COMMERCIALIZING PROMISING TECHNOLOGIES:

One Answer to U.S. Farm Problems

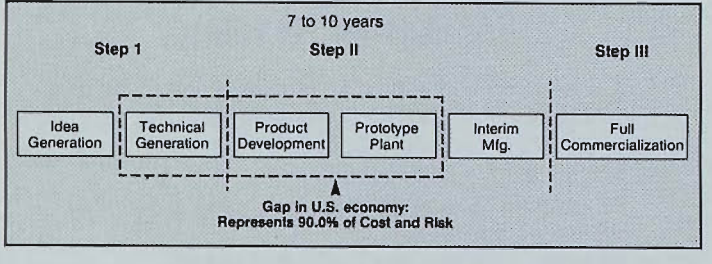
by Paul F. O'Connell

Many people think that new ideas flow easily to the marketplace. Nothing could be further from the truth. Scientific laboratories and libraries overflow with alternative techniques for producing, processing, and marketing agricultural products. Some of these techniques are ready for adoption and others are not. Sorting out the most promising ones is a difficult and time-consuming task. Development costs represent an estimated 90 percent of total costs for the research and development phase of new technologies.

Development is a broad term. It encompasses many diverse activities—growing and harvesting, raw materials handling, processing and extraction, market identification and promotion, business planning, and enterprise organization such as formation of grower cooperatives and associations. The purpose of development is twofold: to prepare the farm sector to grow and sell a material for a new use or to produce a "new" product for an established use and to prepare industry to buy, process, and market the products.

The weakest link in the U.S. economy is transferring promising technologies from "Idea generation" to "Interim Manufacturing" stages. There is little strategic planning or investment in phasing out obsolete technologies and developing new ones that satisfy changing markets (Fig. 1).

Figure 1 - **Commercialization Takes Time**



New Demand Needed

Public supported agricultural research and education (R&E) has always had a close working relationship with producers of food, fiber, and forest products, but involvement beyond the farmgate has been a relatively small portion of the total effort. Most of the publicly supported R&E activities focus on increasing per-unit yields of land, animals and labor. That approach was fine when the United States fed, clothed, and sheltered its own citizens and exports were continually expanding. Imports of Agriculture products now total $21.0 billion.

They have doubled over the last 10 years. These figures do not include $15.3 billion for forestry products, $5.7 billion for edible fish and shellfish, and an unknown quantity of imported industrial feedstocks that could be obtained from U.S. farms and forests. For 1988, the value of agricultural, fish, and forest product exports was $46.9 billion, down approximately 10.0 percent from 1981, but $10.0 billion more than in 1987 (Fig. 2). Major factors in last year's improved export sales were the export enhancement program and more favorable exchange rates in some importing countries.

Expanding the spread between exports and imports in the near future is unlikely for the following reasons: continued import restrictions in Asian and West European markets; little change in foreign exchange rates by competing producers, e.g., in Canada, Brazil, and Australia; expanded food producing capacity in places like China and India; aggressive targeting of U.S. markets by other countries; and lack of foreign exchange in less developed countries, where the largest growth in population is occurring.

This declining trade balance has generated interest in diversification and development of non-traditional farm products.

On April 4, 1987, Congressman Larry Hopkins addressed his constituents in central Kentucky and stated, "...that farmers must diversify into alternative enterprises." Gross income from tobacco sales in Kentucky was cut in half between 1984 and 1986 and corn income was down 40.5 percent. The Congressman further stated: "The question isn't whether our farmers can grow non-traditional crops or begin new farm enterprises...they can. But will they? Are they really convinced they won't always be able to count on tobacco and corn and livestock? And if they do go into supplemental crops, where will they sell their harvest? Where will they store it? Where will they process it...or freeze it, if necessary? How will they move it to market?"

Similar questions are being asked by sugarcane farmers in Hawaii (the world price of sugar is now one third the domestic price), corn producers in Nebraska, and wheat farmers in Kansas. Given these uncertain market situations—primarily in the international arena—what should be done to expand the market base for U.S. farmers?

An Option

One possible approach is to get promising technologies for alternative farm products in the hands of private investors to provide these markets. The first place to start are those areas where we depend heavily on imports. Other countries target our markets, so why shouldn't U.S. scientists, technical specialists, processors, material handlers, venture capitalists, and marketing specialists find ways to tap one of the best markets in the world—the United States. Export markets should be aggressively pursued as well, but let's also explore opportunities within our own borders.

