

## AGREVO: FROM CROP PROTECTION TO CROP PRODUCTION

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AgrEvo is a German producer of crop protection products. In 1995 it made the strategic decision to shift from crop protection to crop production, with the help of biotechnology. It acquired Plant Genetic Systems (PGS), a successful plant biotechnology company, and started a round of acquisitions in the international seed industry. The company soon found out that biotechnology brings many new uncertainties in strategic decision-making.

*Key Words:* innovations; pesticides; plant biotechnology; seeds; strategy.

Hoechst Schering AgrEvo GmbH (or AgrEvo) was a German manufacturer of chemicals for crop protection until 1995. Its main products were herbicides, insecticides, and fungicides, used in the production of all major field crops as well as for fruits and vegetables. AgrEvo also produced pesticides for non-agricultural uses, particularly to control insects in human environments. In addition, the company was selling seeds, both for horticultural and agricultural crops. For maize, canola, and soybeans, AgrEvo had developed genetically modified varieties.

The central element in AgrEvo's strategy was to transition from a crop protection to crop production company. AgrEvo no longer just wanted to sell pesticides but also to become a provider of productivity enhancing solutions to the farmer. Biotechnology was seen as the major element in this strategic reorientation, as the focus of crop protection shifted from the chemical molecule to the genetic constitution of the plant itself. Expanding into the seed business was a necessary step in the implementation of this long term strategy.

As an independent company, AgrEvo has only existed for 5 years. It was established in 1994 when two German producers of chemicals and pharmaceuticals, Hoechst and Schering, merged their crop protection divisions into a new joint venture. Both companies wanted to benefit from economies of scale in marketing and research and development (R&D). In 1999, AgrEvo's majority shareholder, Hoechst, merged with the French pharmaceutical and chemical company Rhône-Poulenc to become Aventis. As a result, AgrEvo and Rhône-Poulenc Agro have been combined into Aventis CropScience. This article presents an analysis of AgrEvo before the merger.

### Main Products And Markets

In 1999, AgrEvo was the fourth largest producer of crop protection products, after Novartis, Monsanto, and Zeneca. In the European market, AgrEvo was the second largest supplier of pesticides, with a market share of approximately 12 percent. In 1998, AgrEvo had a turnover of

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2.1 billion Euro (table 1). The company invested 247 million Euro in R&D, which is about 12 percent of sales.

**Table 1: Key Figures (Million Euro).**

	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>
<b>Net Sales</b>	1,658.5	1,679.0	1,819.5	2,034.5	2,121.5
<b>Operating Profit</b>	17.0	84.0	97.0	157.0	176.5
<b>Cash Flow</b>	N/A	94.0	217.0	253.5	145.5
<b>R&amp;D Costs</b>	209.0	194.0	217.0	255.5	247.5
<b>Investments In Fixed Assets</b>	49.0	53.5	71.5	118.5	65.5
<b>Employment</b>	N/A	7,459	7,427	8,550	8,658

Note. N/A= Not Available. From “AgrEvo 1997 Annual Report,” by AgrEvo, 1997. Berlin, Germany: AgrEvo; and “AgrEvo 1998 Annual Report,” by AgrEvo, 1998. Berlin, Germany: AgrEvo.

Herbicides were AgrEvo’s main product, representing 42 percent of turnover (table 2). AgrEvo had a share of 8 percent in the world herbicide market. Forty percent of AgrEvo’s herbicide production was sold in Europe. For sugar beet and cereal herbicides the company was the market leader in Europe. AgrEvo was particularly strong in grass-herbicides for cereals, with products like Puma/Excel and Illoxan. For sugar beet, the main herbicide sold was Betanal.

**Table 2: Sales by Main Product Group (1998).**

<b>Products</b>	<b>Million Euro</b>	<b>Percentage of Total</b>
<b>Herbicides</b>	880.5	42
<b>Insecticides</b>	454.0	21
<b>Fungicides</b>	341.0	16
<b>Environmental Health</b>	194.5	9
<b>Seeds/Crop Improvement</b>	119.0	6
<b>Others</b>	132.5	6
<b>Total</b>	<b>2,121.5</b>	<b>100</b>

Note. From “AgrEvo 1997 Annual Report,” by AgrEvo, 1997. Berlin, Germany: AgrEvo; and “AgrEvo 1998 Annual Report,” by AgrEvo, 1998. Berlin, Germany: AgrEvo.

