

IENICA

Interactive European Network for Industrial Crops and their Applications

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REPORT FROM THE STATE OF BELGIUM

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RESEARCH METHODOLOGY AND INFORMATION

SOURCES

Methodology has been conventional, based upon the research of written information and interviews with specialists from both the private and institutional sectors, by sector for agricultural production; by companies for processes, intermediary products and end-products. A lot of information has had to be checked and frequent contradictions have occurred.

Publications

Reports from industry, research, agricultural development service, advisory services.

Official Statistics (Institut National de Statistiques, Bruxelles).

Scientific articles.

Expert interviews

Interviews with specialists in Belgium: through meetings, by phone, fax or emails: e.g. Daenekindt A, Algemeen Belgisch Vlasverbond A.B.V. (flax); Sugar Beet Research Institute (Institut Royal Belge pour l'Amélioration de la Betterave IRBAB); Speleers D., ORAFTI Company (chicory and inulin); CENTEXBEL, Scientific and Technical Centre of the Belgian Textile Industry, E. Baetens.

Research teams.

Associations:

Valbiom, APPO (Protein and oil crops), Algemeen Belgisch Vlasverbond (flax), Sugar Beet Growers Association

Internet: research on the web: industrial companies websites, research websites, statistics.

EXECUTIVE SUMMARY

The utilisation of agricultural land has not deeply changed in Belgium during the last five years. Where the flax area has increased, other minor crops such as oilseed rape have regressed, in relation to the reduction of support by the E.U. Despite several attempts to introduce new non-food crops, none have been significantly launched. Reasons are numerous, and are mainly of a technical and economic nature. Also, the general feeling of insecurity in agriculture has played an important role: Agenda 2000, mid-term review in 2003, energy crops status, decisions about set-aside, etc.

However, during this period conventional crops and crop products have increased their importance in existing or new non-food applications. Volumes for non-food uses have increased, notably in cereals, oilseeds and flax fibres and by-products. Starch and sugar volumes for non-food applications have increased in proportions difficult to assess.

Industry find interest in processing higher quantities of 'natural' raw material for marketing reasons i.e. to better meet the increasing demand for natural products. But industry wishes to keep a maximum of freedom and prefers to rely on the international markets for finding the raw materials at the best commercial or technical conditions. Industry is reluctant to address domestic agriculture in order to contract production volumes of a specified quality at a determined price. For instance, linseed oil production and utilisation have increased but this trend is not linked to any development of domestic linseed agricultural production.

In a small country traditionally open to international trade most of the agro-industry must be considered as independent of domestic agriculture. Industries involved in grain starch or in vegetable oil extraction can process all raw materials regardless of their origin e.g. starch from wheat. On the other hand, domestic agricultural production can be exported to be processed by foreign industry e.g. all the non-food oilseed rape produced in Belgium is processed in Germany. In addition, the capacity of agriculture to invest in industry seems too weak.

Existing small or medium enterprises have moved to a larger use of natural products: soap, detergents, inks, paints etc. Many small industrial projects have been realised and several new small enterprises have emerged; notably industries based upon speciality crops have developed in the para-pharmaceutical (all sectors around health and nutrition, herbals, nutrients additives etc.), cosmetics, body-care.

Market size assessments are difficult because markets result both from new product creation and from the substitution of products derived from non-renewable sources, and because they strongly depend upon environmental or health legislation.

Active research is progressing in various directions: industrial uses in biopolymers (sugar and derivatives, fibres etc.), surfactants (sugar, starch, oil), lubricants (oils), cosmetics (oils, sugars, inulin etc.) and others.

The actions of IENICA and other related projects have been well appreciated in both agriculture and industry. Farmers have been informed and want to strengthen their links with industry. Industries and other concerned partners have found interest in the IENICA database and news. They have been in touch with the IENICA representatives. It is quite normal that results will not be immediately obtained and that the effort must continue. Until now, conventional crops have found more industrial outlets and minds have changed more than agricultural land use.

OIL CROPS

In Belgium only two species are grown for vegetable oil production: oilseed rape and linseed (or more precisely the seeds as a by-product of fibre flax production). Several species have been studied in experimental conditions (*Oenothera biennis*, *Calendula officinalis*, *Camelina spp.* etc.), but have not been grown at commercial scale.

Oilseed Rape

Production

Belgium is a minor producer of oilseed rape compared to its neighbouring countries, notably France and Germany, not only by the total acreage but also by the relative importance of the crop in the total arable land surface. With a maximum acreage of about 15,000 ha reached in the 1985-95 period representing about 1% of the agricultural land and 2% of the arable land, the oilseed rape area is now about 6,000 ha only, still decreasing in the last years. About 50% of this surface is devoted to non-food oilseed rape production. Average yields vary between 2.7 t/ha and 3.7 t/ha, but farms more specialised in this production have regularly obtained yields higher than 4 t/ha. Two sources give somewhat different statistical data. For non-food oilseed rape data from Table 2 are more accurate.

