CULTIVATING FLAX AND HEMP

A PRACTICAL GUIDE FOR THE GROWER
The northwest region of Europe is known as the best region in the world for cultivating flax due to its suitable soil, favourable climatic conditions and the knowledge and experience of growers and parties supporting its cultivation. Hemp also grows extremely well in temperate climates such as those of northwest Europe. However, in the early 20th century, both flax and hemp were supplanted by cheaper imported fibres and later by synthetic fibres. Hemp was even prohibited for a while because it was linked to marijuana.

Today the fibre crop chain is slowly but surely redeveloping. The plants have a wide range of applications: the stem with its fibres and the wood-like core (shives) as well as the seeds can be used. Besides the traditional processing for the textile industry, there are numerous products on the market which are based on these crops: various building materials, insulation, fibre-reinforced plastics, stable litter,… The fibre crops’ strengths are the insulating capacity, the strength of the fibres and the low density of the shives. The past decade the crop variation in agriculture has shrunk considerably. If you are looking to broaden your crop rotation, you can think about adding flax or hemp to the rotation.

In this guide, you will find more information about the properties and the cultivation techniques of flax and hemp, the processing, the possible applications and the regulations for these crops. Should you need extra information or should you need more concrete coaching when setting-up flax or hemp cultivation, please do not hesitate to contact Inagro.
FLAX AND HEMP: AN INTRODUCTION

AREAS OF FLAX AND HEMP IN EUROPE

In 2014 about 77,560 ha of flax was grown in France, the Netherlands and Belgium. These countries are the main flax producers in Western Europe. The past decade however the fibre market was very unstable. The flax sector suffered from the economic crisis. In 2004 over 100,000 ha of fibre flax was grown in France, Belgium and the Netherlands. 2010 on the other hand was an all-time low with less than 70,000 ha of fibre flax for the three countries. Today, flax prices rose again and since 2011 we can see that the flax area in the three countries is also rising steadily.

In 2014, the area of hemp in Europe amounted to an estimated 15,000 ha. France is the leader when it comes to cultivating hemp for fibre, with a stable production, followed by smaller, annually varying areas in the UK and the Netherlands.
CULTIVATION TECHNIQUES

FIBRE FLAX

Tillage and seedbed preparation

Flax strongly reacts to the soil’s structure. Intense tillage under extreme dry or especially wet circumstances is pernicious for the soil’s structure. In general, flax is grown on a soil that is shallowly worked in spring in order to obtain an even and fine-textured surface. The aim is to start a smooth seedbed on moist subsoil where you can sow at a regular depth.

Date of sowing and sowing density

Early sowing (long vegetative period) has a positive effect on the total yield. Flax already germinates at 3 to 4°C. However it remains sensitive to night frost until about 3 days after initial development. The best sowing time is the period between March and early April. Flax does require water regularly when growing. In northwest Europe, there is normally sufficient precipitation and soil water supply during the period between the sowing and the harvesting to get a regular growth. Dry years lead to a slow and irregular growth.

Sowing density is about 2000 seeds/m² or 120 kg of viable seeds/ha. This density results in thin stems with fine fibres. This gives a high fibre yield and percentage, suitable for various applications such as textile.

Fertilization

The generally recommended nitrogen level for fibre flax is 80 kg N/ha, minus the soil supply (0-60 cm). Too much nitrogen can cause lodging, which may hinder the harvesting process and can negatively affect the fibre quality. The availability of phosphate (60 kg/ha P₂O₅) is important for the root growth and the seed yield. Potassic fertilization (160 kg/ha K₂O) in spring contributes to the fibre yield and quality.

Crop protection

Weed control plays an important role in flax culture. Common diseases and pests are scorch and mildew. It is customary to treat flax seeds with fungicides in order to protect them against various fungi. The use of fungicides can also be needed during cultivation. Flee beetles and flax thrips can cause serious damage. Regular monitoring is necessary and insecticide can be used in case of an infestation.

Rotation

In view of its crop yield and susceptibility to disease, it is recommended to only cultivate flax on the same parcel once in every six or seven years.

Harvesting time and method

As from mid-July onwards, the flax can be harvested or “pulled”. Harvesting requires an appropriate harvesting machine which pulls the entire crop, including the root, out of the ground. The straw is then laid on the ground in swathes.
HEMP GROWN FOR FIBRE

Tillage and seedbed preparation

Hemp doesn’t thrive in compressed and saturated soil. Structural damage resulting from intense tillage under bad weather conditions must be avoided. In spring a false seedbed can be created. The seedbed must be fine-textured and even.

Date of sowing and sowing density

Hemp grown for fibre must be sown as early as possible, because in order to obtain the longest possible fibre, the highest possible crop is needed. Hemp can be sown as from mid-March onwards. In northwest Europe the ideal time for sowing is the second half of April. The soil temperature should be between 12 to 14°C and not lower than 6 to 8°C. Just after sowing, hemp requires sufficient water; later on it stands dry spells rather well.