A very important herbicide for AgrEvo’s biotechnology ambitions was Liberty. This product was a new formulation of the non-selective herbicide glufosinate, that AgrEvo and Hoechst had been selling under various brand names since 1984 (e.g., Basta, Ignite, Finale and Challenge). The old glufosinate products were particularly used on fruit and vegetable crops, but Liberty can be used on transgenic field crops, thus, greatly expanding its potential market.

Seeds/Crop Improvement was the biotechnology and seeds business of AgrEvo. This product group was newly formed in 1997, after the acquisition of Plant Genetic Systems and the shift of Nunhems Seeds from parent company Hoechst to AgrEvo. Although this business activity

accounted for only a small percentage of AgrEvo's turnover, it was considered the main strategic growth area. The main crops in this group were canola (oilseed rape), maize, soybean, and vegetables.

### **Biotechnology Strategy**

AgrEvo's innovation strategy can be summarized by the following statement by Dr. G. Prante, AgrEvo's Chief Executive Officer (CEO),

We have taken the strategic decision to develop from a plant protection enterprise to a company offering farmers products for enhancing the productivity of plant production through innovations in chemistry, biotechnology and plant breeding. (Bijman & Bogaardt, 2000, p.11)

From the early 1980s, when the first results of biotechnology research become known and a bright future for this new key technology was forecasted, Hoechst has been active in this type of research. As a pharmaceutical company, it heavily invested in biotechnology R&D, particularly in the United States (US). As a major producer of agrochemicals, research on plant biotechnology was only a small step to make. Hoechst had both in-house research and research contracts with small biotechnology companies. For instance, research on glufosinate-tolerance was contracted at PGS.

The importance of seeds for the biotechnology business was already acknowledged in the 1980s. In 1985, Hoechst took a minority share in, and started research collaboration with, KWS—the largest German agricultural seed company. In 1986 Hoechst had acquired Nunhems Seeds, a Dutch vegetables seed company.

In 1995 AgrEvo took the strategic decision to become a serious player in the global plant biotechnology industry. Several developments led to this decision. First, Hoechst had built up biotechnology expertise and saw good commercial prospects. Second, the market prospects for agrochemicals, particularly in Europe and North America, were not very promising. Third, major competitors, particularly Monsanto and Novartis, were all heavily investing in biotechnology and seeds. Fourth, the herbicide-resistance technology developed by PGS for Hoechst/AgrEvo's broad-spectrum herbicide glufosinate was ready for commercialization. Therefore, AgrEvo decided to expand not only in biotechnology but also in seeds as it acknowledged that for commercialization of biotechnology products access to seeds was indispensable.

The 1996 acquisition of PGS (for 436 million Euro) was a major step in implementing the new strategy. Plant Genetic Systems brought to AgrEvo extensive knowledge of plant biotechnology as well as plant breeding. Plant Genetic Systems was one of the most successful dedicated biotechnology firms. It was already established in 1982 by a group of researchers from the University of Gent, Belgium. These scientists were among the first in the world in 1983 to develop a genetically modified plant. Based on its expertise in genetic engineering, PGS had built up a very good intellectual property position. By cross-licensing patents and genes, PGS also had broad, low-cost access to other biotechnologies. Plant Genetic Systems' biotechnology research has been focused on three main application areas: weed control, insect control, and hybrid breeding. The resulting products are named LibertyLink, StarLink and SeedLink, respectively.

LibertyLink refers to crops with genetically engineered glufosinate tolerance. The first LibertyLink canola varieties were introduced by PGS in Canada in 1995. In 1997, LibertyLink maize varieties were introduced in the US. AgrEvo does not have its own maize breeding program in North America, but uses alliances with all major maize seed companies. In Europe, AgrEvo has several LibertyLink crop varieties approved under Directive 90/220, particularly oilseed rape and maize, while others are pending approval. Importation of grain derived from LibertyLink maize was approved by the European Union in 1998.

