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**FLAX 2000**  
The future of flax in the EC

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**ABSTRACT**

**FLAX 2000; THE FUTURE OF FLAX IN THE EC**

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This report contains an English summary of a more detailed Dutch LEI-report, published earlier in the series "Onderzoekverslagen". Subject are the flax production and the linen industry within the EC. Consumption and trends on consumer and industrial markets for flax products are dealt with, the objective being to give insight in the marketing possibilities of flax products and the obtainable growth of the flax production between now and the year 2000.

Finally the main conditions, which have to be fulfilled to obtain the indicated growth, are highlighted.

**Flax/Consumer market/Industrial markets/Trends/Market possibilities/Obtainable growth/Conditions**

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# Contents

	Page
<b>PREFACE</b>	5
<b>SUMMARY</b>	7
<b>1. INTRODUCTION</b>	8
1.1 Motivation	8
1.2 Objective	8
1.3 Method	8
1.4 Structure of the report	9
<b>2. THE CONSUMER MARKET FOR FLAX PRODUCTS</b>	10
2.1 Introduction	10
2.2 Linseed products	11
2.2.1 Consumption	11
2.2.2 Trends	11
2.3 Textiles	12
2.3.1 Consumption	12
2.3.2 Trends	16
2.4 Other consumer products out of flax	16
2.4.1 Consumption	16
2.4.2 Trends	17
2.5 Conclusion	17
<b>3. INDUSTRIAL MARKETS FOR FLAX PRODUCTS</b>	18
3.1 Introduction	18
3.2 The linseed market	20
3.2.1 The oil industry	21
3.2.2 The sowing-seed trade	21
3.3 The fibre market	22
3.3.1 The spinning industry	22
3.3.2 The weaving industry	27
3.3.3 The finishing industry	29
3.4 Non-textile uses of flax	29
3.4.1 The chipboard industry	29
3.4.2 The paper industry	30
3.4.3 Alternative uses of flax fibre	30
3.5 Conclusion	31
<b>4. FLAX CULTURE IN THE EC</b>	32
4.1 Introduction	32
4.2 Production	33
4.2.1 Retting	33
4.2.2 EC subsidies	34
4.2.3 Scutching	35

**CONTENTS (continued)**

	<b>Page</b>
4.3 Preparation and trade	35
4.4 Competition	37
4.5 Conclusion	38
5. CONCLUSION	39
5.1 Market possibilities	39
5.2 Future structure	40
5.3 Conditions	40
REFERENCES	41
ANNEX/WORDLIST	42

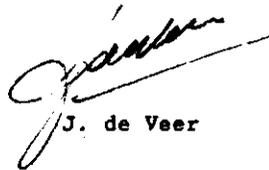
## Preface

In view of the problems of agricultural production within the EC, more insight in the marketing possibilities of alternative crops is necessary. Flax seems to be one of the most promising alternative crops. It was therefore that the Agricultural Economics Research Institute LEI was asked to conduct a study on flax. This communication is a summary of the study, of which the complete report has been published in Dutch as part of the series 'Onderzoekverslagen' (Research Reports).

One of the objectives of the report is to give insight in the results of the study to all the interviewees who co-operated with the study. The authors are grateful to them.

Another objective of this report is to make the results of the study known in a wider area than the Dutch-speaking countries.

The managing director,

A handwritten signature in black ink, appearing to read 'J. de Veer', written over a horizontal line.

The Hague, August 1990

## 1. Introduction

### 1.1 Motivation

The Agricultural Economics Research Institute LEI conducted a study of the possibilities to increase the flax production in the Netherlands. The study was financed by the Dutch Ministry of Agriculture, Nature Management and Fisheries, the Dutch farmers organisation (Landbouwschap) and the organization of the Dutch flax industry (Commissie voor Vlas).

The main motive for the study was that flax appears to be a promising alternative crop. In view of the saturation of markets for most food- and feed crops, which makes research on alternative (non-food) crops necessary, an investigation of the possibilities of flax was desirable. Another important reason to conduct the study was the need of the linen industry to gain more insight in the marketing possibilities of flax fibres and linseed.

This report is based on the results of the study mentioned above. The attention in this report is, however, focused on the West European linen industry in general, its structure and future position.

### 1.2 Objective

Many West European countries have discovered that flax has more marketing and technical possibilities than was assumed ten years ago. Consequently much research has been done in investigating these possibilities. However, most of these researches deal only with a single or a few aspects of flax. This report starts with a wider perspective, its main objective being to give a view on all the possibilities for growing flax and on the possibilities of the various flax products. The target-group for this report are policymakers within the EC or the linen industry, who have to deal with flax.

The report tries to provide an answer to the following questions:

- which are the marketing and technical possibilities of flax;
- which are the ways to exploit these possibilities (structural, technical and competitive).

As a result of the summarily nature of this report, not everything can be discussed in detail. For more detailed information we refer to the original LEI-report (Riensema et al., 1990).

### 1.3 Method

The information in this report was obtained by desk research and by personal interviews with representatives of companies

concerned with the linen industry, representatives of research institutes and other experts.

Use was also made of the statistical resources of the EC and of international and national institutes. The research was carried out in 1989.

In the flax industry many of the names concerning products and processes are generally unknown. These names are entered in a wordlist at the end of this report.

#### 1.4 Structure of the report

Chapter 2 contains a description of the consumer market for flax products. Trends in the consumption of the various flax products are dealt with.

The industrial markets for flax products are discussed in chapter 3.

Chapter 4 gives a survey of the production and of the regions of flax in the EC. This chapter describes also the trade in flax fibres and the competition with other fibres.

Chapter 5 contains the most important conclusions which can be drawn from the information and which are relevant for the policymakers in or outside the linen industry.

## 2. The consumer market for flax products

### 2.1 Introduction

The ultimate user of all products made out of flax is the consumer. Consequently trends on the consumer market affect the production, the processing and the product flows within the linen industry. It is therefore that the consumption of flax products, trends in the consumption and the competition with other products are discussed first.

Figure 2.1 shows the types of flax products that reach the consumer, classified by the part of the flax plant from which they originate.

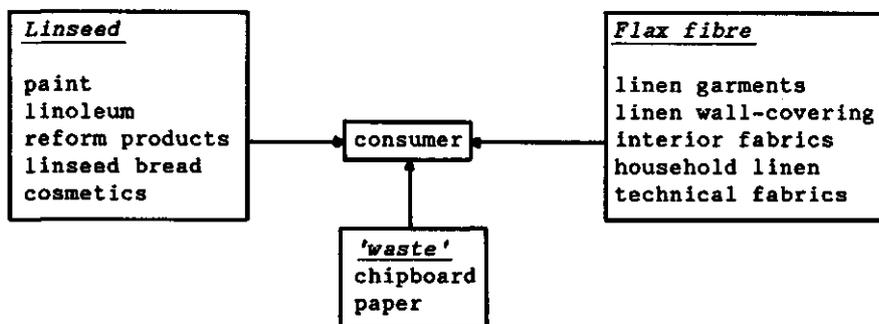


Figure 2.1 Consumer products out of flax

As is shown in figure 2.1, the types of products which can be derived from flax are very diverse. Some products have a long history, like household linen. Other products, like reform foods, have only very recently been introduced.

To create a better understanding of the origins of the products mentioned above, it is necessary to explain the two different possible sources of raw material.

There are two types of flax:

- *Oil flax*

This type of flax is produced in very large amounts in Canada and Argentina. The seeds are used to produce linseed oil, the fibres are regarded as waste and subsequently burned or used for the production of cigarette paper. In the EC this type of flax is only grown (in relatively small quantity) in the UK.

- *Fibre flax*

This type of flax is grown in the EC. The fibre is considered to be the most important part of the plant. The seed production is not as important as with oil flax. The seeds are, however, also used to produce linseed oil. An exception to this rule are the Netherlands where almost the whole linseed production is destined for sowing-seed. Apart from this country, an increasing part of the flax-area in France and Belgium is destined to produce sowing-seed.

Because the importance of growing fibre flax exceeds the importance of producing oil flax in the EC, less attention is given to the latter in this report.

