrati srl**
Activity	Carta e cartone - produzione e commercio
Address	Ponte di Sorana - 51010 Pescia (PT) tel: 0572405425, 0572405513

Company name	**SAIFECS spa**
Activity	Carta e cartoni speciali uso bielettrico, guarnizioni e calzature, cuoio rigenerato per legatoria e pelletteria; produzione di carta e cartoni isolanti per motori e trasformatori, cuoio rigenerato per calzature, fibrati speciali per calzature, fibra e altri prodotti per guarnizioni.
Address	Via Cartiera 1/3 - 37057 San Giovanni Lupatoto (VR) tel: 0458750511 - fax: 0458750746

Company name	**CARTONIFICIO SANDRESCHI srl**
Activity	Carta e cartone - produzione e commercio
Address	Via delle Cartiere 1 - 55019 Villa Basilica (LU) tel: 057243504

Company name	**CARTIERA SAN GIORGIO SRL**
Activity	Carta e cartone
Address	Via Malenchini, 13 - 16156 Genova (GE)

Company name	**CARTIERA SAN ROCCO SPA**
Activity	Carta e cartone
Address	Via delle Cartiere 76 - 55010 Botticino (LU) tel: 057243017, 057243446

Company name	**CARTIERA SANTA GIUSTA**
Activity	Cartotecnica
Address	Via Giovanni XXIII 3 - 09096 Santa Giusta (OR) Tel: 0783 359017 – fax: 0783 359397

Company name	**CARTIERA S. EUSEBIO SRL**
Activity	Carta e cartone - produzione e commercio
Address	Via Nazionale 127 - 25070 Caino (BS) Tel: 030 6630440 – fax: 030 6630017

Company name	**CARTIERA SANT'ILARIO SPA**
Activity	Carta e cartone - produzione e commercio
Address	Località Calamari - 51017 Pescia (PT) tel. 0572 409162 – fax: 0572 409191
Company name	**CARTIERA DI SARTEANO SPA**
Activity	Carta e cartone ondulato
Address	Località Boccalaciana 25 - 53047 Sarteano (SI) tel: 0578265591

Company name	**CARTIERA DEL SARCHIO SPA**
Activity	Carta e cartone - produzione e commercio
Address	Via Cappo di Melo 1/3 - 55014 Marlia (LU) Tel: 0583 407110 – fax: 0583 407279
Company name	**CARTIERA SICARS SRL**
Activity	Carta e cartone - produzione e commercio
Address	Via Calcare 27 - 95020 Aci Bonaccorsi (CT) tel: 0957890248

Company name	**NUOVA SO.CAR. srl**
Activity	Carta e cartone - produzione e commercio
Address	Località Lanciole - 51010 Crespole (PT) Tel: 0572 69247 – fax: 0572 69167

Company name	**NUOVA CARTIERA SORDINI SRL**
Activity	Carta e cartone - produzione e commercio
Address	Via Trinità 2 - 06030 Pale di Foligno (PG) tel: 0742660859

Company name	**CARTIERA DEL TIRRENO SPA**
Activity	Carta e cartone - produzione e commercio
Address	Via Vittorio Veneto 147 - 84013 Cava dei Tirreni (SA) tel: 089340323

Company name	**NUOVA ST/C spa**
Activity	Carta e cartone - produzione e commercio
Address	Via Ludovica, ½ Località Piano della Rocca – 55023 Borgo a Mozzano (LU)

Company name	**CARTIERA TORRE MONDOVI SPA**
Activity	Carta e cartone - produzione e commercio
Address	Via Bosso 3 - 12080 Torre Mondovi (CN) tel: 0174329109

Company name	**CARTIERA VALCHISONE DI BORTOLOTTO & C.**
Activity	Carta e cartone - produzione e commercio
Address	Via Nazionale 340 - 10080 Abbadia Alpina di Pinerolo (TO) Tel: 0121 201600 – fax: 0121 201259
Company name	**CARTIERE TURANENSI E AFFINI srl**
Activity	Carta e cartone - produzione e commercio
Address	Strada provinciale Turanense Km 41.2 – 67061 Carsoli (AQ) tel: 0863995757

Company name	**CARTIERA VALLE MARECCHIA SRL**
Activity	Carta e cartone - produzione e commercio
Address	Via Borbaccino, 1166 - 47038 Santarcangelo di Romagna (FO) Tel: 0541 626229 – fax: 0541 621403
Company name	**CARTONI VETTURI SRL**
Activity	Carta e cartone - produzione e commercio
Address	Via Marconi 20 - 24040 Fornovo San Giovanni (BG) tel: 036350636

Company name	**CARTONIFICO ANGELO VENDITTI SRL**
Activity	Carta e cartone - produzione e commercio
Address	Località Ferrazza - 03030 Broccostella (FR) Tel: 0776 890207 – fax 0776 890860

Company name	**CARTIERA DI VIDARDO SPA**
Activity	Carta e cartone - produzione e commercio
Address	Via Cartiera 16 - 20079 Castiraga Vidardo (MI) Tel: 0371 934881 – fax: 0371 90284

Company name	**CARTIERA DI VOLTRI SPA**
Activity	Carta e cartone - produzione e commercio
Address	Via Ovada 42/R - 16158 Genova (GE) Tel: 010 8133885 – fax: 010 6136464