Starlink refers to genetically engineered crops which produce their own insecticide (*Bacillus thuringiensis* crystal protein). Starlink maize has been grown in the US since 1999. AgrEvo only provides the technology which local seed companies incorporate in their varieties. Since 2000 Starlink maize has been withdrawn from the US market.

SeedLink refers to hybrid seeds obtained by genetic engineering. For the commercialization of its hybridization technology, PGS had decided to start its own breeding program for canola in Canada. No hybrid canola existed, while research had shown that substantial yield enhancements were possible by planting hybrid varieties instead of conventional varieties. Since 1997, SeedLink canola hybrids have been grown by farmers in Canada and the United States.

### **Expansion In Seeds**

By taking over PGS, AgrEvo acquired its own seed business for field crops. This was the beginning of a rapid expansion in the seed industry, in order to gain access to elite germplasm for incorporation of its technology. In the words of an AgrEvo manager, “You have to have an envelope to send your post.” A plant biotechnology company that wants to commercialize its proprietary technology and genes can potentially follow three paths: it can set up a new breeding program (as PGS did for canola); it can contract with seed companies; and it can take over seed companies. AgrEvo is following all three routes, depending on the exigencies of the crops and the particular market situation.

For example, in 1997 AgrEvo established an international cotton seed joint venture with Cotton Seed International (CSI) of Wee Waa, Australia. The new company, called AgrEvo Cotton Seeds International (ACSI), is based in Memphis, Tennessee, US. AgrEvo owns 51 percent of ACSI, and CSI owns 49%. ACSI develops cotton varieties for the US and other markets.

In 1998, AgrEvo wanted to acquire the American seed company Cargill Hybrid Seeds North America (for \$US 650 million).<sup>1</sup> By acquiring Cargill, AgrEvo would have obtained direct access to the North American corn market. However, due to a legal dispute between Cargill and Pioneer Hi-Bred International about infringement of patents, the acquisition was cancelled.

Also in 1998, AgrEvo acquired the rice breeding program and associated assets of the Brazilian seed company Granja 4 Irmaos. Granja was the leading producer and supplier of rice seeds in Brazil at the time, while its affiliated company, Josapar, was the country’s largest rice grain retailer. Granja was developing hybrid rice in collaboration with the French national research institute CIRAD.

In 1999, AgrEvo acquired the Indian Proagro Group of companies which comprised Proagro Seed Company Ltd., Proagro-PGS India Ltd., Hybrid Rice International, and MISR Hytech. The Proagro Group was the second largest seed company in India, ranking number one in hybrid corn, millet, and forage sorghum, and second in sunflower and grain sorghum. The Proagro Group was also developing hybrid rice, cotton, oilseed rape, and vegetables for India and other markets in Asia, the Middle East, and North Africa.

This same year, AgrEvo acquired the Brazilian seed companies Sementes Ribeiral and Sementes Fartura, as well as the corn research company Mitla Pesquisa Agricola. Ribeiral and Fartura were formed in 1973 and 1976, respectively. Mitla was formed in 1993 as the joint corn research company of Ribeiral and Fartura. Mitla was a foundation corn seed company engaged in the breeding and development of proprietary corn parent lines. The combined turnover of the three companies in 1998 was approximately US\$9 million. Together the companies accounted for approximately 8% of the Brazilian hybrid corn seed market. They also produced soybean and sorghum seed for the Brazilian market.

AgrEvo has also expanded in vegetable crops. In 1997, Nunhems Seeds was shifted from the parent company Hoechst to AgrEvo, and AgrEvo acquired the American company Sunseeds Corporation. Sunseeds produced hybrid vegetable seeds and had 300 employees worldwide. It had a fully owned subsidiary in India and joint ventures in China and Chile. It occupied a leading market position in the field of carrots and onions in the US. It also sold seeds for fresh and processed tomatoes, melon, watermelon, and cucumber. Nunhems and Sunseeds became the two business units of the holding company Nunza. In 1998, Nunza acquired Leen de Mos, a Dutch vegetable seed company, strengthening its market position in seed sales for cucumber and lettuce. In India, Sunseeds India was integrated with Proagro-PGS to create a single joint venture—Nunhems-Proagro. With the 1999 acquisition of Proagro by AgrEvo, the company was fully integrated in Nunza. Also in 1999, Nunza acquired Rio Colorado Seeds, located in California which specializes in hybrid onion seeds. In 1998, Nunza was number four in the worldwide vegetable seeds market, with approximately 900 employees, of which 275 are located at Nunhems in the Netherlands.

