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**NEW AGRICULTURAL COMMODITIES AND USES:
PROMISES AND PITFALLS**

Carl Zulauf and Norman Rask

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**Department of Agricultural Economics and Rural Sociology
The Ohio State University
2120 Fyffe Road
Columbus, Ohio 43210**

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NEW AGRICULTURAL COMMODITIES AND USES:
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Carl Zulauf and Norman Rask^{1,2}

Development of new agricultural commodities and uses is not a new idea. It is as old as low farm prices and returns. During the 1930s, chemist William Hale promoted chemurgy, the processing of farm commodities into industrial products. However, the Dust Bowl, World War II, and federal farm price and income support programs raised farm prices, thereby eliminating the momentum for new commodities and uses. In fact, every time low prices disappear, whether via drought, war, or farm programs, the momentum for new commodities and uses disappears.

However, the time for a bold new future is on the horizon. The expected move to a more free market-oriented farm policy will demand a better balance between production and consumption research. Otherwise, production-oriented research will cause chronic surpluses that will depress farm prices more often than not. While exact figures are not available, it is not unreasonable to guess that over 90 percent of all agricultural research dollars are spent on production research. Furthermore, in 1987, U.S. consumers spent only three percent of their disposable income on U.S. farm-produced commodities, while the farm sector accounted for only 1.2 percent of total U.S. economic output. Thus, consumers may be more tolerant of and producers more concerned with developing new commodities

¹ Assistant Professor and Professor, Department of Agricultural Economics and Rural Sociology, Ohio State University.

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and uses because of the small (and declining) importance of the farm production sector.

The promises for new commodities and uses need to be balanced against their pitfalls in order to understand what this vision means. From this overview, conclusions and implications are drawn.

New Commodities

In addition to reducing surplus farm production capacity, the search for new U.S. farm commodities has been driven by the desire to substitute domestic production for foreign imports. For example, kenaf, an annual fiber crop not currently grown in the United States, could supply raw material for manufacturing newsprint (American Soybean Association [ASA], July 13, 1987, p. 3), approximately 70% of which is now imported (U.S. Department of Commerce, p. 660). Other frequently discussed new commodities include guayule, a source of natural rubber; euphorbia, a source of raw material for oil refining; crambe and rapeseed, sources for lubricating oils that do not break down quickly or catch fire; and jojoba, which produces a better replacement for sperm whale oil than currently available synthetic lubricants (Stucker and Stucker, pp. 8-10). Sperm whale oil, a key industrial lubricant, cannot be imported because sperm whales are an endangered species.

Constraints to New Commodities

Most new commodities face serious obstacles to expanding production. For example, the jojoba plant takes five years to produce mature seeds. Only the female flower contains the valuable seed (Stucker and Stucker, p.

10), and the plant must bloom before it can be determined whether the flower is male or female.

New commodities often face marketing constraints. To illustrate, the high erucic acid content of rapeseed oil gives this oil its desirable lubricating properties (Stucker, p. 12). However, it also makes rapeseed oil toxic. Furthermore, erucic acid and glucosinolates are present in rapeseed meal. They can cause enlargement of animal thyroids, slowing weight gain and damaging heart tissue (Stucker, p. 11). To eliminate these problems, a new variety of rapeseed, called canola, was developed. Canola meal and oil are useable by humans and animals, but its oil does not contain rapeseed's desirable lubricating properties.

Canola is currently produced in Canada and Europe. Interest is growing in the U.S. because its cholesterol-related properties are desirable. But canola oil and meal compete against soy oil and meal in food and feed uses. Growing canola in the U.S. will defend domestic vegetable oil markets from imports of this desired oil, but will probably only protect rather than enhance farm sector income. However, individual farmers might enhance their income via canola.

Last, farmers have been slow to support research on many new commodities because they are niche products which cannot be grown in most U.S. major farm production areas. For example, jojoba is a desert plant which grows wild in the Sonoran Desert region of Arizona and Mexico.

New Uses

New uses can be developed for food or non-food purposes. Non-food uses are the most likely to yield a net positive aggregate farm income

impact because new food uses generally displace demand for traditional food products. To illustrate, consumption of corn sweeteners increased from 19 pounds per capita in 1970 to 69 pounds per capita in 1987, primarily because of the advent of high fructose corn syrup (USDA, December 1985, pp. 40). However, consumption of cane and beet sugar declined from 102 to 62 pounds per capita over this period. In total, consumption of caloric sweeteners increased only 10 pounds per capita.