Company name	**ISTITUTO POLIGRAFICO E ZECCA DELLO STATO**
Activity	Produzione e fornitura di carta di sicurezza, carte valori, stampati, pubblicazioni e prodotti cartotecnici per il fabbisogno delle amministrazioni dello Stato, carta da bollo e targhe per autoveicoli; stampa e gestione della Gazzetta Ufficiale delle leggi e dei Decreti della Repubblica; stampa delle pubblicazioni ufficiali dello Stato.
Address	Piazza Verdi 10 - 00198 Roma tel: 0685081 - fax: 0685082517

Company name	**CARTIERA DELL'ADDA SPA**
Activity	Carta da parati - vendita al dettaglio

Address	Via Cavour 63 - 23801 Calolziocorte (LC) tel: 0341635511

Company name	**CARTIERA ALTO MILANESE SPA**
Activity	Carta e cartone - produzione e commercio
Address	Via Giulio Cesare 1 - 21054 Fagnano Olona (VA) tel: 0331617076

Company name	**CARTIERA FERDINANDO AMATRUDA DI ROSA AMATRUDA**
Activity	Carta e cartone - produzione e commercio
Address	Via delle Cartiere 100 - 64011 Amalfi (SA) tel: 089871315

Company name	**ASCOLI PAPER SRL**
Activity	Carta e cartone - produzione e commercio
Address	Via Bonifica - 63046 Fr. Del Tronto – Ascoli Piceno (AP) tel: 0736307046

Company name	**ASSIDOMAN ITALIA SPA – Divisione Cartiere**
Activity	Carta e cartone ondulato
Address	Via Pesciatina Lunata, 147 – 55012 Capannori (LU) tel: 05839391, 0583933330

Company name	**ATICARTA SPA**
Activity	Agenzie ed uffici commerciali
Address	Via Cesare Pascarella, 7 - 00153 ROMA tel: 065819889

Company name	**AUSONIA**
Activity	Carta uso igienico e domestico
Address	Via Dante Alighieri - 52015 Pratovecchio (AR) tel: 05755051 - fax: 0575583183

Company name	**F.LLI BARTOLI SRL**
Activity	Cartoni fibrati per l'industria
Address	Via Traversa di Parazzana 12-14-16 - 55061 Carraia (LU) tel: 0583980196 - fax: 0583980878

Company name	**MAURO BENEDETTI SPA**
Activity	Carta e cartone - produzione e commercio
Address	Via Piavatola 164/m - 06132 San Sisto (PG) Tel: 075 52751 – fax: 075 5275237

Company name	**CARTIERA BONATI & C SRL**
Activity	Carta e cartone - produzione e commercio
Address	Via Argini Parma 40/A - 43100 Parma tel: 0521251333

Company name	**CARTIERA DI BOSCO MARENGO SPA**
Activity	Carta e cartone - produzione e commercio
Address	Viale Modugno 29/A - 16156 Genova tel: 0106973598, 0106974310

Company name	**BOSSO CARTE SPECIALI SPA**
Activity	Carta e cartone - produzione e commercio
Address	Via Stura 98 - 10175 Mathi Canavese (TO) tel: 0119260000

Company name	**CARTIERE BURGO SPA**
Activity	Produzione di patinate moderne (senza e con legno), patinate classiche, LWC, naturali per stampa e scrivere e per imballaggio, anche politenate, rismette, monopatinate per etichette, cartoncini per confezioni, carta per stampa digitale, carte alimentari ed autocopianti.
Address	Via del Fraidano 8 - 10099 San Mauro Torinese (TO) tel: 0112233111 - fax: 0112233292

Company name	**CARTIERA DI CADIDAVID SRL**
Activity	Carta e cartone - produzione e commercio
Address	Via Cà di Aprili 43 - 37061 Cà di David (VR) tel: 0458290711

Company name	**CARTIERA CA.MA SRL**
Activity	Carta e cartone - produzione e commercio
Address	Via Gianolio 31 - 27029 Vigevano (PV) tel: 038171498

Company name	**CARTIERA C CARCANO & F.LLI FU C. SRL**
Activity	Carta e cartone - produzione e commercio
Address	Via Roma 19 - 22026 Masilianico (CO) tel: 031511358

Company name	**CARTIERA MODESTO CARDELLA SPA**
Activity	Carta e cartone - produzione e commercio
Address	Via Acquacalda 2° Trav. 20 – 55017 San Pietro a Vico (LU) tel: 058399871

Company name	**CARTIERE CARIOLARO SPA**
Activity	Carta e cartone - produzione e commercio
Address	Via Provinciale 41 - 35010 Carmignano di Brenta (PD) tel: 0499430000

Company name	**CARTIERA DI CARMIGNANO SPA**
Activity	Carta e cartone - produzione e commercio
Address	Via Roma 96 - 35010 Carmignano di Brenta (PD)

	tel: 0499423600

Company name	**CARTESAR SPA**
Activity	Carta e cartone - produzione e commercio
Address	Via delle Fratte – loc. lago Grillo - 84080 Pellezzano (SA) tel: 089566333

Company name	**CARTITALIA SRL**
Activity	Carta e cartone - produzione e commercio
Address	Via stoliana - 31036 Ospedaletto d'Istrana (TV) Tel: 0422 832336 – fax: 0422 730739

Company name	**CARVAL – CARTIERA DI VALLE TROMPIA SRL**
Activity	Carta e cartone - produzione e commercio
Address	Via Sangervasio 28 - 25062 Concesio (BS) tel: 0302180859