In order to produce fibres, a high density is required so the plant doesn’t branch. A plant that branches will have less and shorter fibres. Hemp grown for fibre is usually sown at 35-50 kg/ha.

Fertilization

The standard for hemp is 100-120 kg N/ha, 70 kg P$_2$O$_5$, and 200 kg K$_2$O per hectare when soil supply is normal.

Crop protection

The crop grows fairly quickly, making it easy to keep the parcel weed-free. Although birds tend to systematically eat the seeds, other diseases or pests are nearly non-existent.

Rotation

Hemp is a self-tolerant crop but rotation with other crops is of course worthwhile.

Harvesting time and method

Due to the height of the crop (till 4 metres) and the toughness of the fibres appropriate harvesting machines are required. Different kinds of machines have been developed and they are successfully used in the Netherlands, Belgium, France, the UK and Germany. After harvesting, the straw is laid on the ground in swathes.
Both hemp and flax are laid on the ground in swathes. The straw can then, depending on the weather conditions, dry and ret for several weeks. When the straw continues to lie on the fields, it is called dew retting. You can also have enzymatic retting and water retting but these techniques are far less used.

While retting, enzymes dissolve the pectin which holds the fibres and the wooden parts (shives) together. It is important to turn the straw in order to achieve uniform retting. The degree of retting influences the fibre’s possible applications. After retting, the hemp straw is pressed into round or square bales. Flax straw is rolled into round bales.
**PRIMARY PROCESSING**

**FLAX**

During the primary processing of flax, the shives are mechanically separated from the fibres. Traditionally processing flax straw into long fibres is done with a flax scutching machine. The focus is on getting long, intact fibres. The different steps include: crushing, breaking the wood-like core, scutching, removing the shives and hackling where the fibres are arranged in a parallel way. The short fibres or 'tow' can be further separated from the shives on the short fibre line.

**HEMP**

The primary processing of hemp requires a very specific process. In northwest Europe several hemp processing lines are already in use.

Hemp grown for fibre cannot be processed on a fibre flax line because the harvesting method differs. When harvesting flax, the entire stem is pulled out of the ground. All stems are arranged in a parallel way after harvesting, while retting and while rolling up in bales. They remain in parallel order when the bales are again unwound for processing. This is not the case with hemp. Due to their height, hemp stems are cut into pieces when harvested and they land on the field in a disorderly manner. So the stems are not lying in an orderly fashion when arriving at the processor. It is therefore much more difficult to extract a long fibre from the stem. The result of most hemp processing lines is a fibre which can be used for technical applications.

Although the line looks different, the processing steps are similar to those of the flax processing. The hemp stems are broken and then scutched.
SECONDARY PROCESSING

Secondary processing is comprised of various techniques aimed at using the fibres, the shives or the dust in a product that is either finished or not. The resulting products are very diverse (cfr. figure). Composite materials and insulation materials represent a growing market. Industry’s growing interest in natural fibres is due, among other reasons, to their renewability, good mechanical properties, low density, good (thermal and acoustic) insulation properties,… One of the drawbacks is that natural materials have variable properties. The market also remains dependent on the price of alternative products and the ability to guarantee a regular supply of fibres.

Based on Michael Carus, Market data on hemp
Survey on industrial hemp in Europe, 2012
**EUROPEAN LEGISLATION**

Farmers growing flax and/or hemp in Europe are, under the Common Agricultural Policy (CAP), entitled to a single payment or direct income support on the basis of the single application.

In 2012 European support for the processing of fibre flax and hemp was uncoupled. This means that product-specific support for processors and farmers was converted into income support for farmers.

In the new CAP (as from 2015 onwards), the payment of the income support is coupled with greening actions. Greening actions are the efforts which farmers must make to apply three climate and environmentally-friendly practices: maintenance of the area of permanent grassland, maintenance or establishment of ecological focus areas on agricultural land and sufficient crop diversification within the company. Flax and hemp can be used in the latter practice to increase rotation.

In some European countries, it was decided to grant extra support to the cultivation of fibre crops. In Flanders (Belgium) agri-environmental and climate regulations coexist with the standard greening measures. A new agri-environmental measure entitled: ‘Koolstofopslag door de teelt van vezelvlas en vezelhennep met verminderde bemesting’ (Carbon sequestration through the culture of fibre flax and hemp grown for fibre with reduced fertilization). In France, grants can be obtained through the Feaga (Fonds Européen Agricole de Garantie) or the Feader (Fonds Européen Agricole pour le Développement Rural). In the UK, farmers can receive support provided that they meet a certain number of criteria. These criteria include possession of a cultivation license obtained from the government or a fibre processor.
CHAIN DEVELOPMENT

The European Grow2Build project has made an overview of all flax and hemp initiatives in northwest Europe. These initiatives are shown on an interactive map available on the project’s website (www.grow2build.eu/maps). The stakeholders can be sorted according to the sector: farmers, primary and secondary processors, producers and end users (i.e. architects). Everyone who is interested in flax and hemp products can easily find the producers; the potential new stakeholders in the flax/hemp chain or existing companies get an overview of the areas in which there are already various activities or where there are still several possibilities.