## 2.2 Linseed products

### 2.2.1 Consumption

As is mentioned above, most of the products made out of linseed are derived from oil flax. Especially for the production of paints and linoleum the EC imports large quantities from Canada and Argentina. Although the seeds of fibre flax can also produce linseed oil, this is only done to a very small extent. Compared to the total use of linseed by the EC, the amount of linseed from fibre flax produced within the EC itself and destined for the production of linseed oil, is small. Apart from this, the seeds of oil flax give more oil than the seeds of fibre flax.

### 2.2.2 Trends

During the last decade the linseed oil based paints have been more and more replaced by synthetic based paints. However, due to the general trend on the consumer market towards more natural products, the paint industry expects that this development will reverse and that in the short term the use of natural oils in paints will grow, although only to a moderate extent. Because in the long term all paints will be water based.

In linoleum linseed oil cannot be replaced by other products. Linoleum has been used as floor covering for a very long time. The linoleum industry is flourishing, thanks to an adequate anticipation on trends on the consumer market (the product is given a plus by giving it fashionable designs).

Another trend on the consumer market is the use of linseed in foods. Linseed fits in the trend towards more 'healthy' foods. In Germany these types of products are already on sale. Although this market is expanding it is still very small.

## 2.3 Textiles

### 2.3.1 Consumption

The interest of consumers in fabrics made out of flax fibres is considerable. This is illustrated by the widespread copying of the 'linen look' in garments, furniture, interior fabrics (like curtains) and wall decoration.

Linen for domestic use constitutes the earliest segment of the linen market. There is a practical reason for preferring linen to cotton for these products: Linen absorbs more water and does not fluff. But apart from the fact that these qualities are generally unknown, household linen has an unfavourable image rendering it oldfashioned. Another aspect of linen which hampers this segment of the linen market is the price; the price of linen towels and sheets is approximately four times higher than the price of the same products in cotton.

In 1984 a traditional application of linen revived; garments. Italian designers who wanted to create their own 'look' to compete with the dominating French designers, started using linen fabrics for their garments, which was the beginning of a real 'linen-boom' in fashion. Ever since then, clothing is the most important outlet for linen fabrics.

Linen garments have the image of being 'fashionable', 'design', 'upmarket' and 'exclusive'. Besides favourable technical qualities (cool and comfortable feeling), this image is the reason why many consumers have less problems with the price of linen garments in contrast to the price of household linen. This fashion-related marketing performance of linen has the consequence that the whole linen industry depends on fashion trends.

The extent of the use of linen garments varies considerably between countries, caused by differences in cultural values. In Italy for instance, linen clothes are highly appreciated but less so in the UK and the Netherlands. The most important reasons are the crinkling of linen, the price and the fact that linen fabrics need more care than other types of fabrics. The use of linen in the West European countries and the distribution over these countries are shown in table 2.1.

Since a few years mixtures of linen and cotton or linen and synthetics (acryl or polyester) are used to produce fabrics for furniture and curtains. This is a market segment with great potentialities, although hardly developed so far.

An other outlet for linen fabrics is wall-covering. The largest market segment is here the institutional market, which could be called a 'snobbish market'. Price and practical qualities (cleaning possibilities, discoloring) are here not important.

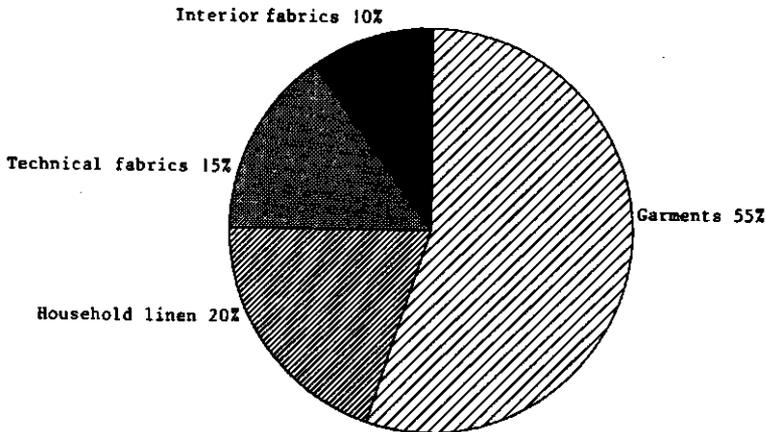
Finally linen fabrics are used for technical applications, like postbags.

**Table 2.1 Consumption of linen in Western Europe, 1988**

Country	Tons	%
Italy	6,200	21
FRG	6,000	20
France	4,000	13
UK	3,700	12
Spain	2,300	8
Benelux	1,700	6
Others	6,100	20
<b>Total</b>	<b>30,000</b>	<b>100</b>

Source: CILC, 1989.

The following figure shows the division in percentages of linen usage in the EC in regard to the most important end-uses.



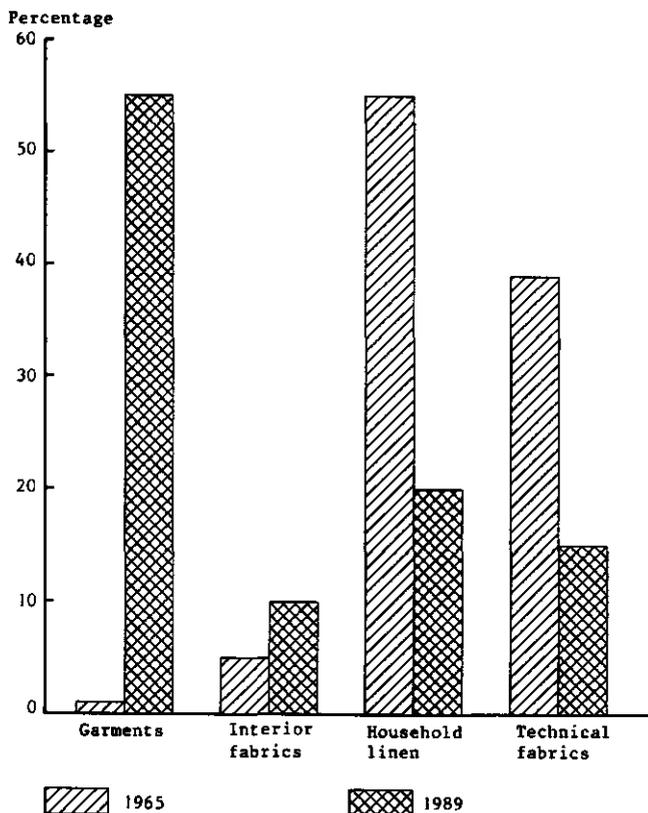
**Figure 2.2 Division of the EC-linen consumption according to the end-uses**

Source: CILC, 1989.

Figure 2.3 shows how the division in regard to the end-uses changed during the last fifteen years.

The figure shows that a dramatic shift occurred in the division of linen by end-use during the last decades. This shift did not only influence the expansion or decline of the different types of linen-producing industries, but it also had its impact on the use of raw material. Flax fibres can be divided in long

fibres and short fibres (tow). In general the short fibres are used for the production of household linen and technical fabrics; the long fibres are used for the production of garments. It was therefore that there was a large demand for short fibre in the sixties. With the shift towards the production of linen garments, not only did the whole linen industry became dependent on the fancifulness of fashion, but the demand for long fibres increased and decreased for short fibres.



*Figure 2.3 Division of the EC-linen consumption in 1989, compared to 1965*

In the fibre market, flax fibre is only of minor importance, as figure 2.4 shows.

The marketing of linen is controlled by the European organisation of the linen industry, the CILC (Confédération Internationale du Lin et du Chanvre). The head office of the CILC is in

Paris. This organisation represents all sectors of the West European linen industry: production, preparation, trade, spinning, weaving and finishing. Besides these sections there are three committees: for financial affairs, for promotion and for research. Almost all the promotional activities for linen products are co-ordinated by the promotion committee of the CILC.

The organization has national agencies in Europe, New York and Tokio. Its marketing budget is about four million Ecu. About 50% of it is contributed by the EC, the other half by the linen industry itself.

The main activity of the CILC-promotion committee is to promote linen among designers. Many members complain about the choice of one single main target group. Furthermore there is disagreement about the distribution of the budget among countries and about the items of promotion.

