Every year millions of tons of chemical pesticides are sprayed or irrigated onto plants in fields and gardens throughout the United States. Protected from weeds and insects, these plants flourish and grow to provide food and visual delight for us all. Chemicals used for pest control, however, sometime turn out to be poisonous for humans, and the results are often tragic. Consequently, efforts are under way to reduce the need for toxic chemical pesticides and, in the process, to eliminate the adverse side effects they can bring.

Reducing the Risk of Toxic Pesticides
One promising approach to reducing the hazards of pesticides is to use genetically engineered organic compounds based on naturally occurring pesticides that are harmless to humans. The ATP project with AgriDyne Technologies offered a novel way to do this by taking advantage of large-scale biochemical production. AgriDyne, founded in Utah in the early 1980s as Native Plants, was a small company that would have been unable to pursue this research without the ATP award.

Scientific knowledge generated by the ATP project . . . is disclosed in two patents and may be important to the genetic engineering of other plant extracts.

A Nontoxic, Chrysanthemum-Based Pesticide
The technology AgriDyne developed during its ATP project is based on the chemistry of pyrethrins, a group of six closely related natural insecticides derived from pyrethrum, a type of chrysanthemum. Pyrethrins kill insects on contact, have low toxicity for mammals, degrade shortly after application, and produce no harmful residues. The only current source for natural pyrethrins is chrysanthemum from east Africa. But, according to AgriDyne’s proposal to ATP, supplies were neither stable nor sufficient to meet the worldwide demand.

Although pyrethrins can be synthesized in the laboratory, production via traditional chemical processes is difficult and expensive. AgriDyne’s alternative was to genetically engineer yeast cells to produce chrysanthemyl alcohol, a precursor that is then chemically converted to chrysanthemic acid. This, in turn, can be used to produce commercial quantities of pyrethrin.

Business Upheavals Stall Technology
AgriDyne achieved most of the technical goals of the project, but production costs were higher than predicted. The company encountered financial problems that forced it to close in 1995, just as the project was ending. AgriDyne apparently did not have enough management resources to handle the challenges of both developing the technology and commercializing a product. The firm was acquired by Biosys of Columbia, Md., another biopesticides company, which decided not to make the investment required to commercialize the ATP-funded AgriDyne technology.

Biosys, in turn, declared bankruptcy in 1996. Its
Gains in Bioengineering Knowledge

Although no commercial product has yet resulted from the ATP-funded technology, new bioengineering knowledge has. Some of it has been disclosed through two patents. But AgriDyne’s manufacturing know-how was apparently not passed on to the company’s successors. Should events in Africa decrease the supply or increase the cost of natural pyrethrin, the AgriDyne approach may be resurrected by funding development of the needed manufacturing skills.
Figure 3.2 Patent Tree for Project Led by AgriDyne Technologies, Inc.: Citations by Others of AgriDyne Patents