Company name	**C.C.R. CARTIERA COOPERATIVA RIVALTA**
Activity	Carta e cartone - produzione e commercio
Address	Località Rivalta - 37020 Brentino Belluno (VR) tel: 0456284063

Company name	**CARTIERA DEL CHIESE SPA**
Activity	Carta e cartone - produzione e commercio
Address	Via tito speri 61 - 25018 Montichiari (BS) tel: 0309653711

Company name	**CARTIERE CIMA SPA**
Activity	Carta e cartone - produzione e commercio
Address	Via C. Ceresa 10 - 24015 San Giovanni Bianco (BG) tel: 034581008

Company name	**CARTIERA DI COLOGNA SPA**
Activity	Carta e cartone ondulato
Address	Via Guzzina 135 - 20093 Cologno Monzese (MI) tel: 0225391289
Company name	**CARTIERA DI CORDENONS SPA**
Activity	Carta e cartone ondulato
Address	Via Nicolò Macchiavelli 38 – 20145 Milano tel: 0225391289

Company name	**CARTOTECNICA CRESPI**
Activity	Lavori grafici e cartotecnica
Address	Corso Novara 225 - 27029 Vigevano (PV) tel: 038121111 - fax: 038121115

Company name	**DELICARTA SPA**
Activity	Cartotecnica
Address	Via di Lucia - 55016 Porcari (LU) tel: 0583297000

Company name	**DEMOLLI INDUSTRIA CARTARIA SRL**
Activity	Imballaggi in cartone
Address	Via Urago 10 - 22036 Tavernerio (CO) tel: 031429811

Company name	**CARTIFICIO ERMOLLI DI MOGGIO UDINESE SPA**
Activity	Carta e cartone - produzione e commercio
Address	Via G. Ermolli 62 - 33015 Moggio Udinese (UD) tel: 043351141

Company name	**CARTIERA FAVINI SPA**
Activity	Favini paper mill: paper, fine and special cardboard. Crusinallo paper mill: paper, fine and glossy cast coated and casting release cardboards. The main production includes: white, top level extra-white, ivory, colour, ecological paper, sized and on request production. The products are addressed to the following industries: printing, machine accounting, paper industry, mailing, publishing, packaging, processing, technical and

	industrial use. Registered trade-marks: BIANCOFLASH FAVINI Master, FINE BOARD, OFFICE FLASH extra-white natural papers and cardboards; BURANO, LAGUNA (random formation), PRISMA (single-branded), LE CIRQUE (cut-size ream) natural coloured papers and cardboards; ALGA CARTA, MAIS CARTA ecological paper; BINDAKOTE,EXTRAKOTE glossy, cast coated papers and cardboards; URECAST, ALFAKOTE glossy casting release papers.
Address	Via Cartiera 21 - 36028 Rossano Veneto (VI) tel: 042484722 - fax: 0424547793

Company name	**CARTIERE FEDRIGONI & C. SPA**
Activity	Carta e cartone - produzione e commercio
Address	Viale Piave 3 - 37135 Verona tel: 0458011701

Company name	**CARTIERA DI FERRARA**
Activity	Carta e cartone - produzione e commercio
Address	Via Marconi 69 - 44100 Ferrara - tel: 053251271

Company name	**CARTIERA FORNACI SPA**
Activity	Carta e cartone produzione e commercio
Address	Via Fornaci 16 - 21054 Fagnano Olona (VA) tel: 0331617164, 0331610549 – fax: 0331611211
Company name	**CARTIERA FORNAI SPA**
Activity	Carta e cartone - produzione e commercio
Address	Strada Cartiera 2 - 01017 Tuscania (VT) tel: 0761443544

Company name	**FORT JAMES ITALIA SRL**
Activity	Carta e cartone - produzione e commercio
Address	Via Boccardo 1 - 16121 Genova tel: 01055411

Company name	**CARTIERA DI GALLIERA SPA**
Activity	Carta e cartone - produzione e commercio
Address	Via 1° Maggio 21 - 35015 Galliera Veneta (PD) tel: 0499413777

Company name	**CARTIERE DEL GARDA SPA**
Activity	Produzione di carte patinate.
Address	Viale Rovereto 15 - 38066 Riva del Garda (TN) tel: 0464579111

Company name	**CARTIERA GIACOSA SPA**
Activity	Carta e cartone - produzione e commercio
Address	Via Borello 1410070 Front Canavese (TO)

	tel: 0119251503

Company name	**CARTIERA GIORGIONE SPA**
Activity	Carta e cartone - produzione e commercio
Address	Via Borgo Padova 112 - 31033 Castelfranco Veneto (TV) tel: 0423491221

Company name	**CARTIERA GRILLO SAS DI G. E D. GRILLO**
Activity	Carte monolucide per cartotecnica da imballo e da stampare. Carte speciali per uso industriale.
Address	Via Acquasanta, 20 - 16010 Genova tel: 0106136630

Company name	**ICO SRL INDUSTRIA CARTONE ONDULATO**
Activity	Carta e cartone ondulato
Address	Via Amendola Sambuceto, 150 - 66020 San Giovanni Teatino (CH) tel: 0854460244

Company name	**INDUSTRIA CHIMICA LEGNO SPA**
Activity	Prodotti chimici industriali – commercio
Address	Via Privata Soc. Alca 1-2 – 55028 Fornoli di Bagni di Lucca (LU) tel: 058380761