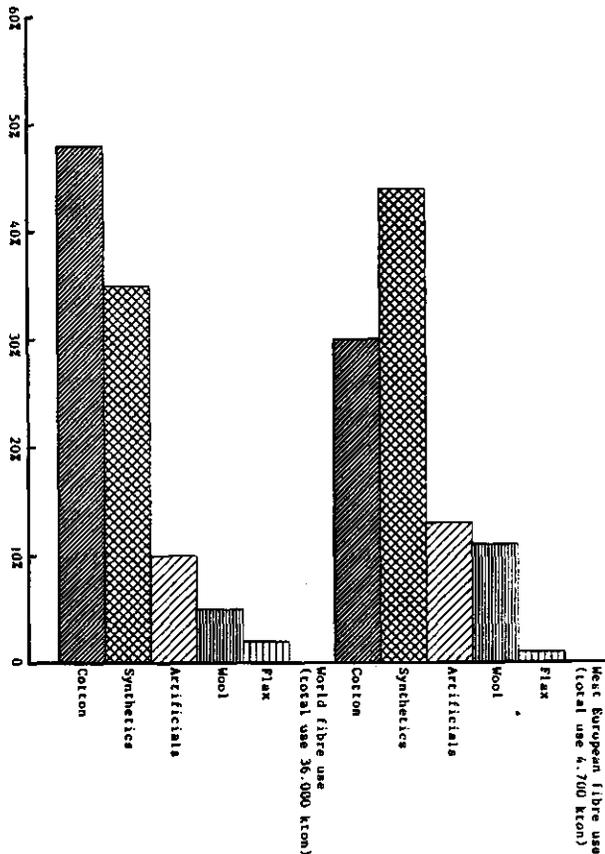


Figure 2.4 Share of flax fibres in the total world- and the West European use of fibre

The last few years some friction arose between the CILC and the EC concerning the issue of where to spend the money for promotion. At the moment they both have their own promotion strategy and they do not co-operate.

The problems mentioned above have their impact on the efficiency and effectiveness of the promotion campaigns. A market study by GMF-polytechnic (1987) and the LEI-study (Riensema et al., 1990) both revealed that the impact of the linen promotion is nil, except in Italy where Italian weaving companies conduct their own linen promotion.

### 2.3.2 Trends

The clothing sector will remain the leader of the linen industry, but in addition to garments attention will be paid to fit linen in the fashion trends in interior fabrics. The trend of furniture and interior decoration towards an increasing fashion-dependence is seen everywhere in the EC, once again with the Italian designers as the leaders. This trend is stimulated by the linen industry because it is extremely necessary to get in future a balanced demand for short and long flax fibres.

It is expected that in the future the use of linen for garments will remain at approximately 50% and the use of household linen at 20%, but that the use of linen for technical purposes will decrease further, while the use of linen for interior decoration will increase.

Growing market segments for linen are:

- garments out of very fine, pure flax yarns;
- high quality mixtures for garments (with rayon or silk);
- tricot;
- interior fabrics (mixtures with acryl or polyester);
- linen-look fabrics (mixtures with cotton, wool or synthetics).

The growing potential of the flax fibre demand in the textile market is in the long term estimated to be 33% (from 49 kton a year at present to 65 kton a year in the year 2000).

## 2.4 Other consumer products out of flax

### 2.4.1 Consumption

The flax-component in the products made out of flax 'waste', chipboard and paper is, in contrast to textiles, of little interest to consumers. Chipboard produced partly from flax-shives is used for the same purposes as chipboard from wood-shives. For example chipboard is used in doors, furniture and building-materials.

Apart from cigarette paper, 'waste' products containing cellulose are used for the production of papermoney (in the USA) and other high quality paper.

## 2.4.2 Trends

There is a trend towards the use of board of a low weight. Chipboard made out of flax-shives meets this demand. It is therefore expected that the demand for board from flax-shives will grow.

Flax products are only used for the manufacturing of paper in a few special cases; paper money, bible paper and cigarette paper. For the production of paper money this is due to legislation. Trends on the consumer market have therefore no influence on the demand for these products.

## 2.5 Conclusion

- Flax has a very small market share on the total fibre market.
- The best marketing performance is seen of linen for textiles.  
On the overall textile market this market segment has been doing very well after the launching of linen garments by Italian designers. This however has consequences:
  1. the demand for flax fibre depends on trends in fashion;
  2. with the long flax fibre as the locomotive of the flax production, the whole linen industry depends on trends in fashion;
  3. developments in the use of linen by consumers led to a disturbance of the balance on the flax fibre market.
- Most of the linseed oil is at this moment applied in linoleum and paint. New outlets for linseed are foods and cosmetics. Although this is a developing market segment, the size of this market segment will never come up to the former.
- On the consumer market there are hardly any trends in the use of chipboard to be expected. The importance of low weight chipboard is more relevant to the industrial market.
- Between 1965 and 1989 a shift occurred in the use of linen from household and technical uses to garments. It is expected that this situation will continue in future. The use of fabrics which exist (partly) out of linen will increase in interior decoration.
- The linen marketing is not efficient. The disagreements between the CILC and her members on the one hand and between the CILC and the EC on the other hand, lead to conflicting marketing strategies. The total effect of the marketing of linen therefore is nil.  
It is necessary to come to a single marketing strategy with clearly defined targets and target-groups.

### 3. Industrial markets for flax products

#### 3.1 Introduction

In chapter 2 we dealt with the market for consumer products out of flax. In this chapter the market of the raw materials will be examined.

The market for raw material is considerably more complex than the consumer market. This is not only due to the diversity of products, but also to the dualistic structure of the linen industry. Therefore we firstly try to give more insight in the structure of the West European linen industry.

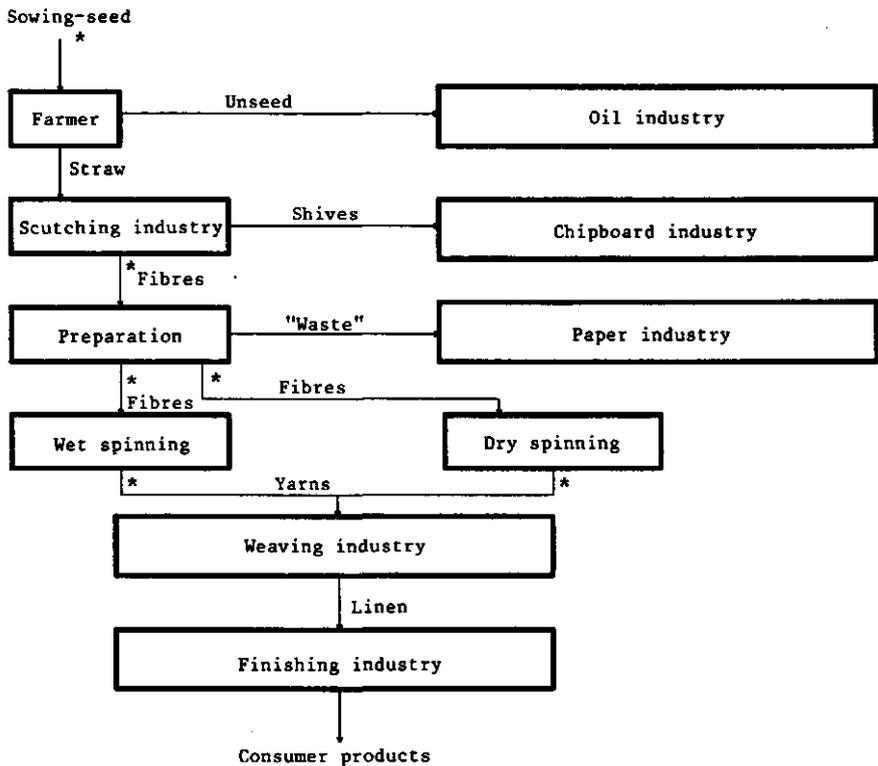


Figure 3.1 Structure of the linen industry in the EC

Figure 3.1 shows the types of industry involved in the processing of the flax fibre and linseed into consumer products. It is a simplified reproduction of the actual product flows. In each flax producing country there are minor deviations from this figure. Important are the \* signs in the scheme, which indicate the intervention of trading companies.