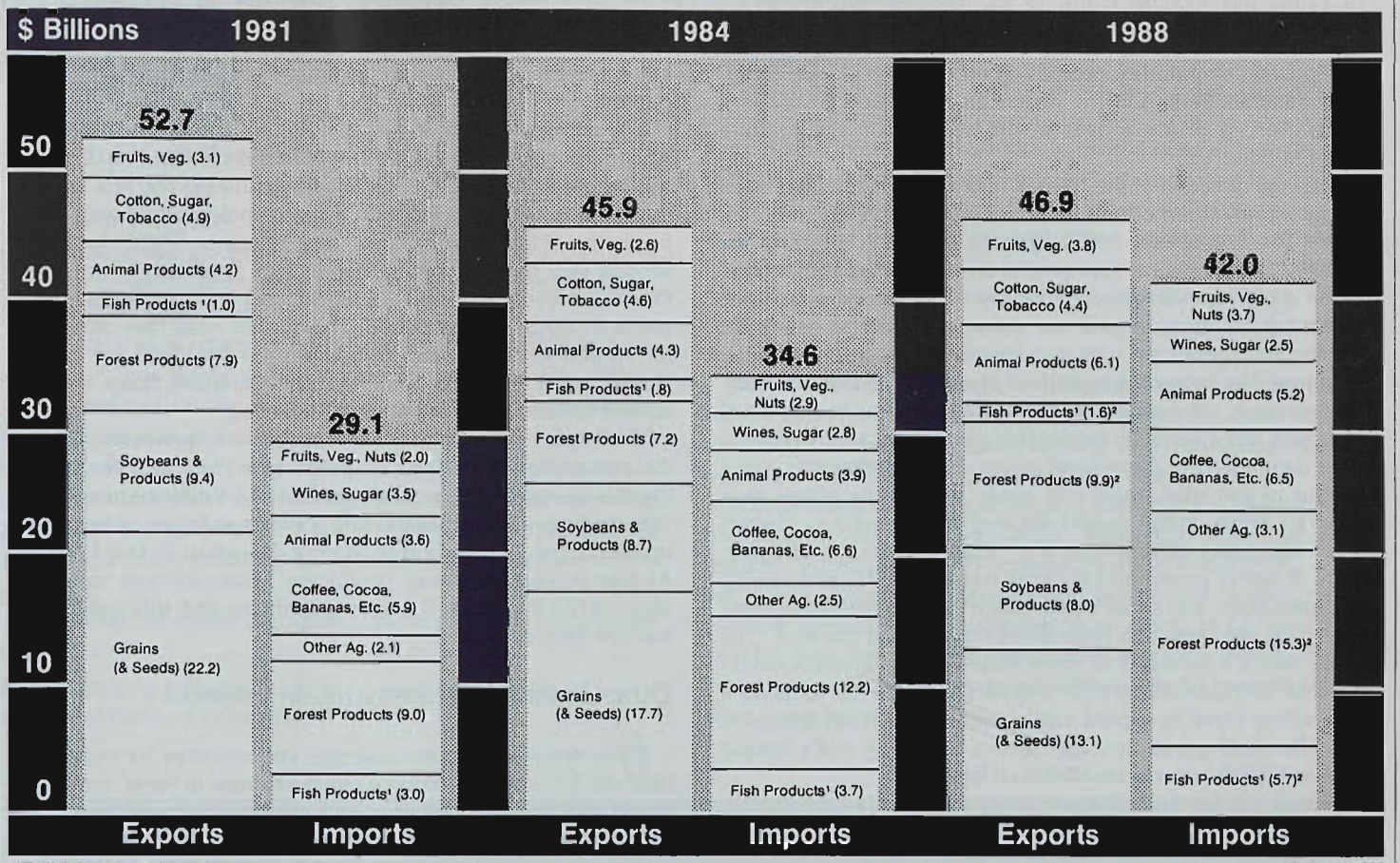
In the United States, private and public institutions have often had an arm's length mistrust of each other. But for product development, these groups need to set aside these mistrusts.

Many research programs are funded by universities and the federal government because returns on investment are long-term and too uncertain for the private sector. Commercialization of promising agricultural technologies has similar incentive problems, but is not quite as elusive. Therefore, a partnership among academia, government, and private industry appears to be the answer.

The private sector has a key role in the development process

Paul F. O'Connell is Deputy Administrator, Cooperative State Research Service, USDA.

Figure - 2 **Agricultural, Fish, and Forestry Products**
(Changing Trade Balance for U.S.)



¹(Edible), ²1987 figures

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because private sector companies are more experienced in identifying marketing channels and implementing promotion strategies than their public sector counterparts. The private sector should also provide a product champion, that is, a firm or individual that is dedicated to making a particular product an ultimate commercial success. A project should be based on solid analysis, but a vital ingredient for success of any given venture requires someone who is optimistic about the final outcome.

