PITA Project: Policy Influences on Technology for Agriculture: Chemicals, Biotechnology and Seeds

SMEs in the Danish Agrochemicals, Seeds and Plant Biotechnology Industries

Annex D 2

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Introduction to the PITA Project

Technological innovation in the agrochemical, biotechnology and seeds industries and in associated public sector research establishments (PSREs) has the potential to deliver more socially and environmentally sustainable farming systems and to improve the quality of life of citizens in Europe. This is particularly true of farms on the most fertile land. However, although policies developed in different areas may all aim to improve the quality of life, in practice, in their influence on company and PSRE strategies, they frequently counteract one another and so attenuate the desired effect.

Market-related factors also influence decision making in industry and PSREs, the most important for this project being the policies of food processors and distributors and also public attitudes and opinion, which often set more demanding standards than those of national governments and the EU.

The PITA project (see Project Structure) is developing an integrated analysis of policies and market-related factors relevant to the agrochemical, biotechnology and seeds sectors. The core of the project is an investigation of the impact of these factors on the strategies and decision making of companies and PSREs and the downstream implications of these decisions on employment, international competitiveness and environmental benefits. The final outcome will be feedback of our conclusions to policy makers and company managers.

The range of policies and other influences studied includes:

- policies to stimulate innovation in the agrochemical, biotechnology and seeds industries;
- purchasing policies of food processors and distributors;
- policies for international trade liberalisation;
- policies for the regulation of industry and farming (for environmental protection and public health and safety, particularly for pesticides and biotechnology);
- agricultural and farming support policies, particularly for crop production;
- policies to promote environmental sustainability and wildlife biodiversity in arable farming areas;
- public opinion and attitudes.

The overall aim of the project is to contribute to the development of sustainable industrial and farming systems and an improved quality of life by encouraging the development and uptake of ‘cleaner’ technology for intensive agriculture. Its objectives are:

- to develop an integrated analysis of policies and market-related factors relevant to technological innovation in the agrochemical, biotechnology and seeds sectors, to study their interactions and to develop hypotheses about their impact on strategic decision making in industry and PSREs.
- to study the influence of policies and market-related factors on innovation strategies in the agrochemical, biotechnology and seeds industries and PSREs, and their impact on decisions about product development, levels of investment and location of investment.
- to study the outcomes of the industry decisions investigated under objective 2, in their effects on employment, on international competitiveness and on their potential to deliver environmental benefits.
Objective 1

Feedback

- Policies for international trade liberalisation
- EU level policies
- National/regional policies
- Public opinion and attitudes
- Demands of food processors and distributors

Objective 2

- Strategies of public sector research establishments
- Product development decision making in the agrochemical, biotechnology and seeds industries
- Decisions about type of product
- Decisions about level of investment
- Decisions about location of investment

Objective 3

- Effects on international competitiveness
- Employment effects
- Potential for environmental benefits
- Strategies of companies operating outside EU

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Introduction

The present report gives an overview of small and medium-sized enterprises (SMEs) within the seeds, biotechnology and agrochemicals industries in Denmark. Like their larger competitors, these companies are affected by the policies analysed under the PITA project.

This report concentrates on seeds and agrochemicals. Agricultural biotechnology in Denmark is still carried out mainly by relatively few companies, far too large to be characterised as SMEs. A few small pharmaceutical biotechnology companies have emerged over the past 5-10 years. Thus, the Copenhagen-Skaane area is sometimes referred to as ‘Medicon Valley’ on account of its dynamic medico-industrial business environment. Although the activities here (stimulated by a science park called Symbion) might provide interesting material for a case study on how to stimulate such activities, the activities of the companies involved clearly lie beyond the limits of the PITA project. Biotechnological research activities are included here only in so far as they relate to the seeds industry. Since these are practically the only SMEs involved in agricultural biotechnology, it would not make sense to have a separate section on SMEs in that sector.

The meaning of ‘small and medium-sized’ should be explained: SMEs are often defined as companies with less than 500 employees. In small countries such as Denmark and the Netherlands, the limit is sometimes set at 250 employees. Although these definitions are fairly standard, the following pages clearly reveal that the size of a company is a multi-dimensional concept. Within the seed business the largest SME (according to the former definition) is a major supplier of grass seeds at European level.

Conversely, even the largest Danish agrochemical companies (too large to count as SMEs) are dwarfed by international giants such as Bayer or AstraZeneca. Moreover, the rise and fall of SMEs is by no means insulated from the world of ‘big business’: both of the industries considered in this document are characterised by concentration tendencies linking the development of small, medium-sized, and very large enterprises. So there is little reason to apply the standard definitions rigorously.