Company name	**CARTIERA KARTOCALL SRL**
Activity	Carta e cartone - produzione e commercio
Address	Via Carlotti - 55016 Porcari (LU) Tel: 0583 21031 – fax: 0583 299061
Company name	**KIMBERLY-CLARK SRL**
Activity	Carte speciali
Address	Via della rocca 49 - 10123 Torino - tel: 01188141
Company name	**LINPAPER SRL**
Activity	Carta uso igienico e domestico
Address	Località La Madonnina - 55010 Lunata (LU) tel: 058375525 - fax: 0583769578

Company name	**CARTIERA LUCCHESE SPA**
Activity	Produzione di carte kraft, veline e tissue. Produzione di carta igienica, tovaglioli, asciugatutto, fazzoletti, strofinacci e asciugamani.
Address	Via Ciarpi 57 - 55016 Porcari (LU) tel: 05832140 - fax: 0583299051

Company name	**CARTIERA DELLA MADONNINA SRL**
Activity	Carta uso igienico e domestico.
Address	Via delle Cartiere 213 - 55010 Pracando (LU)

	tel: 057243530 - fax: 057243530

Company name	**CARTIERA DEL MAGLIO SPA**
Activity	Carta e cartone - produzione e commercio
Address	Via Cartiera 6 - 40044 Pontecchio Marconi (BO) tel: 0516782611

Company name	**DITTA G.B. MANCINI SPA – CARTIERA**
Activity	Carta e cartone - produzione e commercio
Address	Via S. Domenico 5 - 03039 Sora (FR) tel: 0776814314

Company name	**CARTIERA MANTOVANA SRL**
Activity	Carta e cartone produzione e commercio
Address	Via. Pr. Amedeo17 - 46100 Mantova (MN) tel: 0376688216 - fax: 0376686760

Company name	**CARTIERE MILANI FABRIANO SPA**
Activity	Offrono una gamma di carte di pregio per l'ufficio, la scuola, la grafica, l'editoria, per l'uso artistico, per valori e sicurezza,
Address	Viale Pietro Milani 31/39 – 80044 Fabriano (AN) tel: 07327021 - fax: 0732702333

Company name	**CARTIERA DI MORNO SPA**
Activity	Carta e cartone - produzione e commercio
Address	Via Valsesia 22 - 28015 Morno (NO) Tel: 0321 990100 – fax: 0321 990152
Company name	**MONDIALCARTA SPA**
Activity	Carta e cartone ondulato
Address	Loc. Renaccio - 55020 Diecimo – Borgo A Mozzano (LU) tel: 0583838086, 0583838202

Company name	**NUOVA CARTIERA PARMENSE**
Activity	Carta e cartone - produzione e commercio
Address	Via Provinciale 26 - 43040 Viazzano (PR) Tel: 0525 3555 – fax: 0525 39075

Company name	**OMNIAFILTRA CARTIERA DEL TORANO SPA**
Activity	Carta e cartone - produzione e commercio
Address	Piazza Vanuitelli 15 - 80128 Napoli tel: 0815586287

Company name	**CARTIERE PANIGADA SRL**
Activity	Carta e cartone - produzione e commercio
Address	Via Pesciatina - 51020 Lanciole di Piteglio (PT)

	tel: 0573628146, 0573628193

Company name	**PAPIRO SUD SPA**
Activity	Carta e cartone - produzione e commercio
Address	Corso Trieste – Località Castagna - 84018 Scafati (SA) tel: 0818633896

Company name	**CARTIERA PARTENOPE SRL**
Activity	Carta e cartone - produzione e commercio
Address	Corso Salvatore D'Amato 3 - 80022 Arzano (NA) tel: 0817312215

Company name	**CARTIERA PIERETTI SPA**
Activity	Carta e cartone - produzione e commercio
Address	Via Masini 95-97 - 55012 Capannori (LU) tel: 0583407575

Company name	**CARTIERA PIRINOLI SPA**
Activity	Produzione di cartoncini patinati biodegradabili e riciclabili per astucci litografati da imballo.
Address	Via Santa Teresa 3 - 10121 Torino tel: 0115629922 - fax: 011538239

Company name	**CARTIERA PONTE STRONA SRL**
Activity	Carta e cartone - produzione e commercio
Address	Corso Italia 8 - 20122 Milano Tel: 02 89010777 – fax: 02 2021517

Company name	**PORTONOGARO SRL**
Activity	Cellulosa e paste per carta
Address	Via Romana 1 - 33072 Casarsa della Delizia (PN) tel: 0434870688

Company name	**RAPIK SPA**
Activity	Carta e cartone - produzione e commercio
Address	Badia Pozzeveri - 55010 Altopascio (LU)

Company name	**RENO DE MEDICI SPA**
Activity	Carta e cartone - produzione e commercio
Address	Via Tucidido 56 - 20134 Milano tel: 0295320901

Company name	**CARTIERA DI RIVIGNANO SPA**
Activity	Carta e cartone - produzione e commercio
Address	Via G. Bruno 32 - 33050 Rivignano (UD) tel: 0432772811
Company name	**CARTIERA ROMANELLO SPA**
Activity	Carta e cartone - produzione e commercio
Address	Via della Roggia 71 - 33030 Campoformido (UD) tel: 0432563311

Company name	**CARTIERA ROSSI SPA**
Activity	Carta e cartone - produzione e commercio
Address	Via Matton S. Lorenzo 15 - 36100 Vicenza tel: 0444338399