In addition to providing expertise on marketing, industry members of a commercialization team can identify technologies that best meet changing competitive conditions and ensure a flexible and efficient mechanism for producing, processing, and marketing agricultural products through private sector initiative.

Government and academic members of a commercialization project can provide well trained researchers and technology transfer specialists with a long-term view; a network of contacts in state and federal government who can reduce regulatory red tape; necessary seed money; and bring production, processing, marketing, and research specialists together working as a team.

There is often not enough incentive present in any one sector to adopt promising technologies, but together the incentives can often be sufficient.

A commercially successful and profitable enterprise can occur without special joint efforts among government, academia, and industry. Private sector initiatives frequently create new markets for farmers. In many instances, however, barriers to commercialization involve a lack of managerial and financial resources with which to link agricultural production with processing and marketing. A catalyst organization can provide that linkage by actively organizing and promoting the final stage of product development with a relatively small public obligation.

Active Demonstration Projects

In recent years the "Special Projects Unit" in the Cooperative State Research Service, USDA, has been bridging the gap between research results and commercialization with demonstration projects. These projects are short term, usually 3 to 5 years, with public/private partnerships established with USDA cooperative agreements. Capitalizing on decades of research done in the public sector—generally by the Agriculture Research Service or State Agricultural Experiment Stations—the demonstration projects are designed to build, within the private sector, an infrastructure that will initiate and sustain new agro-industries. Two promising projects involve kenaf and hybrid-striped bass.

Kenaf Project

Kenaf is an annual, non-wood fiber crop that will grow from seedling to 10 feet in less than 5 months and can be transformed from seedling to newsprint in less than 7 months. The potential growing area is across the southern tier of the United States.

Kenaf has the technical potential to substitute for newsprint which is normally made from wood such as northern spruce and southern pine. The United States currently imports about 60.0 percent of its newsprint supply from Canada at an annual cost of $4 billion.

The "Kenaf Demonstration Project" (begun in 1986) is a public/private partnership with the principle objective of gaining acceptance for kenaf as a source fiber for the manufacture of newsprint. To accomplish this objective a "Kenaf Task Force" was established involving participation of a venture-capital company, private laboratories, processing and pulping plants, equipment manufacturers, and the American Newspaper Publisher's Association, a prime mover in the search for a substitute newsprint fiber.

Under the direction of the "Kenaf Task Force," kenaf has been brought into the third of a three-phase program for commercialization. The first phase used a systems approach to affirm the feasibility of agricultural fiber production to newsprint manufacture on a high-speed research machine. The second phase was a scale-up for an extended run on a commercial newsprint machine and pressroom runs and analyses by major newspaper publishers. The recently begun third phase will coordinate traditional research, education, and extension resources in support of the project and a kenaf newsprint mill planned for south Texas.

The completion of the second phase demonstrated that kenaf was out of the trial stage and ready to take its place as a newsprint finish. Initial results showed that kenaf has distinct price and quality advantages, e.g., uses less ink, is stronger, results in whiter paper, and requires less energy for processing. Field trials show that kenaf can produce three to five times more paper pulp per acre than trees do at roughly half the cost. The private sector responded to these facts with an announcement by Kenaf International and CIP Forest Products, Inc. to build a $400 million kenaf newsprint mill in south Texas for operation in 1991. The anticipated acreage needed to fill the mill's annual needs is 40,000 acres of unsubsidized kenaf.

The one mill for south Texas is likely to be just the beginning. The newsprint industry estimates that it will need 19 new mills of similar size by the year 2010 to meet estimated demand. If one-half of these were kenaf mills, U.S. farmers would have a market for 375,000 acres of kenaf which would be equivalent to the total acreage of cotton in Alabama.

Hybrid-Striped Bass Project

A field trial demonstration project for raising hybrid striped bass (HSB) in farm ponds began operation in the fall of 1987 at Walnut Point Farm near Chestertown on Maryland's Eastern Shore. The project development phase will span 3 years. Capital construction at the site in the first year will include eight one-half acre fingerling production ponds; four 2-1/2 acre growout ponds; six water supply wells; and a combination hatchery, storage, and Extension education building. With anticipated Federal funds of $175,000, development in the second year will include two additional 5-acre growout ponds. At maturity, the project will encompass 24 surface acres of water, four dedicated to fingerling production and 20 dedicated to the production of market-size fish.

The HSB is a cross between the female striped bass, or rockfish, (Morone saxatilis) and the male white bass (M. chrysops). It has the same flavor and general appearance as a striped bass but is more disease-resistant and faster growing than either of its parents.