Section 2 below presents the seeds sector and discusses the factors influencing its development. Section 3 goes on to consider the agrochemical industry. Finally, Section 4 discusses the role of technical change within the SME sectors of the two industries.

1. Seed companies in Denmark

1.1 Structure of Seed SMEs in Denmark

Many Danish seed companies are quite small, as shown in Table 1 below. The 44 companies have been identified by means of data from Købmandsstandens oplysningsbureau (The Grocery Association’s Information Office) covering all VAT-registered companies in Denmark. Subsequently, the webpages of the individual companies have been consulted (and in a few cases companies have been contacted by telephone) to get an impression of their activities and their current situation.

Some of the largest of the companies behind the figures of Table 1 are members of the Association of Danish Seed Producers. By far the largest companies are DLF-Trifolium with

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1 Material provided by the Danish Association of Biotechnology companies shows that 22 new biotechnology firms were established in Denmark in 1999. None of these were active in agricultural biotechnology, however.

2 Companies have been selected on the basis of the so-called JB industrial classification system and comprises companies producing and selling grains, seed and fertiliser (classification code 6611620.04)
about 330 employees, and Dæhnenfeldt with about 300 employees. Dæhnenfeldt, however, has specialised in the production of flower seeds, and is less relevant from a PITA perspective.

### Table 1.1 Small and medium-sized seed companies in Denmark by size

<table>
<thead>
<tr>
<th>No. of employees</th>
<th>No. of companies</th>
<th>Members of the Association of Danish Seed Producers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unknown</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>0-1</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>2-4</td>
<td>11</td>
<td>1</td>
</tr>
<tr>
<td>5-9</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>10-19</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>20-49</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>50-99</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>&gt;100</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>44</td>
<td>10</td>
</tr>
</tbody>
</table>

Source: Købmandsstandens oplysningsbureau 1999.

The number of independent seed companies has been steadily declining. In the 1980s there was a wave of mergers in which many of companies became integrated into larger national or multinational enterprises, and during the 1990s this development has continued. By far the largest agricultural seed company, DLF-Trifolium, has played a central role in this process (cf. below).

As a result, few of the companies, mainly the smaller ones, are independently owned (cf. Table 1.2). These are generally too small to undertake long-term research and development on a scale comparable to that of their larger competitors. As a result, their main role is as intermediaries between local growers and large seed-producing companies.

One example of a small, independently owned company is *Morsø Frø*, which has specialised in the breeding, processing and trade of grass and clover seeds. The company is located at Mors – an island in northern Jutland with almost perfect climatic conditions for seed production. The company has been independently owned since 1915. High-quality seeds are purchased from suppliers in Denmark, Germany, The Netherlands, France and Britain, and cultivated by the company’s growers (some of whom hold shares in Morsø Frø). The company produces forage as well as lawn grasses for golf lawns, parks, etc. Its turnover grew by about 13% from 1997 to 1998. With 16 employees the company had a turnover of about ECU 4 m in 1997/98 (DKK 30,420,000). It has recently been made publicly known that the shares in Morsø Frø will be taken over by DLF-Trifolium (see below).

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3 The seeds industry (as delimited in Section 2) consists of about 45 companies with an average of about 28 employees. All of these companies are SMEs by the definition employed here. Simple averages can be deceptive, however, in terms of describing highly uneven size distributions. To illustrate, if each employee reported the number of employees of his or her own company, the average of all answers would be around 235 employees – or some 8 times higher. In other words, the absolute number of companies seriously underestimates the industrial concentration within this business. In a sense, the 45 companies of highly unequal size could be said to be equivalent of about 5-6 companies (i.e. \( 45\div8 = 5.6 \)) of equal size. Moreover, a closer examination of the companies within this industry shows that they have specialised in supplying different markets. In other words, the Danish seeds sector is quite concentrated, despite the number of firms.
Table 1.2 Structure of ownership of SME seed companies in DK

<table>
<thead>
<tr>
<th>Ownership Employment</th>
<th>Parent company</th>
<th>Independent Company</th>
<th>Parent co. and subsidiary</th>
<th>Subsidiary</th>
<th>Total no. of companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5</td>
<td>1</td>
<td>19</td>
<td>0</td>
<td>6</td>
<td>26</td>
</tr>
<tr>
<td>6-25</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>7</td>
<td>12</td>
</tr>
<tr>
<td>26-</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>3</td>
<td>21</td>
<td>5</td>
<td>15</td>
<td>44</td>
</tr>
</tbody>
</table>

Source: Købmandsstandens oplysningsbureau 1999

Wibolt Fø is another example illustrating this development. With 45 employees it is somewhat larger than Morso. Founded in Nakskov (in the eastern parts of the country) already in 1859, Wibolt is the oldest seed company in the country. In the late 1980s it was bought up by Cebeco-Handelsraad, which owns seeds companies in a large number of countries (the US, the UK, France, Belgium, Germany). Like Morso Fø, Wibolt produces and sells grass seeds. Production is spread all over the country and the company exports most of its produce. A substantial proportion of its sales are to other seed companies within the CEBECO group, however.

