slow at participating in the R & D effort, and clearly, has not matched the effort made by government research.

A long list of Spanish participants, from industry, universities, and government laboratories, in the BRIDGE, FLAIR, and ECLAIR programs as well as the project titles can be found in reference [34].

## E. THE INDUSTRIAL SECTOR

Recent estimations of the volume of sales of biotech industrial products exceeds 15 % of Spain's GDP or (Cdn $92 billion). 71 % of the 80 firms with manufacturing facilities actively involved in biotechnology are Spanish. In the diagnostics sector that figure was 100 % and in fine chemicals and pharmaceuticals it was 40 %. More than 40, 000 people are involved in the industrial application of biotechnology, 5,000 of them in technology development and nearly 2,000 in R & D. Information, albeit in need of updating, concerning public and private sector biotechnology groups, focus of activity, and patents issued can be found in the References at the end of this document[32].

Active Sectors include:

### 1. AGRIFOOD

Over 400 firms[34b] with a manufacturing volume of Cdn $50 billion constitute the Spanish agrifood sector. An excessive dependence on external technologies makes this area a major player in the future of Spanish industrial biotechnology. Spain is already a leader in the area of citrus plants and products. Main areas of activity are in genetic improvement of seeds, disease resistant plants, and development of plants resistant to drought and hard water. Other areas are in the production of wines and beers with low alcohol content, and in the manufacture of cheese, ham and other meat products. The food industry appears to be taking rapid steps toward the incorporation of new biotech methods. In 1991 there were over 2,000 scientists and engineers involved in more than 600 industrial projects in this sector.

### 2. PHARMACEUTICALS

Pharmaceuticals firms constitute 39 % of the companies involved in biotechnology. In 1990 the volume of sales of this sector exceeded Cdn