It is anticipated that it will take 17 to 18 months to produce HSB from eggs to 1-1/4 to 1-1/2 pound market fish. The fish will be grown to 4- to 6-inch fingerlings during the first season, overwintered, and stocked into the large production ponds in the beginning of the second season. By August or September of the second year they will reach market size. Production (farm, processing, delivery to New York retail store) costs are estimated at about $1.00-$1.50 per pound. The current retail New York price for striped bass and HSB is between $4.50-$5.00 per pound. Market areas are being identified, and Campbell Soup, Inc. has agreed to handle processing and marketing.

The market potential for HSB appears very promising. Due to the moratorium on striped bass fishing in the Chesapeake Bay, there is an immediate market shortfall of 14 million pounds. Private and government marketing experts estimate a beginning market in the U.S. of 52 million pounds—equal to that for trout. At that production level, producers' gross income would be about $182.0 million. Possible growth beyond this initial level has not been estimated.

Other Potential Demonstration Projects

There are several other potential opportunities for expanding markets for products farmers could produce in large quantities. These include expanded uses for traditional and new farm crops such as: industrial oils from soybeans, meadowfoam, crambe, and winter rapeseed; natural rubber from a desert shrub called guayule (project underway); absorbents, de-icers, and biodegradable plastics from corn; carbon char from hardwoods; and reddrum and shrimp fish farming.

Need for Ventures

Why are these joint private/public ventures needed? Quite simply because very little happens without a combined effort. Private investors generally will not look beyond a few years to obtain returns on their investment. To commercialize many technologies, longer time frames are required. A joint partnership is required to help share the costs and risks, especially in the early stages.

Looking at the HSB project, the margin between $1.00-$1.50 estimated per pound costs and current New York price of $4.50-$5.00 per pound appears adequate to attract private investment. The reason it has not involves a whole list of technical considerations and market uncertainties. Will the fish overwinter in commercial size ponds? What is the best feed mixture? How are hybrid-HSB harvested? What regulatory approvals are needed? Answers to these and other questions cannot be obtained from research reports. The best production, processing, and marketing talents need to be brought together in a commercial size demonstration project. The significant costs and uncertainties associated with technology adoption must be recognized by public and private sector representatives.

A renewed push in commercializing promising technologies for the American farmer will not solve the immediate market uncertainties in U.S. agriculture. However, it represents a positive market oriented response and a more effective long-term solution than subsidizing production of products in surplus.

Have You Heard...

That 1989-90 resident fellowships are available at the National Center for Food and Agricultural Policy? Applications are due April 3, 1989. Send them to George E. Rossmiller, Director, National Center for Food and Agricultural Policy Resources for the Future, 1616 P Street, NW,Washington, DC 20036.

Agriculture and Institutions

Regulation In Agriculture Is Uniquely Public

by Karl Kottman

We inherit institutions. But we also change institutions to bring about change that society perceives as beneficial. Agriculture is one area in which institutions and nature are related. Regulations focus on these relationships.

For example, products of farming are both beneficial (wholesome food) and harmful (pollution of the environment). Public policy often focuses on promoting the production of the beneficial products and discouraging, and in some cases, prohibiting the production of harmful products.

An important point is that regulation alone does not make agricultural practices better. It is the purposeful and presumably beneficial ordering of things brought about by regulation that is important.

The relation of nature and institutions makes agriculture better only as both nature and institutions appear purposeful as this ordering takes place. Otherwise, policy is only a strategy to deal with nature the consequence of which exceeds our ability to manage it. This would make any moral qualification of things inappropriate.

Modern agricultural production depends on extensive complex production, processing and marketing operations. In some cases these institutions have given rise to distributions of benefits that society has deemed inappropriate. In turn, other institutions were developed to modify the distributional outcomes. For example, over time special institutions for agricultural policy have been created. One of these was the U.S. Department of Agriculture, "the people's department created in 1902 by President Lincoln." More recently the Environmental Protection Agency was created.

Now we are on the verge of biotechnologies bringing about radical changes in agriculture. These changes will erase boundaries and relationships among farming and institutions that we now know. And new institutions will be created.

The relationship of agriculture and institutions is about nature and purpose, not institutions alone. Regulation in agriculture is uniquely public because the outcomes are so evident. The coming reassessment of agriculture will create new institutions to evaluate nature. If new institutions show nature to be more purposeful than before, then agriculture improves things. If not, things only change. One may evaluate things for oneself. This is what agriculture is for.

Karl Kottman is Executive Director, Washington State Council of Farmer Cooperatives.