A worldwide revolution in demand, production and marketing of farm products is producing wide-scale changes in the U.S. agrichemical industry. In fact, it is no longer a U.S. industry. It is now a global industry responding to conditions around the world.

The agrichemical industry is coming to grips with the fact that dramatic change is inevitable. Internationally, as Lester Thurow noted in the first issue of this magazine, the American-based economy has been replaced by global enterprise. Agrichemical companies that once concentrated on the U.S. market, such as Velsicol, Union Carbide or Stauffer, have been replaced—bought out, in fact—by Sandoz and Rhône-Poulenc and ICI, all of which are global in their operations, finance, and management.

Forces of Change

We see a number of changes in other countries that affect the nature of regional and worldwide markets for the agrichemical industry, including:

— a concerted effort by developing nations to approach agricultural self-sufficiency and to service massive debt loads;
— intense competition among food exporters as new technology boosts production and adds new nations to the list of net exporters; and
— growing international concern for environmental impacts.

These developments coincide with significant changes occurring in the U.S. farm economy. For example:

— As commercial farms grow larger and fewer in number, a significant change in ownership is taking place. Production is rapidly becoming more concentrated.
— Institutions (e.g., insurance companies and banks), consultants, and professional farm managers are making more and more farm management decisions including the purchasing and use of agrichemicals.
— Farmers are forming buying groups to gain discounts and favorable delivery schedules from agribusiness suppliers.

In addition, highly productive agrichemical technology in crop production, pest control, improved communications, and the development of efficient international financial markets, led to massive changes on a worldwide basis within a few short years. The agrichemical industry faced a revolution in agriculture, international finance, and reorganization.

The New Agricultural Chemical Industry

In coping with these changed conditions, the agrichemical industry has gone through the same process as an individual coping with a fatal diagnosis. Initial denial turned to anger toward competitors and the inescapable forces eating away at the old order both at home and overseas. We have been frustrated and depressed by our inability to stave off change, and have felt betrayed by the very systems and techniques that produced robust health for the U.S. industry for half a century.

The U.S. agrichemical industry of the 1960s was characterized by growth and a steady stream of new products for the world's biggest agricultural market. American companies, for the most part, were content to grow their businesses at home. Most of the larger players concentrated on the U.S. market although several did have small international divisions to run their activities in the rest of the world (mostly Europe).

There were not many European businesses entering the U.S. market in those years. The Swiss pharmaceutical giant, Ciba (later to merge with another Swiss company and become Ciba-Geigy) had always been a contender in the U.S. market. American-based DuPont paid more than passing attention to the rest of the world, but, for the most part, American companies focused their attention on their home turf, and had it all to themselves.

Fueled by world needs, U.S. acreage and crop production expanded during the 1960s and then expanded even further in the 1970s. The National Agricultural Chemical Association, the industry's primary trade group, reached a peak of more than 120 member companies in 1976.

Stark Reality

By the 1980s, however, the picture began to change. The American agricultural boom went bust. The agricultural chemical industry was marked by consolidation: ag divisions of larger companies were sold, shut down, or merged.

At present, the National Agricultural Chemical Association membership has dropped to around 80 members. Industry observers expect this downtrend to continue until the indus-
try is consolidated into a small number of large companies with strong worldwide businesses. Besides having the economic strength to remain competitive around the globe, these companies will also be marked by their ability to adapt to a new market-oriented reality.

In the agricultural chemical industry of today, it is no longer possible to follow a manufacturing philosophy willing to give markets whatever they want "as long as it's black," as Henry Ford so aptly characterized that previous approach. National regulation and legislation developed to protect old economic interests have been neither productive nor effective.

The Response

Rather, the future of agrichemical companies is being determined by how well we anticipate and respond to individual needs in developed and developing countries alike, and to the new demands and economic forces at work, on a global basis. Such responses include improved communications, international integration of financial markets, and concerns for the environment.

In this environment, the manufacturing orientation of earlier years must give way to a market-driven philosophy. In large measure, the current buzzwords—"close to the customer"—define one of our most important challenges. Agrichemical companies must become partners with farm producers. This means listening closely to growers worldwide, and then tailoring the industry's research and development to meet their needs in a new economic environment.