Figure 3.1 gives an indication of the structure of the linen industry in the traditional and largest flax producing countries, France and Belgium. Since a few years however, the interest in the production of flax is growing in non-traditional flax producing countries like Austria, Denmark and especially Western Germany. In these countries one cannot speak of a traditional structure of the linen industry. These countries look for a less traditional structure of their linen industry, for which the main reasons are:

- The unwillingness to be dependent on the traditional traders;
- The possibilities to sell flax products to non-traditional outlets;
- The quality of the flax fibre is more suitable for alternative, non-textile uses, because it is less than the quality of the flax fibre in the traditional flax producing countries.

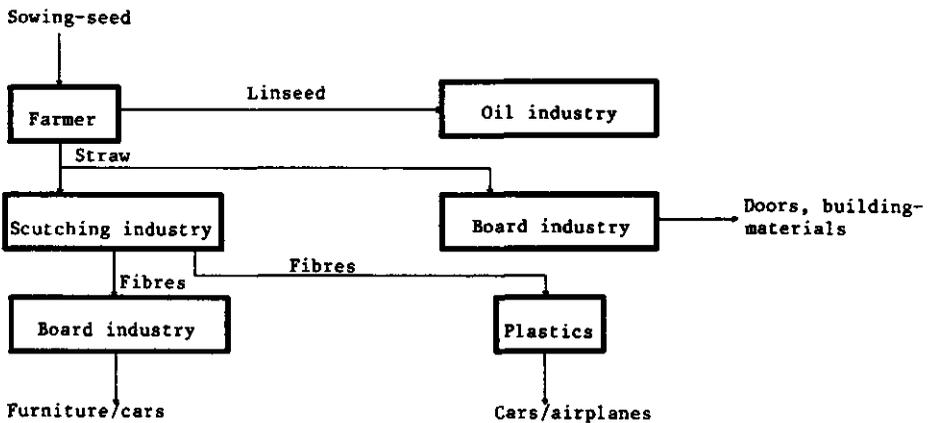


Figure 3.2 Structure of a non-traditional linen industry \*)

\*) The structure is developing in some countries next to the structure in figure 3.1. The progress of the development depends on the country in question.

The structure of the linen industry in the non-traditional linen countries is not yet a definite one. The most innovative country in this respect is Western Germany. The Netherlands, as well a traditional as a non-traditional country concerning flax, have the aspiration to create a structure which will supply both traditional and non-traditional users of flax fibres. A preliminary structure is given in figure 3.2. It is expected that in five to ten years such a structure will be developed in Western Germany and the Netherlands.

### 3.2 The linseed market

There are two branches in the linseed market, the linseed oil branch and the sowing-seed branch. In the EC these markets are discerned by the origin of their raw material. The linseed oil branch generally uses seed of oilflax, the sowing-seed branche generally use seed from fibre flax. This separation however, is not an absolute one. The linseed oil branch also uses seed from fibre flax, although in relatively small amounts compared to the use of seed from oilflax. When seed from fibre flax is used to produce linseed oil this is generally done because the quality of the seed is not sufficient to sell the seed as sowing-seed. The use of seed from oilflax for sowing-seed is seen in for example in the UK where oil flax is grown.

Figure 3.3 give some insight in the origin of linseed (oil flax or fibre flax) and the destination of the seed (oil or sowing-seed) and the cross-overs in the EC.

#### DESTINATION:

Linseed oil	UK :10	France :22
	Imports: 1.000	Belgium: 5 FRG : 2
Sowing-seed		France : 3 Belgium: 5 NL : 5

#### ORIGIN:

oil flax

fibre flax

*Figure 3.3 Origin and destination of linseed in the EC by country of production (kton)*

In the following sections the two branches are further discussed.

### 3.2.1 The oil industry

Linseed oil is used to produce paint (the so called alkydic paints), primers and linoleum. The oil is very well suited for these applications because of the high content of poly unsaturated fatty acids. For the same reason linseed oil is not suited for consumption. As a consequence oil producing companies can not easily switch from linseed oil to edible oils like rape oil. This raises the threshold for processing linseed by the oil industry.

Almost all the linseed used by the West European oil industry comes from Canada and Argentina (approximately one million tons a year). The linseed produced in the EC itself, is by far not sufficient to meet the demand (approximately 35,000 tons a year). The largest producer of linseed oil in the EC is Western Germany.

In France and Belgium most of the linseed not destined for sowing-seed, is processed by the national oil industry. In the Netherlands and Germany the quantities of the linseed which is not used as sowing-seed are too small to be processed into oil. This seed is used to produce cosmetics and foods.

During the last few years the use of linseed in the oil industry in the EC has declined. The reason for this is the price. For most applications (except linoleum), linseed oil can easily be substituted by soya oil, which in recent years has been cheaper than linseed.

### 3.2.2 The sowing-seed trade

The trade in sowing-seed takes place in France, Belgium and the Netherlands. In France the trade is only national. Originally the sowing-seed production in France was nil. Nowadays about 8,000 ha produce sowing-seed, sufficient for 50% of France's own need. This development was started when a large French co-operative and a research institute developed two new flax-varieties with very good qualities such as high resistance against diseases. In addition to this the investments in de-seeding machinery in France were increased. However, the sowing-seed production per ha is in France only about half of that in Belgium or the Netherlands (500 kg/ha).

The Belgian production of sowing-seed is almost completely exported to France, after using a part for own sowing. As the self-supply of Belgium exceeds 100%, they supply France for about 30% of its need.

The Netherlands are the smallest, but nevertheless most dominating trader in sowing-linseed. The quality of their linseed is said to be the best of Western Europe. The production of sowing-seed is in this country the most important part of the flax production, in contrast to other flax producing countries where the fibre is considered to be the most important part of the plant.

### 3.3 The fibre market

The industrial market for flax fibres can be divided up in textiles and non-textiles. The non-textile market for flax fibres will be dealt with in section 3.4.

The traditional industrial market for flax fibres is the textile sector. The flax fibres are processed by spinning, weaving and finishing companies and finally made into consumer products. Each stage of the processing from flax fibres to linen has its own structures and developments which are specific for the linen industry. These aspects have their effect on the position of linen on the textile market and the position of the flax fibre on the fibre market.

In the following section the performance is considered of the spinning, weaving and finishing industry for linen in the EC.

#### 3.3.1 The spinning industry

In the West European linen industry the flax spinning companies are completely dependent on the management of the linen weaving-mills. The same is true for spinning-mills which spin cotton or synthetics, although to a lesser degree.

The West European flax-spinning sector is very small. The most flax spinning companies are affiliated with the CILC. These 26 spinning companies use mainly flax fibres. Among them there are six large ones. Together they produce about 35,000 tons of yarns.

Besides by CILC-spinning companies, flax fibres are also used by other firms like rope-makers, spinning companies which produce mixtures, the paper industry and flax spinning firms which are not affiliated with the CILC. These companies use 38,000 tons of flax fibres, as compared to 49,000 tons by the CILC-companies. CILC-companies however, use more long fibres, but the non-CILC-companies more short fibres.

Table 3.1 shows the structure of the West European flax spinning industry. It should be noted that this table contains only data of CILC-companies, because (with exception of the total amount of flax fibres used) nothing is known about the number and the production of non-CILC-companies. When interpreting the table one must therefore bear in mind that it shows only the contribution of the pure flax spinning companies.

In the flax spinning business there is a sharp difference between the so called wet-spinning and dry-spinning companies. Not only do the spinning-techniques differ, but also the management.

The largest wet-spinning companies are in Italy and Northern Ireland. They produce about 5,000 tons of yarns per year each. They are very modern and well equipped in comparison to dry-spinning companies and they invest extensively in knowledge and

**Table 3.1 Structure of the West European flax spinning industry, 1988**

Country	Number of pure flax spinning companies	Production (tons)	
		wet spun yarns	dry spun yarns
Belgium	7	1,800	7,000
UK	7	4,200	2,600
France	5	5,300	1,800
Italy	3	7,100	700
FRG	2	600	400
Austria	1	700	1,100
Switzerland	1	.	.
<b>Total</b>	<b>26</b>	<b>19,700</b>	<b>13,600</b>

machinery. Wet-spinning companies produce fine yarns, which can be used to produce clothes. The wet-spinning market is dominated by a large Italian company, Linificio. Linificio is part of the Marzotto-group, a textile producing organisation. This company has also a share in two of the largest wet-spinning companies in Italy and France.