Company name	**CARTIERE SACI SPA**
Activity	Carta e cartone - produzione e commercio
Address	Strada della Ferriera 17 - 37135 Verona tel: 0458550077

Company name	**CARTIERA SAN FELICE SPA**
Activity	Carta e cartone - produzione e commercio
Address	Via Calabbiana 1 - 51030 Piteccio (PT) tel: 057341468

Company name	**CARTIERA SAN MARCO SPA**
Activity	Carta e cartone - produzione e commercio
Address	Via T. Nuvolari 10 - 55061 Carraia (LU) tel: 0583297200

Company name	**CARTIERA SAN MARTINO SRL**
Activity	Carta e cartone - produzione e commercio
Address	Via Ferrazza 15/a - 03030 Broccastella (FR) tel: 0776890461

Company name	**CARTIERA SAN PAOLO SPA**
Activity	Carta e cartone - produzione e commercio
Address	Via del Casalino 1 - 55012 Tassignano (LU) tel: 0583429689

Company name	**CARTIERA DI SAREGO SPA**
Activity	Carta e cartone - produzione e commercio
Address	Via Favorita 40 - 36040 Sarego (VI) tel: 0444726411

Company name	**SCA PACKAGING ITALIA SPA – SCA ITALCARTA**
Activity	Carta e cartone - produzione e commercio
Address	Via del Frizzone - 55016 Porcari (LU) Tel: 0583 2991

Company name	**CARTIERA DEL SERRA SRL**
Activity	Carta e cartone - produzione e commercio
Address	Via di Costia 1 - 56032 Buti (PI) Tel: 0587 723163 – fax: 0587 723184

Company name	**SMURFIT- SISA- CARTIERA DI TORREMENAPACE**
Activity	Scatole cartonaggi, Imballaggi in cartone
Address	Strada per Silvano Pietra 20 - 25058 Voghera (PV) tel: 038344826

Company name	**NUOVE CARTIERE DI TIVOLI SRL**
Activity	Carta e cartone - produzione e commercio
Address	Via Nazionale Tiburtina 158 - 00010 Villa Adriana (RM) Tel: 0774 530808

Company name	**TORBOLA PAPER MILL SPA**
Activity	Carta e cartone - produzione e commercio
Address	Via delle Cartiere 168 - 51014 Collodi (PT) Tel: 0572 429090 – fax: 0572 429422

Company name	**CARTIERA DI TOSCOLANO SPA**
Activity	Produzione di carta da stampa per editoria; carte naturali, patinate, film, coated, opacizzate, leggere, per dizionari, per editoria scolastica e patinatino per editoria.
Address	Via Piave 1 - 38077 altavilla Vicentina (VI)

Company name	**CARTIERE DI TREVI SPA**
Activity	Cartiere - macchine; Carta e cartone ondulato; Carta e cartone - produzione e commercio; Carte speciali; Cartotecnica.
Address	Via Clitunno 4 - 06032 Borgo di Trevi (PG) tel: 074238511 - fax: 0742385130

Company name	**INDUSTRIE CARTARIE TRONCHETTI SPA**
Activity	Carta per uso igienico e domestico. Carta e cartone - produzione e commercio.
Address	Piano Della Rocca - 55023 Borgo a Mozzano (LU) tel: 0583888888

Company name	**CARTIERA VALCHIAMPO SPA**
Activity	Carta e cartone - produzione e commercio
Address	Via Arzignano 26 - 36072 Chiampo (VI)

Company name	**CARTIERA VALLAGARINA SPA**
Activity	Carta e cartone - produzione e commercio
Address	Via Pasanti 1 - 38060 Villa Lagarina (TN) tel: 0464411511

Company name	**CARTIERA VALLE SERIO SRL**
Activity	Carta e cartone - produzione e commercio
Address	Via L. Carrara 46 - 24027 Nembro (BG) Tel: 035 520333 – fax: 035 521808

Company name	**CARTIERA DI VARO SPA**
Activity	Carta uso igienico e domestico
Address	Via delle Cartiere 201 - 51014 Collodi (PT) tel: 05724661 - fax: 0572466466

Company name	**CARTIERA DEL VIGNALETTO SPA**
Activity	Carta e cartone - produzione e commercio

Address	Località Tre Ponti 5 - 37050 Santa Maria di Zevio (VR) tel: 0456069005

Company name	**CARTIERA DI VILLORBA SPA**
Activity	Carta e cartone - produzione e commercio
Address	Via Roma 212 - 31050 Villorba (TV) tel: 04226281

Company name	**SMURFIT PACKAGING ITALIA (spa)**
Activity	Carta e cartone ondulato
Address	Via. I Maggio, 76 - 40026 Imola (BO) tel: 0542622111, 0542641111, 0542642071

Company name	**CARTIERA VALENTE**
Activity	Carta imballo
Address	Via Cartiera, 122 - 36031 Dueville (VI) tel: 0444590121

Section 3: PULP INDUSTRYES

Company name	**CELLULOSA CALABRA S.p.A. (Poligrafico dello Stato)**
Activity	
Address	Ctr. Passo Vecchio – 88900 CROTONE Tel: 0962 930241

Company name	**SICEM - SAGA**
Activity	Produzione pastalegno
Address	Via dell'industria, 21 – 42026 CANOSSA (RE) Tel: 0522 878626 – fax: 0522 878944