In general, the SMEs within seeds have not been very profitable. Last year’s gross profits were published for 12 companies with more than 10 employees. The median value for these companies was just above zero (DKK 1,950 or about 260 ECU). Eight companies were making small but positive profits, while 4 were losing money.

1.2 DLF-Trifolium

With an annual turnover of more than ECU 100 m (DKK 840 m) and about 340 employees, DLF-Trifolium is by far the largest seed company within the SME group. Despite its being an SME (the company has less than 500 employees), DLF-Trifolium claims to be the world’s largest producer of clover and grass seeds. It supplies over one third of the total volume of grass seeds consumed within the European Union, and it was the first company to genetically engineer a herbicide-resistant fodder beet. In view of the dominant position of this company among seed-producing SMEs, it was natural, therefore, to select this company for further analysis.

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4 DLF is short for Danske Landboforeningers Føfrorsyning, which means Danish Farmers Unions’ Seeds supply.
Figure 1.1 The DLF-TRIFOLIUM GROUP

DLF-Trifolium is a PLC, but 95.9% of the shares are held by a co-operative holding society, DLF Amba. An amba is a limited liability co-operative. De facto, DLF-Trifolium is an agricultural co-operative, therefore. The company – as it is now constituted – was founded in

5 Amba is an abbreviation of Andelselskab med begrænset ansvar, i.e. co-operative with limited liability.
1989 when DLF (Danish Farmers Unions’ Seeds Supply) bought up the shares in Dansk Frøhandel Trifolium Silo and SN Frø. Before then, these companies co-operated on development activities, which proved not to be very rational: after having developed new or improved traits together, the two companies found themselves competing in the marketplace. This obviously inhibited the appropriation of innovation profits. Thus, R & D related scale economies contributed significantly to the decision to merge the seed companies.

The company has subsequently expanded substantially through a series of mergers during the 1990s – a process which has been supported both financially and politically by the agricultural organisations. According to an editorial by Mr Benny Christensen, Chairman of the Board of Directors, this process will continue, both in order to stabilise markets and avoid duplicate research and development activities.

In general, the philosophy of concentrating business activities to realise economies of scale in production and innovation and obtain market power has been very pervasive within the agricultural co-operative sectors in Denmark. Within the dairy industry the formation of MD (an abbreviation of Mejeriselskabet Danmark, or Dairy Denmark) is an obvious case in point. MD Foods has subsequently merged with Swedish Arla to become Arla Foods. With more than 80% of milk intake in Denmark, this dairy society is absolutely dominant in the Danish market. Similarly, the amalgamation of a number of co-operative slaughterhouses into Danish Crown has been motivated by the desire to realise economies of scale and market power in increasingly competitive international food markets.

As shown in Figure 1, DLF-Trifolium has subsidiaries in a large number of countries and owns shares in Danært (a Danish pea producing company), Scanseed and HF Seeds Ltd. in the UK.

The company is very active in research and development. According to Trifolium’s homepage, “one in every six employees at DLF-Trifolium is engaged in product quality and development. Our overall goal is to increase quality and, at the same time, strengthen reliability of cultivars. We therefore attach a great importance to developing varieties of high quality that can survive under different climatic conditions. / The DLF-Trifolium R & D activities are based at Store Heddinge in Denmark together with activities in France, Ireland and the Czech Republic. The varieties are tested under varying climatic conditions all over Europe, North and South America, Asia, Australia and New Zealand. The major plant breeding programmes include a wide range of grass seed for fodder and amenity, clovers, fodder beet, oilseed rape and peas”.

Together with Danisco and Monsanto, DLF-Trifolium has been heavily involved in the development of a roundup-resistant fodder beet (cf. the PITA monograph on Danisco for further details).

DLF has also set up a common research laboratory with Risø National Laboratory with a view to developing a new type of rye grass without stems. Since the stems are generally hard to digest, grass without stems would have a higher forage value.

According to Marketing Director Gunnar Johansen, DLF-Trifolium intends to stick to the production of grass and clover seeds, i.e. to concentrate on developing its core competencies. The company has no plans of expanding into other types of seed production.