Most of the dry spinning companies are in Belgium. This sector has not been doing very well in the last decade. This is due to the low investment-level in this type of companies and further to a declining demand for more course flax yarns due to the declining demand for household linen and technical linen. During the last few years these companies have expanded their activities into clothing. According to the representatives of these companies this led recently to an expansion, although not structural, of the production of dry spun yarns. The main pillars are yarns for sportswear and mixtures for the so called 'hot linen'. 'Hot linen' is the counterpart of 'cool wool'. The purpose of this product is to extend the season in which linen clothing can be worn. The sales of dry spun yarns might profit from the production of this product.

Up till now the production of yarns for hot linen is still in the testing stage. At this moment it is therefore impossible to foresee whether this yarn will increase the sales of dry spun yarns in future.

The last five years there was once more a shift in the use of long and short flax fibres, due to a shift in the use of raw material by dry spinning companies. Before then the main raw material for dry spinning-mills were unpurified short fibres. The use of plastics in agriculture however, pollute the fields with remnants of these materials. The use of plastics in agriculture is the source of the problem, which was not a real problem

until a different, more cost efficient, way of harvesting flax was generally adopted. With the new harvesting method the plastics are picked up together with the flax straw. In the further processing of the flax straw the small plastic remnants (mainly polypropylene) finish up into the unpurified short fibres.

Polypropylene is a synthetic which is woven into the fabric when coarse yarns are used, made out of unpurified short flax fibres. When the fabric is dyed, the polypropylene is seen as little black stripes in the fabric because it does not absorb paint at all. Consequently the fabric is worthless.

Because the polluted fabrics are worthless, weaving-mills require absolutely polypropylene free yarns from the spinning-mills/sellers. This forces the dry spinning companies to use purified short fibres or cutted long fibres instead of unpurified short fibres as raw material. Consequently the price of the raw material increased. To deal with this raise of costs many dry spinning companies buy, besides purified short fibres, long fibres of low quality from Eastern Europe which they cut. The higher costs for the raw material are compensated then by a higher spinning performance, which increases from about 55% to 70%.

In addition to the shift from short fibres to long fibres which occurred in the period 1965-1985 because of the changing distribution over the different market segments (from household linen to garments), the shift from West European short fibres to (East European) long fibres by the West European dry spinning industry, led to a complete disturbance of the balance in demand for short and long fibres in the EC. Flax is a natural product and the ratio short fibres/long fibres can not be varied artificially. Due to the market developments the stocks therefore increased enormously, as is shown in table 3.2.

*Table 3.2 Development of EC-stock of flax fibres divided into short fibre and long fibre*

Year	Total stock (tons)	Short fibre (%)	Long fibre (%)
1971	12,000	33	66
1988 *)	68,000	75	25

\*) First five months.

Source: EC, 1989.

The price of a flax yarn is fixed by its fineness. The fineness of a yarn is indicated by the yarn count. There are several ganges to indicate the yarn count. In this report the Nm will be used. Nm stands for metric number. Nm 10 indicates that 10 metres flax yarn weigh one gram. The higher the Nm-number, the finer the yarn.

An indication of the relation between fineness and price of flax yarns is shown in figure 3.4.

As can be seen in figure 3.4, the prices of flax yarns increase rapidly with an increasing yarn count. Therefore the demand for raw material which makes it possible to produce high yarn counts is very large. At this moment however there is not sufficient raw material of this type available. Spinning companies make use of methods like bleaching to get an acceptable fineness. With a normal quality of flax fibres a yarn count of Nm 26 can be achieved. When the same raw material is bleached a yarn count up to Nm 60 can be achieved.

The yarn loses about 25% of its strength when bleached. The requirements of the flax spinning companies in regard to the quality of the raw material consist for this reason of high fineness and/or high strength.

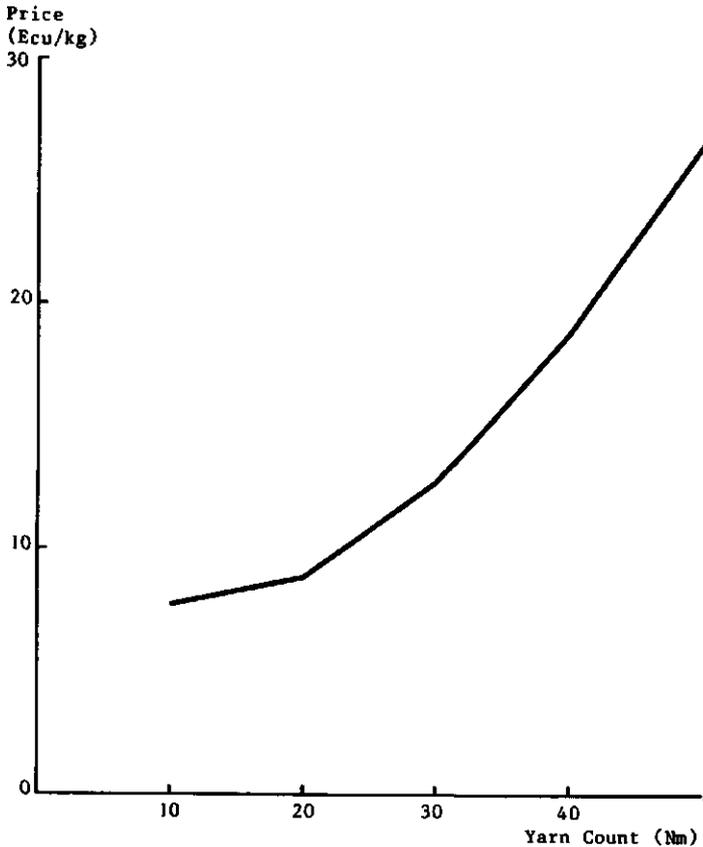


Figure 3.4 Relation between fineness and price of flax yarns

This fact leads to the conclusion that although there is a surplus of flax fibre in the EC, the qualities of the supply do not meet the requirements. It can also be concluded that a large market exists for very fine and/or very strong flax fibres.

Extensive research has been done to increase the quality of the flax fibre, especially at the retting-stage (the loosening of the flax fibres from the pith in the straw). This will be dealt with later.

Flax fibres of the highest quality come from a region in the North of France, where the climate is very suitable for the growing of flax. Other French flax and Belgium flax is of a somewhat lower quality. Dutch and especially German flax is of the lowest quality. Besides differences in climate this variation in fibre quality is also due to quality control during the fibre-production out of the straw (scutching). Also important is the fact that the production of high quality sowing-seed does not go together with high quality fibre production.

The prices of flax yarns fluctuate with approximately 10% over the year. The reasons for this are speculation by traders and the price-management of the market leader.

The prices of cotton yarns differ considerably from those of flax yarns. The difference increases when the yarn counts are higher. The prices of raw material do not differ much, being 1,2 Ecu per kg for both. The price difference starts in the spinning phase. For cotton more cost efficient spinning techniques are available than for flax (the same is true for synthetic yarns). There are three reasons why there is not a more efficient way to spin flax yarns:

- The most important reason is the scale of the flax-spinning sector. Because it is relatively small, it is not advantageous for machine-producing companies to produce flax-spinning frames. The few machines they can sell do not make up for the investment. This has two consequences:
  1. the prices of flax-spinning frames are very high, compared to these of cotton or synthetics spinning frames.
  2. technical improvement progresses slowly; flax-spinning mills lag behind to a considerably extent, compared to cotton or synthetics spinning mills.
- Dry-spinning companies do not invest much. As a consequence they face a growing gap with the wet spinning ones.
- The qualities of the flax fibre (stiff, irregular surface, high torsion resistance) make it difficult or even impossible to implement spinning techniques of other fibres, like cotton.

Flax yarns therefore cost about two or three times the price of cotton yarns.

The market shares of the different yarn counts of flax yarns is shown in figure 3.5.

The reason for the relatively small market share of the

higher yarn counts is the lack of sufficient raw material of the right quality, as is mentioned before. Consequently the demand for very fine yarns can not be fully met.