### **Living In A Different World**

The strategic transition from crop protection to crop production brought major changes for the organization and decision making within AgrEvo and brought new challenges for its relationship with various stakeholders. Although the company had only been formed in 1994, its constituent parts had a long tradition in developing, producing, and marketing crop protection products. Decision making on new pesticides was routine, the company knew which tests to do and what information to provide to regulators. Legal requirements were clear and similar all over the world. While government policies to protect human, animal, and environmental health resulted in ever stricter requirements for new pesticides, and thus higher R&D and registration costs, AgrEvo managers considered this trend as predictable. They anticipated future developments in government regulation of the pesticide market, and installed strict go/no-go decisions early in the product development process.

On the biotechnology side, the learning curve on how to deal with regulation has been much steeper. The rapid strategic shift to become a plant biotechnology company brought different types of uncertainty to AgrEvo decision makers, “different requirements in different countries, low transparency of the (political) decision making process, adding new requirements all the time, approval at one level of regulation and prohibition at another, etc.” (Bijman & Bogaardt, 2000, p.18). These uncertainties made decision-making on biotechnology innovation extremely difficult.

In 1989, Plant Genetic Systems had its first field trials with genetically modified plants in France, the US, and Canada. Particularly among farmers did PGS not see a different attitude between Europe and North America. But the regulation that was decided upon for these field trials, and for further introduction of genetically modified organisms (GMOs), turned out to be very different on both sides of the Atlantic. In America there is the so-called deregulation since 1993—once a product is considered safe, further activities with this product do not have to be approved, and labeling and segregation is not needed. AgrEvo favors this type of regulation because it looks at the product and not the technology. In Europe, on the other hand, a GMO remains a GMO even when it is approved. This leads to the demand for labeling and for repetitive approvals for products derived from the GMO crop. These differences in the type of regulation between Europe and North America have made it very difficult for AgrEvo to decide what products to develop. Because of international trade in agricultural products, the European regulation on approval, labeling, thresholds, and segregation (or the absence of definite regulation) has even influenced AgrEvo’s innovation activities in the North American market.

One of the organizational effects of focusing on biotechnology and the introduction of genetically modified crops has been the strengthening of central decision-making. Because the main agricultural crops are traded internationally, decisions about the marketing of transgenic crop varieties have to take into account the regulatory affairs concerning biotechnology in other

countries. Local decisions on crops can have global repercussions. Even when a product is not exported, the influence of pressure groups campaigning against biotechnology encourages AgrEvo to take a global perspective in deciding whether to market a transgenic crop. Thus, the worldwide debate on the merits of biotechnology, and the activism of globally operating non-governmental organizations (NGOs) like Greenpeace, have even shifted marketing decisions from the local and regional affiliates back to headquarters in Frankfurt. This re-centralization of decision-making has been a major cultural change within the company.

## **Conclusion**

AgrEvo's strategic reorientation from crop protection to crop production seems a logical one from a technological point of view. Biotechnology has opened up new opportunities to shift crop protection from chemicals back to genetics and to new combinations of the two. However, biotechnology has also brought many new uncertainties to the company. While the success of a new pesticide basically depends on two criteria, governmental approval and farmer uptake, the success of a genetically modified crop variety is contingent upon the formal or informal approval of a large range of stakeholders. Different regulatory requirements in different parts of the world have to be complied with, various national and international NGO's have to be pleased, and all firms in the agrifood production and distribution chain have to give their consent. While farmers may be the primary clients of AgrEvo's products, whether they will grow transgenic varieties is mainly determined by food processors and food retailers, who ultimately listen to consumers.

## **Endnote**

<sup>1</sup> One US\$ equals 1.08 Euro (in 2000).

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