Table 1. Oilseed Rape in Belgium

	2000	2001	2002	2003*
Total acreage (ha)	7,930	6,092	5,919	5,500 *
of which OSR for food (ha)	4,000	2,974	2,924	2,735
OSR for non-food uses (ha)	3,930	3,118	2,995	2,765
Yields (t/ha)	2.7	3.0	3.1	2.9
Production (t)	21,400	18,446	18,304	15,830

* estimation

Source: I.N.S (Institut National de Statistiques)

Table 2. Non-food Oilseed Rape in Belgium

	1999	2000	2001	2002	2003
Acreage of non-food OSR (ha)	3,948	3,883	3,270	2,995	2,765
Yields non-food OSR (t/ha)	3.7	2.7	3.4	3.6	N.A.
Production non-food OSR (t)	14,744	10,775	11,271	10,765	N.A.

Sources: Valbiom and APPO

Industrial Use of the Oilseed Rape Produced

Despite the presence of high capacity oil mills in the country the domestic non-food oilseed rape production doesn't interest the national industry; this seems mainly due to the administrative complexity linked to this utilisation. Currently all the non-food production of oilseed rape is sold to German oil mills and seems to be used exclusively for biodiesel production. From the industrial side, several factories have developed their productions from rape oil but without any link with the national agricultural production. Oilseed rape enters the composition of end-products such as biolubricants and surfactants.

Linseed

Production

Two different types of *Linum usitatissimum* are devoted, one to fibre (flax) production and the other to seed (linseed) production. Despite recent projects for checking the interest of new linseed varieties this crop is not currently grown. However, from the fibre flax production, and in addition to the production of flaxseeds as reproductive material (seeds of about 6,500 ha) a residual volume of seeds as co-products of fibre flax is destined for oil extraction and it is considered here as linseed. This volume can only be roughly estimated for 2003: the production of about 13,500 ha at 750 kg/ha gives about 10,000 tonnes (see the section on Flax below). This volume is a maximum, as in 2003 the total flax acreage has been higher than ever.

Industrial Uses of Linseed

In Belgium several factories crush imported linseed mainly for industrial uses. Besides the domestic 'flax' seeds described above, all linseed is imported mainly from non-European countries, notably from Canada. After milling, the cake is utilised in animal feed, the oil is processed into several product types - raw, refined, blown and boiled oils - according to purchaser's demands.

Oils and oil derivatives are used by domestic and foreign industry and enter end-products such as paints, coatings, inks, soaps, detergents, linoleum or linoleum-related products. The recent trend is a significant increase of the volumes utilised for these applications.

Generic Issues

Demands are growing for products from vegetable origin such as lubricants, inks, detergents and surfactants. In recent years several existing industrial companies have turned themselves to these new products (biolubricants, detergents) or have increased their production (detergents, inks etc.).

Markets are reasonably expected to continue their current growth. The contribution of European agricultural production in that growth is not yet certain.

FIBRE CROPS AND LIGNOCELLULOSIC CROPS

Flax

Flax is the only fibre crop grown in Belgium. It is well adapted to soil and climatic conditions in the northern and central regions. Several attempts to introduce hemp and Miscanthus crops have failed and only experimental plots are now grown.

Flax is nearly totally grown under contracts between farmers and the flax industry sector. In the last decades the area devoted to flax production has been between 7,500 and 15,000 ha. But recently this acreage has shown an upward trend reaching about 20,000 ha in 2003 (Table 3). Despite the good adaptation to ecological conditions and high technical skill, bad yields have been recorded in 2001 showing that production remains dependent on climatic conditions. Except for 2001 the gross straw production is increasing. One part of the seeds harvested from the flax is devoted to oil extraction. About 6,500 ha produce multiplication seeds for sowing. Seeds from the remaining acreage are considered as 'linseed' and are destined for the oil mills.

Table 3. Flax production in Belgium

	2000	2001	2002	2003 *
Acreage (ha)	13,761	17,662	16,270	20,368
Straw Yield (t/ha)	6.54	2.56	6.64	6.64
Straw Production (t)	90,011	45,288	108,017	131,577

* estimated Source: I.N.S.

Generic Issues

A large part (estimated about 70%) of the production is devoted to textiles both from pure linen woven fibres and from associations of flax fibres with other natural or artificial fibres. Recently, the market for clothing and housing textiles is increasing due to fashion and interest for natural fibres, notably flax. The industrial sector makes efforts to diversify the uses of all components e.g. long fibres and bast fibres. Main other uses are insulation materials, the paper industry and new composite materials e.g. for the automotive industry.