In order to make hemp and flax culture a real, cost-effective success, a good cooperation between growers, processors and buyers of processed materials is necessary. Grow2Build wants to boost this chain support. Farmers which have ideas or suggestions can always contact Inagro.

MORE INFORMATION NEEDED?

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### Soil type
All types of soil are suitable for flax. The crop prefers deep, fertile, humous sandy loam and loamy soils with a good water balance, as well as disentangled clay soils. Acidic soils (pH < 6) must be avoided.

### Seedbed preparation
Flax reacts strongly to the soil's structure. As a rule ploughing is applied; depending on the soil type this can already be done before the winter period. In spring the soil is shallowly worked for a fine texture. The aim is to obtain a smooth seedbed.

### Date of sowing
The best sowing time is the period between March and early April. Early sowing (long vegetative period) has a positive effect on the total yield. Flax already germinates at 3 to 4°C, however it remains sensitive to night frost until about 3 days after initial development.

### Sowing
Sowing density is about 2000 viable seeds/m². The depth is about 2 to 3 cm. The maximum row spacing is 12.5 cm.

### Fertilization
Per hectare and with a normal soil supply 80 kg N/ha; 60 kg/ha P₂O₅; 160 kg/ha K₂O and 50 kg MgO.

### Crop protection
Weed control plays an important role in flax culture. Common diseases and pests are scorch and mildew. It is customary to treat flax seeds with fungicides in order to protect them against various fungi. Flea beetles and flax thrips can cause serious damage. Regular monitoring is necessary and insecticide can be used in case of an infestation.

### Rotation
As part of IPM (Integrated Pest Management) and in view of its crop yield and susceptibility to disease, it is recommended to have a minimum rotation of 1 in 6.

### Flowering season
Fibre flax comes into bloom halfway June.

### Harvesting period
As from July onwards, the flax can be harvested or "pulled".

### Harvesting method
Harvesting requires an appropriate harvesting machine which pulls the entire crop, including the root, out of the ground. The straw is then laid on the ground in swathes. Sometimes, the seed pods are threshed instantly, but the seed is mostly removed while scutching.

### Retting
Depending on the weather conditions, the straw can dry and ret for 3 to 6 weeks. While retting, enzymes dissolve the pectin which holds the fibres and the wooden parts (shives) together. It is important to turn the straw in order to achieve uniform retting.

### Rolling
After retting, the swathes are rolled up in bales. The straw yield amounts to approx. 8 tonnes/ha.

### Processing
When processing, the shives are mechanically separated from the fibres. Processing flax for linen is traditionally done with a flax scutching machine. The focus is on getting long, intact fibres. For textile applications, the different steps are: crushing the flax, scutching (removing the shives), hackling (straightening the fibres) and combing in order to prepare the long fibres for spinning and weaving. The short fibres or 'tow' can be further separated from the shives on the short fibre line.
**Crop Information Sheet: Hemp Grown for Fibre (Cannabis sativa L.)**

<table>
<thead>
<tr>
<th>Topic</th>
<th>Description</th>
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<tbody>
<tr>
<td><strong>Soil type</strong></td>
<td>Hemp thrives well on all soil types but is very sensitive to compressed and saturated soil. Acidic soils (pH &lt;6) must be avoided.</td>
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<td><strong>Seedbed preparation</strong></td>
<td>Structural damage resulting from intense tillage under bad weather conditions must be avoided. In spring a false seedbed can be created. Depending on the soil type, tillage is done in spring or autumn. The seedbed must be fine-textured and even.</td>
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<td><strong>Rotation</strong></td>
<td>Hemp is a self-tolerant crop but rotation with other crops is of course worthwhile.</td>
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<td><strong>Flowering season</strong></td>
<td>Hemp grown for fibre comes into bloom in the second half of July.</td>
</tr>
<tr>
<td><strong>Harvesting period</strong></td>
<td>Harvesting takes place in the second half of August. The ideal time is between the peak of the bloom and the beginning of the seedpods. The harvest can however only be started 10 days after the bloom at the earliest in order to be able to check the THC content. Early harvest is only possible on demand.</td>
</tr>
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<td><strong>Harvesting method</strong></td>
<td>Due to the height of the crop (till 4 metres) and the toughness of the fibres appropriate harvesting machines are required. Such machines are not available in Flanders. Different kinds of machines have been developed and they are successfully used in the Netherlands, Belgium, France, the UK and Germany.</td>
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