

## FRENCH AG-BIOTECH SMEs: DEVELOPMENT PROSPECTS

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European policy to promote small- and medium-sized enterprise (SMEs) creation seems to be successful in France, judging by the high rate of new business formation. Yet French firms remain very small compared to United States (US) firms, employing less than 40 employees on average, as opposed to 140 in the US. This prompts the question of their future. Are all biotechnology SMEs destined to expand, disappear or be bought out? Or is there a place for small businesses that cater to a particular market niche? This paper argues that agbiotech SMEs do have a specific trajectory that will allow them to continue to exist, at least in the medium term. However, they will continue to have a low potential for growth because (1) they are older and more mature than other biotech SMEs and yet remain small; and (2) they currently face a difficult venture capital market because of the uncertainty surrounding investment in agbiotech within Europe.

*Keywords:* small and medium sized enterprise; SMEs; France; growth.

European policy to promote small- and medium-sized enterprise creation seems to be successful, judging by the astounding rate at which new companies are being established throughout Europe. The number of European biotech companies increased by 15% in 2000 over 1999 to 1,351 firms. These firms are, moreover, a driving force behind growth of the biotechnology sector (Liebeskind *et al.*, 1996; Powell, *et al.*, 1996). Yet French firms remain very small compared to United States (US) firms, employing less than 40 employees on average, as opposed to 140 in the US. This prompts us to wonder about their future. Are all biotechnology SMEs destined to expand, disappear or be bought out? Or is there a place for small businesses that cater to a particular market niche? Since observers are expecting the consolidation of the biotechnology sector (Ostro & Esposito, 1999; Woler, 1999), are all biotechnology firms likely to follow the same trajectory?

Firms are often distinguished in terms of their target markets. Thus, the health, agricultural, agri-food and environmental sectors are analyzed separately in this paper. In the human health sector, Gambardella (1995) shows that a division of labor is progressively emerging between established firms and biotechnology start-ups. Large pharmaceutical groups sell most biotechnology-based drugs currently on the market, whereas they are generally the outcome of biotech SME<sup>1</sup> research. Due to the growing rapidity and complexity of innovation processes, it is no longer possible for a single actor to possess all scientific and technological competencies needed for the creation and development of new

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products. “Go it alone” strategies are therefore ineffective. Biotechnology firms active in human health position themselves as actors in the pharmaceutical sector or as suppliers to the pharmaceutical industry (Nilsson, 2001).

For biotechnology firms active in the agricultural or agri-food markets, the situation is more complex. Are they destined to adopt the same position as seed companies such as Aventis Crop Sciences or Monsanto, or will they remain service companies for the agri-food sector? What is their development in coming years likely to be?

Lastly, by linking biotechnology firms to the “customer firm sector” we neglect a large proportion of firms involved in the development of generic activities aimed at all actors in the life sciences—agriculture, the environment, and animal and human health. To understand the development dynamics of biotechnology firms in France, an annual survey on all biotechnology small- and medium-sized enterprises (SMEs)<sup>2</sup> was carried out in 2000 under the impetus of the Research and Technology Ministry. The survey covered three years: 1997, 1998, and 1999. Of the 380 firms identified, 277 responded<sup>3</sup> to this second survey. The response rate was about 73%, which is a good rate for a postal survey. Only 255 surveys with complete responses were usable.

The aim of this article is to analyze the growth dynamics of the biotechnology sector and to identify the specificities of agbiotech SMEs in France. In the next three sections, we discuss the creation process of SMEs in France. We analyze and characterize the activities of biotechnology SMEs and highlight the diversity of their activities and present recent trends and driving forces behind their development and research strategies.

### **Creation Of Biotechnology SMEs In France**

On January 1, 2000 France had around 300 biotechnology SMEs employing 15,000 people with an estimated turnover of €1.9 billion<sup>4</sup>. Biotechnology remains a small emergent sector compared to others, such as agri-food (which consists of over 4,200 French firms with 372,300 employees and a turnover of €100 billion) or pharmaceuticals (with 94,500 employees in 271 firms and a turnover of €28.5 billion (Sessi, 1999)). In 1998 and 1999, the turnover of all French biotechnology SMEs rose by 8%. Of this growth, 80% is related to growth in the turnover of the 160 existing SMEs and 20% is due to the creation of 30 new SMEs. Only 17 biotechnology SMEs closed down in 1999, which resulted in a marginal drop in the overall turnover. The total number of employees in the sector rose by 13%, from 9,700 to 11,000 persons. This corresponds to an average of 43 persons per firm, a result consistent with analyses by Ernst and Young (2000).

About one hundred firms were created between 1997 and 1999. Although the increase in turnover and number of employees in the sector is largely attributable to growth of established firms, start-ups did account for 20% of that growth—a significant amount. It has been shown (Lemarie *et al.*, 2000) that the creation of SMEs is the main vehicle for the diffusion of new technologies, primarily related to genomics and bio-informatics. Development of biotechnological knowledge is generating increasing specialization in the technological offerings of such companies. SMEs take part in this process, whether they are created by researchers wanting to valorize their discoveries or by entrepreneurs eager to take advantage of market opportunities.