Section 4: **STARCH FACTORIES**

Company name	**AMIDERIA FERRAZZI**
Activity	Produzione Amido
Address	C. Venti Settembre 18 – 21052 BUSTO ARSIZIO (VA) Tel: 0331 678408

Company name	**AMIDERIE ITALIANE spa**
Activity	Produzione Amido
Address	Ctr. Fiorentina - 83051 NUSCO (AV) Tel: 0827 607327

Company name	**BOSCHI srl**
Activity	Produzione Amido
Address	V. Del Lavoro 3 - 40050 MONTERENZIO (BO) Tel: 051 920450

Company name	**ROQUETTE ITALIA (spa)**
Activity	Produzione Amido
Address	V. Serravalle 26 - 15063 CASSANO SPINOLA (AL) Tel: 0143 7741

Company name	**SEDAMYL spa**
Activity	Succhi Distillazione Alcoolici
Address	V. Monviso 24 – 12037 SALUZZO (CN) Tel: 0175 210400

Section 5: SUGAR INDUSTRYES

Company name	**ERIDANIA spa**
Activity	Sugarfactories
Address	Corso A. Podestà, 16128 GENOVA tel: 010 54811 – fax: 010 5536351 Via Pironi, 160 – 44012 BONDENO (FE) Tel: 0532 893027 – fax: 0532 892901 Via Venezia, 13 – 30022 CEGGIA (VE) Tel: 0421 329101 – fax: 0421 322336 Via Cà Contarini, 4 – 45014 PORTO VIRO (RO) Tel: 0426 633401 – fax: 0426 320505 Via Carrarone, 3 – 48026 RUSSI (RA) Tel: 0544 583351 – fax: 0544 582657 Via Altedo, 4133/D – 40018 S. PIETRO IN CASALE (BO) Tel: 051 811160 – fax: 051 817905 Via Mazzacavallo, 47 – 43010 SAN QUIRICO TRECASALI (PR) Tel: 0521 377111 – fax: 0521 878393 Via Emilia, 33 – 29010 SARMATO (PC) Tel: 0523 887821 – fax: 0523 887449

Company name	**ISI INDUSTRIA SACCARIFERA ITALIANA AGROINDUSTRIALE spa**
Activity	Sugarfactories
Address	Piazza G. Salvemini, 4 – 35131 PADOVA Tel: 049 8754506 – fax: 049 662142 Strada per Sannazzaro – 27050 CASEI GEROLA (PV) Tel: 0383 381081 – fax: 0383 612022 Via zuccherificio, 102 – 44038 PONTELAGOSCURO (FE) Tel: 049 9775399 – fax: 049 9775785 Via Ceresa, 11 – 41034 FINALE EMILIA (MO) Tel: 0535 95611 – fax: 0535 97117

Company name	**CO.PRO.B. – Cooperativa Produttori Bieticoli**
Activity	Sugarfactories
Address	Via Mora, 56 – 40061 MINERBIO (BO) Tel: 051 6622-111 – fax: 051 873100

	Via Lidi Ferraresi, 50 – 44020 OSTELLATO (FE) Tel: 0533 605011 – Tfax 0533 57415

Company name	**SADAM Zuccherifici**
Activity	Sugarfactories
Address	Via degli Agresti, 4/6 – 40123 BOLOGNA Tel: 051 6564411 – fax: 051 6564491 Contrada Campiglione, 15 – 63023 FERMO (AP) Tel: 0734 6071 – fax: 0734 628180 Via della Barchetta, 1 – 60035 JESI (AN) Tel: 0731 2321 – fax: 0731 60092

Company name	**SADAM Abruzzo spa**
Activity	Sugarfactories
Address	Strada 14, 67043 CELANO (AQ) Tel: 0863 7981 – telefax: 0863 792881

Company name	**SADAM Castiglione spa**
Activity	Sugarfactories
Address	Località mancino, 68/H – 52043 CASTIGLION FIORENTINO (AR) Tel: 0575 6351 – telefax: 0575 653182

Company name	**SADAM ISZ spa**
Activity	Sugarfactories
Address	Via Togliatti, 58 – 09034 VILLASOR (CA) Tel: 070 9648033 – telefax: 070 9647609

Company name	**Zuccherificio del Molise spa**
Activity	Sugarfactories - Raffineria
Address	Contrada Pantano Basso – 86039 TERMOLI (Campobasso) Tel: 0875 58921 – telefax: 0875 751446

Company name	**SFIR – società Fondiaria Industriale Romagnola spa**
Activity	Sugarfactories
Address	Via Benedetto Croce, 7 – 4023 CESENA (FO) Tel: 0547 22818 – fax: 0547 25962 Via P. Togliatti, 9 – 47034 FORLIMPOPOLI (FO) Tel: 0543 748911 – fax: 0543 743624 Via Ricostruzione, 96 – 44038 PONTELAGOSCURO

	(FE) Tel: 0532 461234 – fax: 0532 461849 S.S. 16 Sud – Zona Industriale – 71100 INCORONATA (FG) Tel: 0881 810037- fax: 0881 810004
Activity	Sughificio
Address	Via Cento, 68/C – 40017 SAN GIOVANNI IN PERSICETO (BO) Tel: 051 6811511 – fax: 051 825054

Section 6: COLORANTI

Company name	**SPRING COLOR Colorificio**
Activity	Produzione e vendita
Address	Via Jesina, 63 – 60022 Castefidardo (AN) Tel e Fax 071 7823780