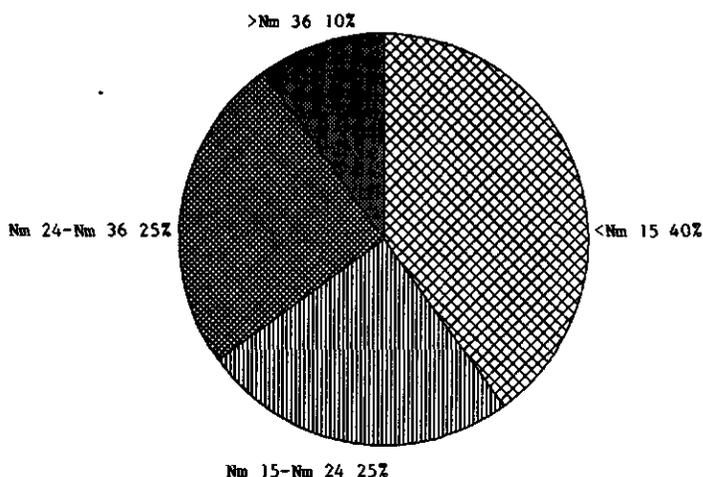


Figure 3.5 Market shares of different yarn counts of flax yarns

As mentioned above, the wet spinning sector does invest extensively (e.g. in 1988 41,000 Ecu). Most of the investments concern Linmacks, a modernised version of ring-spinning machines. With the introduction of the Linmack the wet spinning process became not only more efficient, but it became also possible to produce stronger yarns. This in turn made it possible to weave flax yarns on modern high speed looms.

A weak point of the flax spinning industry is its location in Western Europe. The spinning of flax yarns is very labour intensive. However, labour in Western Europe is expensive, compared to for instance South East Asia. A general trend in West European spinning companies to offset the price competition of the South Asian spinning companies, is to run 8,000 hours a year. This trend can also be noticed in modern wet spinning companies.

### 3.3.2 The weaving industry

Weaving-mills plan their production 18 months in advance, according to the types of fabrics, colors and patterns, which are chosen at the 'International Fashion Meeting' (a meeting of social-scientists, designers, weaving-mills and the clothing industry which takes place every half year).

Although it is possible to weave linen on the same looms as other types of fabrics, one has to face more technical problems,

because flax yarns are stiffer and break off more often than other yarns, especially in case of very fine yarns. Therefore flax yarns are not generally used in non-traditional linen weaving-mills. To deal with these qualities of flax yarns, many linen weaving companies use a cotton warp (vertical threads) and a linen woof (horizontal threads).

The use of flax yarns by West European weaving companies (as well linen as non-linen weaving-mills) is shown in table 3.3.

*Table 3.3 The use of flax yarns by West European weaving companies, 1988*

Country	Use	
	amount (tons)	distribution (%)
Italy	14,400	48
France	3,900	13
UK	3,800	12
Belgium	3,300	11
FRG	2,900	10
Austria	1,200	4
Switzerland	600	2
<b>Total</b>	<b>30,000</b>	<b>100</b>

Source: CILC, 1989.

Most of the linen weaving-mills are located in Italy, which produces about 50% of the total linen production of Western Europe.

These Italian linen weavers contract designers, are innovating and very modern. They produce mostly pure linen or fabrics with more than 50% linen. In general Italian weavers use very fine yarns, suitable for fine linen clothes (dresses, shirts).

The major Italian weaving companies are vertically integrated or have joint ventures with spinning-mills in South America or Eastern Europe. The main reason being the fact that the market leader in the spinning business is vertically integrated and therefore both supplier and competitor for the weaving-mills.

In France, Belgium and the UK (Scotland and Northern Ireland) there are also many weaving-mills. Most of these mills, especially the Belgian and Scottish, differ considerably from the Italian ones. They are less modern, do not invest as much as their Italian colleagues and generally serve an other segment of the market; the market for household linen. In general they use the more coarse yarns, suited for this purpose. In recent years they also started operating in the clothing-business, although

they use the more coarse fabrics and mixtures for this purpose (sportswear).

Flax yarns are hardly used to produce tricots. There are two reasons for this:

- The knitting industry has low priority on the list of potential sellers by spinning-mills;
- The technical qualities of flax yarn, especially the stiffness, make modifications of the yarns for this type of processing necessary. Pure flax yarns can only be used if treated with paraffine or mixtures of linen and synthetics should be used.

The knitting industry is potentially an important user of flax yarns. For example in the USA are flax yarns used to produce 'cool wool'.

### 3.3.3 The finishing industry

In the finishing industry fabrics are bleached to make them absorb paint easily, where upon they are dyed or printed, followed by a chemical and/or mechanical treatment to prevent the fabric from shrinking, discolouring, crickling, burning etcetera. The finishing of linen is highly specific, especially the dyeing. The flax fibre does not absorb paint easily, therefore the result of the dyeing depends on the skill of the firm.

The most finishing companies which are specialized in linen, are small. Large buyers like the wall decoration industry therefore encounter difficulties with the use of linen, because of the differences in color between separate dyebaths. The difficulties of dyeing have also positive effects; after dyeing linen shows specific pastel-like colors.

The crickling problem of linen can only be solved by the finishing industry by abandoning the specific linen-feeling and linen-look. Crinkling therefore will remain a specific property of linen, which confines its market growth to specific segments.

## 3.4 Non-textile uses of flax

### 3.4.1 The chipboard industry

At present chipboard from flax-shives is used for the same purposes as chipboard out of wood-shives. However, the advantage of the first type of board over the last is the two or three fold lower weight. The demand for board with a low specific gravity is growing. Flax-shives are very suitable to be used in this type of board. It is therefore expected that the demand for chipboard out of flax-shives will grow in future.

### 3.4.2 The paper industry

During the processing of the flax plant to linen, 'waste' like very short cellulose fibres come free. These fibres are used to produce paper. The longest, cleanest fibres are used to produce papermoney. This is only done in the USA, due to the American legislation. The raw material is bought in the EC, especially in Belgium. However, the production of oil flax in Canada and the USA itself also releases short cellulose fibres, which can be used to produce papermoney. In former times all fibres from oil flax were burnt and the raw material was imported from the EC. Nowadays more and more use is made of the fibres from oil flax of national production. Raw material therefore is only imported in times of non-sufficient national supply.

For the production of cigarette paper shorter and less clean flax fibres are used, which come free during the processing of linen. The problem is that many spinning companies mix dust with these fibres in order to save costs, which make them useless to the paper industry.

Apart from papermoney and cigarette paper, other types of paper may also be produced out of flax. In France a large part of the acreage of flax is grown solely for the paper industry.

### 3.4.3 Alternative uses of flax fibres

Much research is done into the use of flax fibres for alternative applications. Especially Western Germany is very active in this field. Up till now the use of flax fibres for alternative outlets is very small and confined to sponges. However, the intensive reseach in various countries during recent years, urged by the increasing importance of the use of agricultural products for industrial purposes (agrification), has had its results. The most promising alternative outlets for flax fibre in the near future are:

- fibre board;
- strenghtening of plastics.

Ever since the seventies the use of fibre board has been growing, as a result of the development of Medium Density Fiber board (MDF). This MDF-board can replace wood in the production of furniture. Another advantage of fibre board is that fibres can be flat-pressed or moulded, eg into dashboards. For this purpose low weight is also an advantage. It is expected that the use of MDF-boards will grow in future. Flax fibres can be used to produce this type of board.

The use of fibres for the strenghtening of plastics is no real novelty. Nowadays, glass fibre, carbon-fibre or asbestos are used for the same purpose. They can be substituted however by natural fibres. Important applications of plastics, strenghtened by natural fibres, are panels in cars and airplanes.

The extent of the use of flax fibres in future for alternative outlets is difficult to estimate. It is estimated for the near future that in the EC there is room for the yield of an additional 2,000 ha of fibre flax to be applied in alternative products. In the long term this might increase to 10,000 ha.

The main obstacles for the use of flax fibres for alternative applications are:

- the price compared to the price of synthetics or other natural fibres;
- the differences in supply; in quantity, quality and time of year.

In the long term there are possibilities for rayon out of flax, modified celluloses and flax fleeces (rubbish bags, hygienic and household products). Much research has still to be done to produce technically and commercially successful products. A research program has to be developed within the framework of agrifunctional research in the EC, in which the research into these kinds of products can be initiated and co-ordinated.