Apart from overall growth figures, it is important to understand the distribution of that growth across different sectors in order to understand the development dynamics. Are certain technologies or applications the source of more growth than others?

## Diversity Beyond Target Markets

Biotechnology SMEs are primarily engaged in business-to-business type relationships. Over 80% have no direct contact with end users. They supply products and services to other firms in sectors related to human or animal health, the environment, or agriculture. It is preferable to talk of target sectors or markets than artificially to attach biotechnology SMEs to an industrial sector (Arundel & Rose, 1998). Table 1 shows that French biotechnology firms are essentially spread over three markets which are as follows:

- 40% of biotechnology firms are active in the human health market, primarily as suppliers to pharmaceutical and cosmetic companies. Firms such as IDM (Immuno Designed Molecules), Bioproject Pharma, Exhonit, MP5, and Kappa Biotechnologies are active in this market. Some of these firms have developed additional related activities, such as production of products and services for the cosmetics or veterinary sectors—a springboard for development of human health-related activities that are more costly and take longer to develop.
- 24% of biotechnology firms sell services to other firms that have the environment, agriculture or agri-food sectors as their main customers.
- Lastly, 37% develop generic services used by other biotechnology firms and by all actors in the lifesciences. This is the case for firms, such as Genome Express which do customized sequencing, and Atlangène Développement which produce diagnostic kits.

**Table 1: Target Markets Of Biotechnology Firms.**

	# Firms	Total Number of Employees	Sum of Turnover M€	Turnover / Firm K€	Average Date of Creation
<b>Diagnostics or Genomics</b>	93	3,147	425	4,572	1991
<b>Agriculture and Agro-food</b>	60	3,087	738	12,302	1987
<b>Human Health</b>	101	3,480	650	6,444	1992
<b>Total</b>	<b>254</b>	<b>9,714</b>	<b>1,814</b>	<b>7,142</b>	<b>1990</b>

Table 1 highlights three noteworthy facts influencing the evolution of biotechnology firms:

1. The size of firms varies widely from one sector to another. Firms that are active in the agri-food sector are older. On average they have a creation date of 1987 versus 1990 for all firms put together. They also generate a high turnover.
2. Firms in the human health market typically involve more recent formations (an average creation date of 1991). They are more diverse and, typically, larger firms (employing over 500 persons) co-exist with small firms (under 10 persons) that are oriented more towards services.
3. On average, firms that specialize in the provision of services or specific equipment to other actors in the life sciences are more recent and smaller.

Table 2 presents firms' target markets and activities, in four categories: product development; diagnosis or testing, including design and production of diagnostic kits; design of new methods or

advice (contract research); and lastly, design and production of equipment for other biotechnology firms. As shown in table 2, over 50% of biotechnology firms develop diagnostics or production of specific customized biological material. Fewer than 25% of firms develop products, and 20% design and sell tools and methods for developing products and services. That is the case, in particular, of bio-computing firms engaged in sequencing and gene function.

**Table 2: Type Of Business Activity And Target Market.**

	<b>Diagnostics and Genomics</b>	<b>Environment and Agri-food</b>	<b>Human Health</b>	<b>Total</b>
<b>Diagnostics and Tests</b>	23	10	20	53
<b>Equipment</b>	4	2	2	7
<b>New Methods and Advice</b>	9	1	7	16
<b>Product Development</b>	2	11	11	24
<b>Total</b>	<b>37</b>	<b>24</b>	<b>40</b>	<b>100</b>

Note. Figures are expressed as percentages.

Firms engaged in selling products, as opposed to services, are the oldest (on average, created in 1986) and generate the highest turnover: half of them have a turnover in excess of €15m. A majority of the firms that have developed a certification strategy (BPL, BPF, Cofraq, and so on), and are protecting their innovations with patents, are firms that develop in health- or cosmetics-related markets. These are mainly firms that target the agriculture, agri-food, and human health markets. For instance, firms that supply services are generally younger (average date of creation is 1993) and more diverse: certain firms remain small (around 10 persons with a turnover of between €1.5m and €5m), target mainly a local market and are not likely to expand. Examples include firms such as Aquanal S.A. that develops diagnostic-related activities for agri-food products, and LCA which has a diagnostic activity for farmers. Others, such as Genome Express provide services as a means to financing their research and development (R&D). This applies essentially to the youngest firms that valorize their know-how primarily in the pharmaceutical sector. They are the firms that most frequently form partnerships with university teams.