Company name	**CIPA – AT Centro Istruz. Professionale Agricola e l'Assistenza Tecnica**
Activity	
Address	Corso Stamira, 29 – 60122 Ancona Tel. 071 202987 fax 071 56314

Company name	**BIOCHIM s.r.l.**
Activity	
Address	Via Sarfatti, 3 – 20136 Milano Tel. 02 8251086 – Fax 02 57511969

Company name	**FORESTALP Soc. Coop.**
Activity	
Address	Via Fossombrone, 14 – 60126 Ancona Tel. 071 2801010 – Fax 071 2810473

Company name	**HOCUS POCUS**
Activity	Laboratorio artistico artigianale
Address	Via Dal Pozzo Toscanelli, 1 – 20132 Milano Tel. e Fax 02 27203553

Company name	**ASSAM**
Activity	Agenzia Servizi Agroalimentari Marche
Address	Via Alpi, 21 – 60131 Ancona Tel. 071 8081 – fax 071 - 85979

Company name	**Coop. Agraria "LA CAMPANA"**
Activity	Coltivazione specie tintorie e saggi di tintoria
Address	Via Menocchia, 39 – 63010 Montefiore dell'Aso (AP) Tel. 0734 938229 – fax 0734 938484

Company name	**P.A.I. di Panconesi Stefano**
Activity	Tintura tessuti
Address	Via Lazzerini, 67 – 59100 PRATO Tel. 0574 37124

Section 7: SCIENTIFIC

Company name	**+ DIPARTIMENTO DI AGRONOMIA**
Address	Via Filippo Re, 6-8 – 40126 BOLOGNA Tel: 051 2091533 – fax: 051 2091545

Company name	**+ DIPARTIMENTO DI AGRONOMIA AMBIENTALE E PRODUZIONI VEGETALI**
Address	Via Romea, 16 – 35020 LEGNARO (PD) Tel: 049 8272830 – fax: 049 8272839

Company name	**+ DIPARTIMENTO DI ECONOMIA E INGEGNERIA AGRARIE Sez. Economia e Politica Agraria**
Address	Via Filippo Re, 10 – 40126 BOLOGNA Tel: 051 2091580 – fax: 051 248832

Company name	**° ISTITUTO SPERIMENTALE PER LE COLTURE INDUSTRIALI**
Address	Via di Corticella, 133 – 40129 BOLOGNA Tel: 051 6316811 – fax: 051 374857

Company name	**# AGRONOMICA S.r.l.**
Address	Via Romolo Gessi, 20 – 48100 RAVENNA Tel: 0544 35078 – fax: 0544 36589

Company name	**# A. BIOTEC - FORLÌ'**
Address	(closed)

Company name	**+ DIPARTIMENTO DI SCIENZE AGRONOMICHE E GESTIONE DEL TERRITORIO AGROFORESTALE**
Address	Piazzale delle Cascine, 18 – 50144 FIRENZE Tel: 055 3288251 – fax: 055 332472

Company name	**+ DIPARTIMENTO DI AGRONOMIA E GESTIONE DELL'AGRO-ECOSISTEMA**
Address	Via S.Michele degli Scalzi, 2 – 56124 PISA Tel: 050 599111 – fax: 050 540633

Company name	**+ ISTITUTO DI AGRONOMIA GENERALE E COLTIVAZIONI ERBACEE**
Address	Borgo XX Giugno, 74 – 06121 PERUGIA Tel: 075 5856329 – fax: 075 5856344

Company name	**+ DIPARTIMENTO DI PRODUZIONE VEGETALE**
Address	Via S.Camillo de Lellis – 01100 VITERBO Tel: 0761 357554 – fax: 0761 357558

Company name	° **ISTITUTO SPERIMENTALE PER LA CEREALICOLTURA**
Address	Via Cassia, 176 – 00191 ROMA Tel: 06 3295705 – fax: 06 3319215

Company name	**# ENEA**
Address	Casella Postale, 1 – 75025 POLICORO (MT) Tel: 0835 974476 – fax: 0835 974351
Company name	**+ ISTITUTO DI AGRONOMIA GENERALE E COLTIVAZIONI ERBACEE**
Address	Via Amendola, 165/A – 70126 BARI Tel: 080 5442970 – fax: 080 5443043

Company name	**° ISTITUTO SPERIMENTALE AGRONOMICO**
Address	Via Celso Ulpiani, 5 – 70125 BARI Tel: 080 5475011 – fax: 080 5475023

Company name	**+ DIPARTIMENTO DI PRODUZIONE VEGETALE**
Address	Via Nazario Sauro, 85 – 85100 POTENZA Tel: 0971 201111 – fax: 0971 202269

Company name	**+ ISTITUTO DI AGRONOMIA GENERALE E COLTIVAZIONI ERBACEE**
Address	Via Celoria, 2 – 20133 MILANO Tel: 02 70600164 – fax: 02 70633243

Company name	**+ ISTITUTO DI AGRONOMIA GENERALE E COLTIVAZIONI ERBACEE**
Address	Via delle Scienze – 90128 PALERMO Tel: 091 6650211 – fax: 091 6650229

Company name	**+ ISTITUTO DI AGRONOMIA GENERALE E COLTIVAZIONI ERBACEE**
Address	Via Valdisavoia, 5 – 95123 CATANIA Tel: 095 234480 – fax: 095 234449