### 3.5 Conclusion

- The EC is in regard to linseed and linseed oil completely dependent on imports. Therefore, the EC should become more self-sufficient in linseed by stimulating the production of flax (fibre flax and/or oil flax) in the EC itself.
- In Western Europe there exists a large market for flax fibres of high quality (i.e. very fine and strong).
- The flax spinning business is technically quite inferior to the cotton and synthetic spinning companies. Therefore, research into technical improvements of flax spinning must be stimulated.
- Polypropylene is a very serious problem for the linen industry:
  1. the costs for the dry spinning sector are increasing;
  2. the EC-stocks of short fibres are piling up;
  3. the subsidies for the stocks of raw material constitute a financial burden to the EC, which money is better used to improve the technical standard of the flax spinning industry.

It is therefore very important that the replacement of plastics by natural fibres as binder twine is stimulated on flax growing farms.

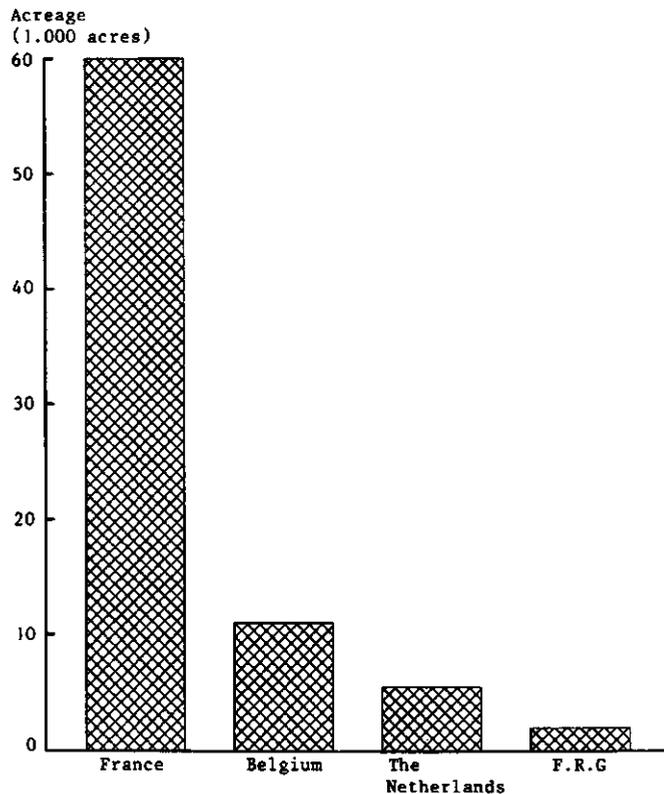
- There is a large potential market for alternative uses of flax fibres. The most important use in the near future is fibre board. With regard to other alternative uses feasibility studies have to be conducted.

## 4. Flax culture in the EC

### 4.1 Introduction

Flax has been grown in the EC for a long time. After a sharp decline in the sixties, the interest in flax from an agricultural point of view is growing, and consequently the acreage.

The most important flax-producing country is France, followed by Belgium and the Netherlands (see figure 4.1).



*Figure 4.1 Acreage of flax in the EC (ha)*

Besides in the West European countries, flax is grown in Eastern Europe, the USSR and China. However, the yield per ha and the quality of the product is much lower in these countries than in Western Europe.

## 4.2 Production

Flax can be called a real agrorefinery crop, which means that all parts of the plant can be used. The yield of the different parts of the plant is shown in table 4.1. The margins are very wide, because the yield varies considerably over the years, depending on the climate and the harvesting methods.

*Table 4.1 Division of the yield of flax-products per ha in Western Europe*

Product	Yield (kg/ha)
Whole crop	6,000-9,000
Linseed	500-1,600
Long fibre	600-1,200
Short fibre	700-1,300
Shives	3,500-5,300

The harvesting of fibre flax is a rather complex undertaking. It can not be harvested with ordinary agricultural machinery. It is important not to damage the fibre. Therefore, the plant has to be plucked and rolled up in stead of combined. The consequence is that the growing of flax requires a relatively high investment rate.

### 4.2.1 Retting

One of the most important 'treatments' of flax in respect of the quality of the fibre is retting. Retting is the separation of the flax fibre from the pith by bacteria or fungi, which remove the 'cement' between these two parts of the stem. The course of the retting period is crucial for the quality of the fibre. There are different methods of retting. The methods which are used nowadays are water retting and dew retting. In the process of water retting the stems are left in bathes filled with warm water for two or three days. In the process of dew retting, the stems are left on the field for about three or four weeks to ret under the influence of the weather. The advantages and disadvantages of both retting methods are shown in table 4.2.

Water retting in the EC is almost completely replaced by dew retting. Only in Belgium about 20% of the acreage is water retted. Because of the lack of environmental legislation and the low costs of labour a large amount of flax in Eastern Europe is still water retted.

*Table 4.2 Comparison between water retting and dew retting*

Water retting	Dew retting
+ good manageable	+ low costs
+ short duration	
+ no weather risk	
- high costs	- high weather risk
- bad working conditions	- long duration
- water pollution	- pollution of short fibres with polypropylene

Since the replacement of water retting by dew retting much research has been done to find a method, combining the advantages of water retting with the low costs of dew retting. The two most promising methods are given here:

*1. Enzymatic retting*

This method is based on water retting. The main difference is that enzymes are added to shorten the retting period to a few hours and that the water is recycled. This method seems very promising but is still in its experimental stage. It is unknown yet in what aspects the quality of the fibre can be heightened to an extent to make up for the higher costs of processing.

*2. Steam explosion*

This method loosens the fibre mechanically by steam explosion. This process leads to very fine, clean, medium long fibres. In France this method is being put into practice. However the price of the end-product is too high to compete with traditionally treated fibres.

It would be rewarding to co-ordinate the various researches in the field of retting which are taking place in several countries.

**4.2.2 EC subsidies**

There are different subsidies in the EC which concern the growing and processing of flax:

- A subsidy per ha (only for fibre flax), half of this goes to the grower, half to the buyer;
- A subsidy per kg linseed to make up for the difference between target price and world market price;
- A subsidy per kg sowing-seed.

The total subsidy per ha varies from approximately 500 Ecu to 1,000 Ecu, depending on the yield and the year. With the declining prices and subsidies for other crops, the growing of flax has become very interesting to farmers.

Because of the lower subsidies and the lower prices for fibre and seed, oil flax is not an interesting alternative of fibre flax to farmers. However, oil flax can be an interesting alternative of other crops.

Flax is an interesting crop to farmers, not only because of the subsidies, but also because it fits well in the rotation of crops. Apart from that it does not need much fertilization and cannot transmit the diseases of potatoes.

#### 4.2.3 Scutching

After the harvest of flax and before the preparation of the fibre, the stalks are to be scutched. Scutching is the separation of the long fibres, the short fibres and the shives. Every flax producing country has scutching machines (see table 4.3).

The proportion of long fibres compared to short fibres is determined by the quality of the crop and can be influenced by the way the scutching machine is operated. Normally this proportion is 1/1. In case of bad quality it can be 1/2.

*Table 4.3 Structure of the scutching industry in the EC, 1989*

Country	Number of scutching firms	Mean scuted acreage
Belgium	139	150
France	51	1,000
The Netherlands	10	300
FRG	3	700
Austria	1 *)	450

\*) In 1990: 2.

#### 4.3 Preparation and trade

Before the flax fibre can be spun, extensive preparation is necessary. Some of the work is done by the spinning mill itself, like bleaching. Most of the treatments however, are done by specialized firms. Most of these firms are in Belgium. The treatments they execute are hackling (of long fibres), carding and combing (of short fibres or cutted long fibres) and sometimes cottonising. Hackling as well as carding combined with combing is the same as separating the pure fibre from shorter fibres, dust and impurities.

With cottonising all non-cellulose materials are chemically and mechanically removed and the fibre is reduced in length to get a fibre which is very similar to cotton fibres. Cottonised flax fibres are used by cotton spinning-mills to produce mixed yarns (cotton and cottonised flax).

The 'waste' of the hackling (hackle tow) is used to produce dry spun or gill-spun yarns (half wet). The waste of the carding and combing is used to produce paper.