### **Growth And Resources**

Target markets and activities are not enough to define groups of homogeneous firms and to forecast what their futures are likely to be. Firms in the same target market have varied trajectories. Ownership structure and partnerships can provide insights into the development dynamics of biotechnology SMEs and their potential trajectories. As biotechnology firms are science based, in the beginning the life cycle is mainly funded by shareholders. Thus, the identity of the shareholders can be used as a proxy for those who invest in such firms. Close to 40% of firms are owned by individuals who most often founded the company and their family. Irrespective of their age, these firms develop more slowly than those with more diversified shareholders.

**Table 3: Shareholders of Biotechnology SMEs in ‘000s of €**

Type of Shareholder	In Percentage of the Total	Average Turnover		Average No. Employees	
		Yes	No	Yes	No
Venture Capital Firms	28%	41,982	28,683	35	35
Another Company	41%	45,565	22,334	54	22
Individuals (company founder)	38%	16,769	45,625	15	54

For firms that have another firm as a shareholder, the average number of employees and average turnover are far greater. The shareholder company usually constitutes a market in which the biotechnology firm can quickly extract value from its research services. The average size of those biotechnology SMEs that have a venture capital company among their shareholders is no different from firms in other categories. Differences are substantial, however, when one analyzes the age of firms. Venture capital firms withdraw their capital from the oldest companies when conditions are right. Thus, the average size of firms created before 1980 and in which venture capital companies remain shareholders, is smaller than the sample average in terms of both turnover and number of employees. On the other hand, for firms set up between 1980 and 1990, average size is far greater when venture capital firms are shareholders. There are no significant differences for firms established in the 1990s.

The development of firms is, thus, related to the identity of their shareholders, which is logical since firms with shareholders consisting of individuals will have more limited resources. They are less likely to develop an ambitious research portfolio and might focus on innovations that can be valorized quickly in the market. By contrast, firms in which venture capitalists invest have a higher growth potential. They tend to develop more ambitious research projects. Those companies that develop large research programs target far broader markets and develop cooperation at an international level. The potential profitability of such programs is possible, however, only when the downstream markets targeted are broad. Finally, firms in which another company invests have a much broader financial base as well as access to their shareholders' markets.

Table 4 reveals that shareholders are very different depending on target markets. Venture capitalists invest little to nothing in firms which target markets in the agricultural, agri-food, or environmental sectors. They prefer instead to invest in markets in the human health sector or in firms which are providing specific biotechnology know-how. Firms focused on agricultural or agri-food markets often have other firms as shareholders and rarely have venture capital investment. In all, the identity of French biotech SMEs' shareholders also gives an indication of the extent of firms' research programs and development prospects. Such indicators are particularly relevant when they are related to the average date of creation per target market.

### Some Concluding Comments

Recent trends seem to suggest closer relationships between SMEs which have similar competencies but are situated in different countries. Thus, the buyout of the company Génopoiétic by Avax Technologies, which is a continuation of prior cooperative agreements, has enabled the US firm to acquire the know-how and patents of the French SME. Génopoiétic specialized in gene and cell therapy. The same logic has governed the merger between the US-French SME ValiGen and the

German SME Infogen, ValiGen being the result of a merger between the US Kimeragen and Valigene.

Development prospects of French biotechnology SMEs vary depending on the target sector, the age of the firms, and their goals. Recently formed SMEs financed by venture capital, and which develop technologies, services, or products for the lifescience markets are likely to grow rapidly in coming years. By contrast, many family SMEs will remain small and supply a narrow local market. Firms that target the agricultural, agri-food, and environmental sectors are, on average, the oldest. They have reached maturity and have other firms as shareholders. However, their development prospects are weak, especially since reluctance among European consumers is forcing groups to reduce the use of biotechnology in agriculture (mainly GMOs). Such firms face a difficult capital market because of the uncertainty surrounding investment in agbiotech within Europe. As pointed out by Kalaitzandonakes (2000), without private investment the prospects for development remain low. On the other hand, the diagnostics and testing market is buoyant, especially for small firms that adapt tools developed in human health.

**Table 4: Targeted Markets and Shareholders.**

	<b>Firms Owned by Only Natural Persons</b>	<b>Firms Owned by Venture Capitalists</b>	<b>Another Firm is in the Shareholding</b>
<b>Diagnostics or Genomics</b>	26	17	39
<b>Agriculture and Agro-food</b>	35	3	52
<b>Human Health</b>	24	14	45
<b>Total</b>	27	13	44

Note. Figures are expressed as percentages.

## Endnotes

<sup>1</sup> SMEs are firms that employ less than 500 employees.

<sup>2</sup> “Techniques that consist of treating matter, whether living or not, by biological agents, whether recombined or not, with a view to finding or producing goods and services by means of technological tools that exploit the properties of living cells in research on and production of chemical or biological substances.” Extract from the Organization of Economic Cooperation and Development (OECD) definition [Authors’ Translation].

<sup>3</sup> The firms that responded are listed in an on-line directory available on the World Wide Web: <http://biotech.education.fr>.

<sup>4</sup> This figure does not take into account firms with large biotechnology divisions employing over 500 employees. In January 2000, 1€ = 1 US dollar.

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