Maintaining Competitive Development

The economic environment has had a dramatic impact on research and development as well. These activities must also be efficient. Costs have reached such levels that only a few companies can afford to sustain the research and development needed to stay competitive. Jack Early, president of the National Agricultural Chemicals Association, has estimated that the cost of bringing a new chemical to market is approximately $40 million, compared to $6 million only 10 years ago. This 567 percent increase in cost is only one of the factors forcing a dramatic change in the scale of operations. Today, agrichemical companies need to achieve sales of $500 million to $1 billion to manage ongoing development.

One response to these higher research and development costs is the continuing concentration of the industry and expansion of multinationals, including:

---DuPont's (U.S.) purchase of the U.S. agrichemical business of the Royal Dutch/Shell Group (Netherlands);
---Sandoz, Ltd.'s (Switzerland) consolidation of the agrichemical unit it acquired from Velsicol Chemical (U.S.) with its Zoecon Corp. subsidiary (U.S.) to form Sandoz Crop Protection Corporation (U.S.); and
---Rhône-Poulenc's (France) purchase of the majority of Union Carbide's (U.S.) agricultural chemical business.
Finding New Products Through Research

The traditional research approach has been to examine an extraordinary number of chemical structures to find one that can be commercially developed. This expensive, time-consuming process continues to be the major route to finding new products.

Our expanded knowledge of biology and genetics, however, is making possible a far more rational and direct approach. Much of today's research is aimed at finding ways to alter life processes of pests. Insecticides developed from this knowledge, for example, interrupt the life cycle of targeted insects by altering their internal chemistry or physiology. Because the products are species-specific, they are harmless to humans or other non-targeted life forms. We should see the impact of this biotechnological approach during the next 15 to 20 years. Its growing importance is indisputable.

Through genetic engineering, a plant's DNA code can be altered to increase the plant's resistance to herbicides. Geneticists already are working on tobacco, tomato and potato plants that appear to be unaffected by certain nonselective herbicides. Equally important, these new crop strains pass their resistance on to succeeding generations.

An increasing number of agrichemical producers and seed companies have formed joint R&D ventures to develop herbicide-resistant crop varieties. For example, Monsanto Agricultural Company is working with DeKalb-Pfizer Genetics to develop corn hybrids resistant to Monsanto's glyphosate herbicides. American Cyanamid is working closely with Pioneer Hi-Bred International to develop hybrids resistant to imidazolinone, a herbicide toxic to corn.

Importance of Patents

The development of new products sustains further development to the extent that the products return income to their original producers. In this light, the loss of revenue due to widespread pirating of patented agrichemicals and the premature expiration of patents can be devastating. These practices erode the return on investment, sometimes before the costs of developing and marketing the product have been recovered.

The federal government is working to encourage countries not currently granting patent protection to chemical products to do so. At the same time there is a movement in the United States that would lengthen the effective patent term of products by making the patent effective when sales begin, rather than when the product is invented. Presently, as much as half of the patent life can be eaten up during product safety testing for government registration. Taken together, these actions would encourage new R&D efforts while further protecting a manufacturer's income on existing products and providing manufacturers with an opportunity to spread R&D costs over a longer period.

Agrichemical Industry of the Future

It is the combination of these developments that leads us to think that the agrichemical industry, at the turn of the century, will be vastly changed from today's industry. The industry will be more concentrated than today. Fewer than a dozen giant companies will be supplying farmers around the world. These companies will be owned internationally and will be involved in the chemical and pharmaceutical arena as well as in agriculture. Research and product development will be ongoing in all parts of the world and sales efforts will be as focused on Asia and the developing nations as they now are concentrated in Iowa or France.

The agrichemical industry is not alone in the need to address the new global economy. Every sector of agribusiness, from individual farmers to entire nations, must come to grips with this issue. Governments need to remove trade barriers—such as crop price supports and tariffs—and concentrate on promoting economic development if they wish to participate in the global market and increase demand to meet supply.

With so many countries engaged in on-again, off-again production policies, farmers around the world are unable to develop long-range plans. Artificial reductions in food production are senseless when other nations quickly move to seize market share. Ultimately, agriculture must become market-oriented to meet the demands of a growing world population.

The agrichemical industry faces the same challenge. We must market products on a global scale in order to cover the costs of research and development essential for staying in business and remaining competitive. At the same time that we must have a global orientation, a key factor to staying in business is the ability to become partners with the end users of our products. Research and development, manufacturing and marketing must address the problems and needs of those customers, whether they are in the Midwestern Corn Belt, Asia, Europe, or the Subsahara.

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