1.3 Summary

As shown in the preceding sections, the agricultural seed business in Denmark consists entirely of small and medium-sized enterprises – no single company has more than 500 employees. Nevertheless, with a market share of over 70% in the Danish home market, and a dominant position as a supplier of grass and clover seeds for the European market, the largest SME, DLF-Trifolium, is relatively large within its core business area. In functional terms, it can hardly be seen as an SME at all.

Unlike some of the smallest seed companies that have specialised in importing seeds on a licence basis, DLF-Trifolium has the capacity to develop and market its own traits. Historically, the development and improvement of traits was mainly carried out within a jointly
owned organisation, Danish Plant Breeding. This way of organising R&D activities turned out to be commercially unsatisfactory, however, and Danish Plant Breeding was subsequently acquired by and integrated into DLF-Trifolium.

With the low profitability of other small seed companies and the expansionary policies of DLF-Trifolium there are strong economic and organisational reasons to expect that the concentration of the seed business will continue in the coming years. This will bring to an end the process of concentration around a few absolutely dominant companies. As concerns the agricultural seeds industry, DLF-Trifolium appears to be the centre of gravitation, attracting its minor competitors.

2. Agrochemical Industry

Most of the agrochemical companies in Denmark do not actually produce agrochemicals. Their main business is in importing and selling these products. According to statistics from Købmandsstandens Oplysningsbureau there are 38 such companies, whereas the production of agrochemicals is confined to 29 companies. The size distribution of the latter group of companies is shown in Table 3.1 below. As with the seeds industry, the webpages of the individual companies have been visited and a few companies have been contacted by telephone to get an impression of their activities and their current situation.

Table 3.1 Small and medium-sized agrochemical companies in Denmark by size 1998

<table>
<thead>
<tr>
<th>No. of employees</th>
<th>No. of companies</th>
<th>Companies without production</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>2-4</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>5-9</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>10-19</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>20-49</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>50-99</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>&gt;100</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>29</td>
<td>37</td>
</tr>
</tbody>
</table>

Source: Data from Købmandsstandens Oplysningsbureau

In the remainder of this Section, we shall mainly concentrate on the producing companies within the agrochemical industry. With about 1,000 employees the largest one of these – Cheminova – is too large to count as an SME by any of the standard definitions.

Nevertheless, apart from the local agencies of multinational agrochemical companies, it is the only PITA relevant chemical company in Denmark, and in functional terms – i.e. in terms of market leadership, relative size, etc. – it seems to be more of an SME than, say, DLF-Trifolium.

The agrochemical industry’s counterpart to the Association of Danish Seed Producers is a trade association known as Dansk Planteværn (DP) – or Danish Crop Protection, as it would be in English. Fifteen companies are members of this association, including Danish subsidiaries of multinational companies such BASF, Bayer, Du Pont, Monsanto, Novartis and

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6 As in the Section on seed companies, companies have been selected on the basis of the JB industrial classification system. In this case producers of agrochemicals are coded 3351130.14 while companies with wholesale as their main activity are coded 3351130.16.
Zeneca. According to Dansk Planteværn (or DP), its members supply about 90% of the Danish market.

Like some of the large agrochemical companies, DP advocates a strategy of Integrated Crop Management (ICM), defined as “The best possible combination of cultural, mechanical, biological, chemical and biotechnological methods...” Integrated Crop Management is seen as the only realistic way of feeding the growing world population in an environmentally benign way. DP thus supports the policies of ECPA, the European Crop Protection Association.

In the following we shall briefly consider some of the most important companies. With almost 1,000 employees the largest company within this business group is Cheminova. As mentioned in the Introduction, this company may be considered a rather large SME and is included here because of its relevance to the PITA project. Its core business area is the production and marketing of agrochemicals for crop protection. It is a major producer of insecticides (organophosphates) and has a substantial production of glyphosate. The greater part of its production takes place in Harboøre in Northern Jutland. Like other agrochemical companies considered under the PITA project it is a member of the Responsible Care Initiative of the international chemical industry.

Superfos used to be a major producer of chemicals with a strong market position in the fertilizer market. A couple of years ago Superfos Chemicals announced that it intended to become “the leading Nordic company within the sale and distribution of raw materials, including food ingredients and chemical products.” (Superfos, Annual Report 1998, p. 17). In October of 1999, Superfos was taken over by Ashland, Inc., however, and very recently the Superfos Group has sold off Superfos Chemicals to Holland Chemicals International (HCI). Officially, this is “part of a stronger focus strategy for the Superfos Group, designed to strengthen the utilisation of financial and management resources within a fewer number of business areas.” (Quoted from the press release 1 March 2000).