The flax preparation business is organized in a special way. None of the companies works independently, instead they all work in commission for Belgian traders. As a consequence only Belgian traders know how product flows go. They can not be bypassed neither by producers of raw material nor by spinning-mills.

The most important function of the Belgian traders is to 'ennoble' the quantities of flax fibre. This means that the quantities are sorted out in accordance to quality and are consequently upgraded.

The strength of the traders is their knowledge of the market i.c. the spinning-mills. The advantage for the spinning companies to do business with the traders instead of the producers is certainty; as most of the contacts between spinning companies and traders date from decades, the traders know exactly which qualities of flax fibre their customers need. In addition, reclamation is possible for the spinning company.

There is some overcapacity in the preparation business, especially in hackling and cottonising. The overcapacity of hackling machines presses more upon the spinning companies (which hackle themselves) than on the trading companies. The hackling machines especially are becoming a burden to the financial situation of medium sized spinning companies. It is expected that in future these firms will reduce their hackling activities.

The overcapacity of the cottonising machines is caused by the fact that countries in the Far East, who were in former times important buyers of West European cottonised flax, bought West European cottonising machines and started producing themselves.

The prices of flax products are shown in table 4.4.

*Table 4.4 Prices of flax products (Ecu/kg)*

Product	Price
Sliver	3.8-5.0
Hackle tow	0.9-1.6
Carding waste	0.2
Combing waste	0.3

The import and export of flax fibres by the EC are shown in table 4.5. Apart from the trade between the EC-countries, import

comes mainly from Eastern Europe and the export goes mainly to South America.

*Table 4.5 Production, imports, exports and consumption of flax fibres by the EC (in tons), 1989/90*

Product	Product.	Imports	Exports	Consumpt.	Stock
Long fibres	48,000	7,000	16,000	48,000	-9,000
Short fibres	40,000	10,000	11,000	39,000	-0

Source: EC, 1990.

#### 4.4 Competition

The main competition for flax fibres, within the textile sector, comes from cotton. With the price for cotton products only a quarter of the price for similar linen products, the differences in qualities of these products will only be appreciated by a small segment of the market.

Apart from this, it is possible to create a linen-look by using synthetics or cotton, applying only a small amount of flax (5% to 10%) or even no flax at all.

On the market for alternative products, competition for flax fibres comes from synthetics and natural fibres like jute and cotton.

In both cases flax from the EC meets with a strong price competition from Eastern Europe. High quality flax fibres from Eastern Europe are comparable with low quality flax fibres from Western Europe. However, due to the lower labour costs and the politically influenced prices, the East European products are a serious competitor for West European flax, especially in the market segment of the course yarns and the alternative outlets.

The competition mentioned above is mainly a price-competition, although in some cases the qualities of the product are important as well (durability, non-crinkling).

Both market segments, of textiles and non-textiles, may possible in future expect competition from ramie. Ramie can not only compete with flax on the price-level but it also has very similar qualities, as opposed to cotton or linen-look fabrics. Ramie is grown in tropical climates. The most important producers are China and South America. In these areas and Japan the ramie fibres are processed into textile and non-textile products. The Japanese process to produce ramie yarns is very sophisticated. This, in addition to the qualities of this fibres, makes ramie yarn a serious competitor to flax yarn.

#### 4.5 Conclusion

- The production of flax (growing, harvesting and scutching) in the EC takes place on a very small scale, except in France. To compete successfully on the textile and non-textile fibre markets the production of flax fibres has to be scaled up.
- The Belgian traders have the monopoly of the flax trade. A more balanced distribution of market control would be more desirable.
- The overcapacity in preparation and consequently the rejection by spinning companies, leads to an increase of market control by the trading companies.
- Ramie yarns from Japan could mean a serious threat to flax yarn in future.
- The preparation and spinning-techniques and the quality of the textile-research in Japan, could function as a model for the West European linen industry.

## 5. Conclusion

### 5.1 Marketing possibilities

The most important conclusion of this report is that there are marketing possibilities for flax. The yearly demand for flax fibre on the traditional textile market (the linen sector) is estimated to increase in the next ten years by approximately 16,000 tons, which means that there is room for the yield of an additional 15,000 ha of flax in the EC around the year 2000.

The growth of the demand on the non-traditional flax-using textile market (the cotton, synthetics and wool sectors) is more difficult to estimate. Estimations vary between a demand of 1,000 to 5,000 tons a year in the year 2000.

The extent of the demand of flax fibres for non-textile uses in the short term is estimated to be about the yield of 2,000 ha, with in the long term growing possibilities up to 10,000 ha.

The total growing capacity of the flax fibre market between now and 2000 can be summarized as follows:

1. *The textile market*  
Volume : 17,000-21,000 tons  
Product: 0%-25% short fibre and 75%-100% long fibre  
Acreage: approximately 15,000-17,000 ha  
Major producing countries: France and Belgium
2. *Alternative outlets*  
Volume : 20,000 tons  
Product: 50% short fibres and 50% long fibres  
Acreage: approximately 10,000 ha  
Major producing countries: FRG and The Netherlands

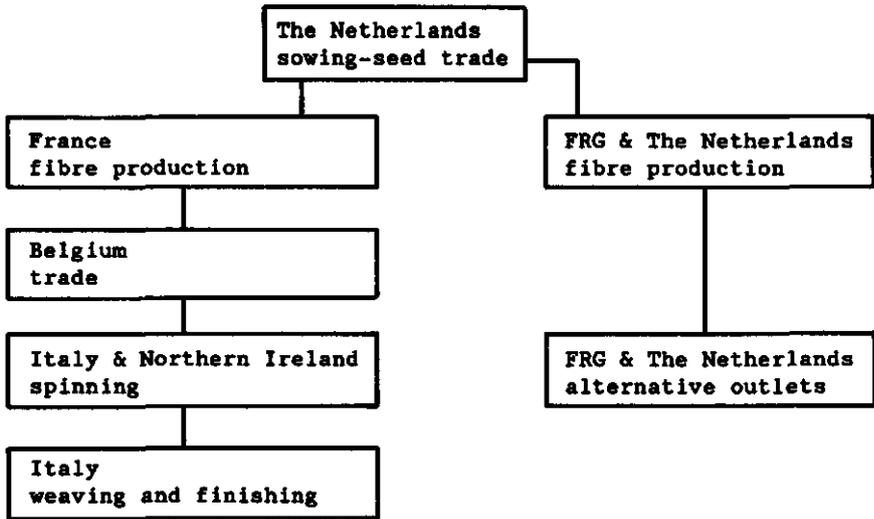
The total growing capacity of the linseed market is harder to estimate. The following can be said about this market:

1. *Sowing-seed*  
Volume : limited (maximal 3,300 tons)  
Product: 100% seed from fibre flax  
Acreage: maximal 2,500-3,000 ha  
Major producing country: The Netherlands
2. *Linseed for oil production*  
Volume : depends on the competitive power of EC linseed  
Product: large quantities of seed from fibre flax or oil flax  
Acreage: unknown  
Major producing countries: EC

It is necessary that feasibility studies will be made of the growing of oil flax in the EC, such in view of the very small self-supply of the EC with linseed (oil), combined with the search for alternative crops for agriculture.

## 5.2 Future structure

At the moment every country dominates a certain section of the West European linen industry. It is expected that in future the specialization will become even more explicit. The structure of the future West European linen industry is shown in figure 5.1.



*Figure 5.1 Future structure of the EC linen industry*

## 5.3 Conditions

To bring about the realisation of the several marketing possibilities and of the structure mentioned above, the following conditions must be fulfilled:

- Scaling up of the whole linen industry;
- Development and co-ordination of international research programmes on the following items:
  1. improvement of flax varieties (higher fibre content);
  2. increase of fibre quality;
  3. alternative retting methods;
  4. improvement of spinning techniques;
  5. alternative outlets.

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## Annex/wordlist

artificial fibre	- chemically derived pure cellulose fibre
enzym	- catalyst of chemical reaction
ha	- 10,000 m <sup>2</sup>
to hackle	- to comb long flax fibres
ramie	- tropical plant, very similar to flax
retting	- loosen flax fibres from the pith
scutching	- separation of long and short flax fibres
shives	- wooden chips from the flax pith
sliver	- end-product of hackling, input spinning