Ligno-cellulosic material, not including wood - Cereal Straw

Cereal straw production is estimated at about 1.2 million tonnes. It is partly returned to the soil and partly harvested for use in animal husbandry, as litter or forage. An amount estimated to be between 3-5% of the total straw production is destined for use as paper, cardboard, insulation panels, etc.

CARBOHYDRATE CROPS

Carbohydrate crops considered here are those producing sugar (sugar beet), inulin (chicory) and crops producing starch (cereals, potato etc.). Sugar production originates not only from sugar crops (sugar beet and chicory) but also from starch crops after processing starch in order to produce the so-called 'ex-starch sugars'.

Sugar (saccharose and inulin) - Sugar beet

Production remains relatively stable due to the quota system (Table 4). Average sugar percentages in roots are usually between 16-17.5%.

Table 4. Production of Sugar Beet

	2000	2001	2002	2003 **
Acreage (ha)	90,858	95,553	96,457	90,851
Root Yield (t/ha)	67.7	58.8	67.8	69
Root Production ('000 t)	6,152	5,614	6,537	6,300
Estimated sugar production ('000 t) *	1,025	905	1,101	1,115

** estimations

Source: I.N.S. 'Institut National de Statistiques, Bxl) sauf * IRBAB (Sugar Beet Research Institute)

Industry

No distillery is linked to sugar factories and ethanol from raw sugar is not produced in Belgium.

Chicory for inulin

In 1985-1990, Belgium has been a pioneer in inulin production from chicory. Production of chicory for inulin has remained stable for several years (Table 5). It has not been possible to obtain accurate data on the inulin production, which can be estimated between 80,000 and 100,000 tonnes. Crop extension is limited by the capacities of the factories, which are themselves calibrated to the market dimension.

Two companies (ORAFIT and COSUCRA) process chicory roots in order to extract inulin and produce several products, derivatives and co-products mainly for food use.

Table 5. Production of Chicory for inulin

	2000	2001	2002	2003 *
Acreage (ha)	15,008	14,610	13,044	16,142
Root Yield (t/ha)	45.7	36.0	45.6	40 *
Root Production (t)	686,065	525,775	594,743	580,000 *

* estimated Source: I.N.S.

Generic Issues

Research on non-food utilisation of inulin and side-products is promising, notably in the fields of biopolymers, surfactants, paintings and cosmetics.

Starch

In Belgium the main crops producing starch are small grain cereals, mainly wheat and barley, maize and potato. The grain maize production is small – maximum 10,000 ha - and used in animal feeding. Potato is grown on a significant part of the arable land (about 50,000 ha, or 7% of the arable land) and is used as food only. In Belgium, wheat is the only domestic crop produced which is processed for starch extraction; no domestic barley, potato or maize is processed for starch extraction.

Wheat

Wheat production remains stable at a volume of about 1,600,000 t.

Table 6. Wheat production in Belgium

	2000	2001	2002	2003
Acreage ('000 ha)	204	173	192	193
Grain Yield (t/ha)	8.0	8.2	8.4	8.4 *
Grain Production ('000 t)	1,630	1,410	1,620	1,620 *

* estimations Source: INS

Table 7. Potato production in Belgium

	2000	2001	2002	2003 *
Acreage (x 1000 ha)	63	60	59	57 *
Tubers Yield (t/ha-1)	45	42	48	42 *
Tubers Production (x 1000 t)	2,900	2,500	2,900	NA

On the industrial side, starch production and processing is mainly from wheat. There is no factory involved in potato starch (no national quota) or in maize starch. Pea and other pulses participate in starch production after cracking but all the resulting starch-type products are used in human or animal nutrition.

There has been no significant development of relations between agricultural production and domestic industries. Starch production from wheat develops on the basis of wheat availability on the market and without any contractual link with the cereal production sector. Nevertheless, the starch industry uses mainly local wheat and absorbs about one fifth of the national wheat production.

Generic issues

Conventional non-food uses such as in paper and cardboard manufacture are expected to be maintained, or slightly increase. Starch production could still increase notably as a basis for biopolymers processing. Low volumes could be devoted to the preparation of surfactants.

SPECIALITY CROPS

These crops have not significantly developed and they don't appear in the official statistics of agricultural land use or agricultural production. Several aromatic plants used as condiments and flavour are produced in greenhouses. Species such as *Carum carvi*, *Angelica archangelica* and *Silybum marianum* have been sporadically cultivated on a very limited area (maximum 40 ha) but have been given up.

Signs of interest have been given recently mainly by the organic agriculture with the intention of growing bio-certified production.

The industrial sectors of medicinals' preparations (from herbals to pharmaceuticals), natural cosmetics and body-care products are expanding well. They import raw materials or semi-processed products, as they always have done. The interest for bio-labelled products could help to launch small-scale productions of a limited number of species.