Company name	**+ DIPARTIMENTO DI SCIENZE AGRONOMICHE E GENETICA VEGETALE AGRARIA**
Address	Via E. De Nicola – 07100 SASSARI Tel: 079 229229 – fax: 079 229222

Company name	**° ISTITUTO SPERIMENTALE PER LA NUTRIZIONE DELLE PIANTE**
Address	Via della Navicella, 2-4 – 00184 ROMA Tel: 06 7005413 – fax: 06 7005711

Company name	*** STAZIONE SPERIMENTALE PER LE INDUSTRIE DEGLI OLI E DEI GRASSI**
Address	Via G. Colombo, 79 – 20133 MILANO Tel: 02 2361051 – fax: 02 2363953

Company name	*** STAZIONE SPERIMENTALE PER LA CELLULOSA, CARTA E FIBRE TESSILI E VEGETALI ED ARTIFICIALI**
Address	Piazza Leonardo da Vinci, 26 – 20133 MILANO Tel: 02 2395531 – fax: 02 2365039

Company name	**+ DIPARTIMENTO DI ECONOMIA E INGEGNERIA AGRARIE - Sez. Ingegneria agraria**
Address	Via Gandolfi 19 – 40057 CADRIANO DI GRANAROLO DELL'EMILIA (BO) Tel: 051 766632 – fax: 051 765318

Company name	**+ ISTITUTO SPERIMENTALE PER LA MECCANIZZAZIONE AGRICOLA**
Address	Via della Pascolare, 16 – 00016 MONTEROTONDO (RM) Tel: 06 9067916 – fax: 06 90625591
Company name	**+ DIPARTIMENTO DI SCIENZE DEL FARMACO**
Address	Via Muroni, 23/a – 07100 SASSARI Tel: 079 228751 – 079 228712

Company name	**+ DIPARTIMENTO DI AGRONOMIA, SELVICOLTURA E GESTIONE DEL TERRITORIO**
Address	Via Leonardo da Vinci, 44 – 10095 GRUGLIASCO (TO) Tel: 011 6708778 – fax: 011 6708798

+ Università degli Studi
° Ministero per le Politiche Agricole
* Ministero dell'Industria
# Altri

Section 8: OTHERS

Company name	**MiPA: Ministero per le Politiche Agricole**
Address	Via XX Settembre, 20 – ROMA Tel: 06 484723 – fax: 06 4819580

Company name	**REGIONE EMILIA-ROMAGNA Assessorato all'Agricoltura**
Address	Viale Silvani, 6 – 40122 BOLOGNA Tel: 051 551438

Company name	**CAMERA DI COMMERCIO**
Address	Piazza Costituzione, 8 – BOLOGNA 051 6093111

Company name	**CONZORZIO AGRARIO PROVINCIALE (CAP)**
Address	Via E. Mattei, 6 – 40138 BOLOGNA Tel: 051 537111 – fax: 051 535800

Company name	**CONFEDERAZIONE ITALIANA AGRICOLTORI (CIA)**
Address	Via Bigari, 5/2 – BOLOGNA Tel: 051 6314311 – fax: 051 6314333

Company name	**ACCADEMIA NAZIONALE DI AGRICOLTURA**
Address	Via Castiglione, 11 – BOLOGNA TeL 051 263736

Company name	**A.I.A.C.E. (Agricoltura Innovativa per l'Ambiente, la Chimica e l'Energia)**
Address	Via Riva di Reno, 61 – 40122 BOLOGNA Tel: 051 237063 – fax: 051 262203

Company name	**FEDERAZIONE PROVINCIALE COLTIVATORI DIRETTI**
Address	Via E. Mattei, 30 – BOLOGNA Tel: 051 532547

Company name	**CONFAGRICOLTURA**
Address	Corso Vittorio Emanuele, 101 – ROMA Tel: 06 6833375

Company name	**ACCADEMIA DI AGRICOLTURA**
Address	Via Andrea Doria, 10 – 10123 TORINO Tel: 011 8127470

Company name	**ASSESSOTATO ALL'AGRICOLTURA**
Address	Corso Mazzini, 148 - ANCONA

Company name	**SOCIETA' AGRICOLA E FORESTALE per le PIANTE da CELLULOSA e da CARTA spa**
Address	Via dei Crociferi, 19 – 00187 ROMA

Company name	**A.I.S.O. (Associazione Interprofessionale Semi Oleosi)**
Address	Via Pirro Ligorio, 18 – 00153 ROMA

Company name	**REGIONE VENETO**
Address	Largo Adige Capuleti 11 – 37122 Verona VR Tel: 0458010017

Company name	**REGIONE PUGLIA**
Address	Via G. Bozzi 45/C – 70121 BARI Tel: 0805589760

Company name	**REGIONE BASILICATA**
Address	Via. Dante Alighieri 1 - 75100 MATERA Tel: 0835281111

Company name	**ASSESSOTATO ALL'AGRICOLTURA**
Address	Corso Mazzini, 148 - ANCONA

Company name	**PROGETTO ABSOV (Attività Biologica Sostanza Organica Vegetale)**
Address	c/o Dipartimento di Agronomia , Via Filippo Re 6 – 40126 BOLOGNA

Company name	**PROGETTO CITECA (Colture Industriali Tessili e Cartarie)**
Address	c/o Dipartimento di Agronomia , Via Filippo Re 6 – 40126 BOLOGNA