Kemira Danmark is one of the many subsidiaries within the agrochemical industry in Denmark. It is owned by Finnish Kemira Agro. Its agrochemical production in Denmark consists mainly of fertilisers produced in Fredericia, so, its activities are not really relevant to the PITA project.

The international chemical corporations are present in Denmark with local offices employing some 10-25 people each. This applies to Bayer, Rhone-Poulenc, and Dupont, for example. Similarly, U.S. based Cyanamid (now owned by American Home Products) is represented by Cyanamid Denmark, which is responsible for the sales, development and registration of Cyanamid’s products in Denmark, Norway, Sweden, Finland, Estonia, Latvia and Lithuania.

On closer inspection it turns out, therefore, that the production of agrochemicals in Denmark (except for fertilisers) is carried out almost exclusively by Cheminova, the remaining companies being much smaller and without any independent production of their own.

To sum up: Apart from Cheminova (which is not an SME by the standard definition), agrochemical companies in Denmark appear to be either trading companies whose main responsibility is the wholesale of agrochemicals, or they produce chemical fertilisers. Consequently, many of the companies described are likely to be relatively unaffected by policy changes such as those considered by the PITA project. The Danish subsidiaries of multinationals are unlikely to be very strongly affected by the introduction of pesticide taxes, by changes of the CAP, or other major policy changes, since their primary purpose is to open (or keep open) the doors to the Danish or wider Scandinavian market.

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7 Cf. e.g. http://www.superfos.dk/en/news/latest/chemicals.html
3. Concluding remarks

As mentioned in the Introduction, Denmark has few SMEs within the seeds, biotechnology, and agrochemical industries. The two most relevant companies are DLF-Trifolium (seeds) and Cheminova (agrochemicals). It is doubtful whether these companies qualify as SMEs. As indicated in the table below, the two companies were chosen for rather different reasons.

<table>
<thead>
<tr>
<th>Criterion</th>
<th>DLF-Trifolium</th>
<th>Cheminova</th>
</tr>
</thead>
<tbody>
<tr>
<td>No of employees</td>
<td>approx. 400</td>
<td>&gt;1000</td>
</tr>
<tr>
<td>Relative position in European</td>
<td>important</td>
<td>marginal</td>
</tr>
<tr>
<td>industry</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Both of the industries presented in this report are highly concentrated and undergoing greater concentration. That process is driven by economies of scale pertaining to research and development as well as production and marketing. Within the seeds sector, the very low profitability of many small companies, their very limited development activities, as well as their general tendency to merge with larger companies suggest that market-related factors are the most important drivers in explaining this tendency. Many small companies in this sector appear to be traditional family-owned enterprises with long-standing relations to networks of local growers. Despite some development activities, these companies have little innovative potential in comparison with their larger competitors.

The minimum scale required to be able to survive in the long term differs substantially between the seed and agrochemical industries. As mentioned in the Introduction, the largest agrochemical supplier (Cheminova) is small compared to its multinational competitors, whereas the largest SME in the seeds sector is a dominant player in the European marketplace. As regards the agrochemical industry, government policy may have little impact on SMEs for the reasons given above, e.g. because they are mainly wholesalers (see Section 2.2).

If present trends continue, the Danish seeds sector will be dominated completely by one company within a foreseeable future. Being highly research intensive, this company is likely to be sensitive to initiatives and changes in STI policies at national and EU level. Similarly, the seed markets will be affected by CAP-related policies and environmental regulations affecting the types and quantities of seeds demanded.

Apart from DLF-Trifolium, Denmark has no agro-biotechnological SMEs, though we have no systematic evidence explaining why not. The EU moratorium on GM crops, as well as the general public suspicion towards biotechnology, are main factors behind the reluctance to start new enterprises within this field -- according to representatives of companies within the seed sector and a representative of the Danish Association of Biotechnology. [added sentence? Another factor may be the structural dependence of seed SMEs upon larger companies and competition with them.]
'DLF-Trifolium A/S har overtaget alle frøaktiviteterne' ['DLF-Trifolium plc has taken over all seeds related activities']. *Andelsbladet no. 20*, 1989 p. 392

‘DLF fik overskud på 16 mill. kr.’ ['DLF made a profit of DKK 16 m'] *Andelsbladet No. 21*, 1990 p. 437

Købmandsstandens Oplysningsbureau: ‘CD-direct’ Database covering VAT registered companies in Denmark.

PLS Consult, Dialog med Fødevarer, Copenhagen.

**Interviews** with Sales Manager Gunnar Johansen, DLF-Trifolium

**Contacts** made with The Association of Biotechnology Industries in Denmark