Current interest in non-food uses centers on soy oil and corn. One reason is the relatively large surpluses of these commodities. Another is that both have a history of non-food uses, although in small quantities. Soy oil is currently used in resins, plastics, and cosmetics, among other products (Hazera, pp. 15-16). Starch from corn is used in paper products, building material, textiles, adhesives, ethanol, and other products (USDA, May 1986, p. 14).

New uses currently being promoted for soy oil are its use as a suppressant for grain dust, which is an explosive hazard in elevators, and feed dust, which in confinement buildings can cause respiratory problems in humans and animals (ASA, March 16, 1987 and November 9, 1987). Another new use is soy oil-based printing inks (ASA, April 13, 1987).

Most new uses for corn are currently tied to utilization of corn starch. Corn starch can be manufactured into a highly absorbent "super slurper" for use in diapers and body powders, as well as filters that remove moisture from fuels. Corn starch can also be manufactured into materials which can encapsulate pesticides, pharmaceuticals, and food flavoring products, imparting a time-release characteristic to the product. Other potential new uses include a de-icer and an ingredient used in making

artificial snow (Corn Refiners Association, Inc., pp. 2-4). However, the new use generating the most current interest is biodegradable plastic. Its potential to decay significantly faster than conventional plastics could relieve some of the burden on landfill space. Corn starch may also provide an alternative to petrochemicals as a plastic feedstock if oil prices increase substantially from current levels.

While only time will confirm if the new corn starch uses will be commercially successful, several companies have built or expect to build plants that utilize corn starch. They include Eastman Kodak Co., American Maize-Products Company, Archer Daniels Midland Company, and National Starch and Chemical Corporation (Corn Refiners Association, Inc., pp. 2-4).

Constraints on New Uses

Non-farm commodity alternatives will exist for most potential new uses of farm commodities, whether it is mineral oil as a dust suppressant, photodegradable petrochemical plastics, or natural methane gas as a motor vehicle fuel. Thus, new uses must not only be technologically feasible but also be economically competitive, preferably without government subsidies. Subsidies require time and money to defend and create uncertainty because their removal likely would destroy the protected market.

Consumers must also believe a new use to be high quality and low hassle. Consumption of ethanol blends remains low in part because, whatever the scientific merit, the consuming public remains skeptical of its reliability (see U.S. Department of Agriculture (USDA), April 1988, pp. 14 and 16 for a discussion of this issue.) However, Iowa and Illinois have overcome some of this skepticism in their states through aggressive

advertising campaigns, thereby increasing ethanol consumption. In addition, new products must meet public health and environmental standards.

Last, even if new corn starch uses are commercially successful, economic benefits to the farm sector will be limited by the co-component constraint. Corn starch products use only part of the corn kernel. The residue includes corn oil and high protein co-components, which compete against soy oil and meal. Rask, et. al. found that the amount of corn oil and high-protein component produced from an acre of corn could displace soy oil and meal produced from as much as 0.84 acres of soybeans. This substitution limits the increase in farm sector income even though corn starch is used in industrial applications. Maximum benefit from new corn starch uses requires that new uses be found for all components of the corn kernel.

Concluding Observations

Developing new commodities and uses requires developing a complementary set of production practices, efficient processing methods, and coordinated marketing networks, not to mention a saleable product. Only when all sides of this many-sided equation come together is a viable product created. The process is time consuming and highly risky. It is important to remember that the soybean plant was available for use and development in the U.S. for more than 100 years before it became successful (Stucker and Stucker, p. 10).

A very important issue confronting new uses and commodities is convincing a skeptical public, especially farmers, of the long term benefits. Too many heralded new uses and commodities in the past have

failed to deliver on their expected promise. It is imperative that expectations be realistic as to the amount of time it will take to develop for an effective and competitive product and the size of its potential market.

A good example of prudent marketing is the American Soybean Association's promotion of soy oil. The market was estimated initially at 28 million bushels of soybean equivalent (ASA, April 13, 1987, p. 3). As technological advances expanded the potential market from colored ink in newspapers to include colored ink in magazines and sheet paper and black ink, sights have been raised to 40-70 million bushels (ASA, March-April, p. 1).

The maximum potential for most new commodities and uses will be a limited niche market. However, the inelasticity of demand for most farm commodities means that relatively small increases in demand can have reasonable impact on farm income.

Historically, one role for publicly funded research is to conduct research that carries a high economic risk for the private sector and, thus, is under-funded from a societal perspective. Although no evidence exists on whether development of new commodities and uses is under-funded by the private sector, under-funding appears likely, given the complex and highly risky development process.

To achieve coordination of the needed set of complementary strategies and techniques needed for success, innovation incubator centers are needed to bring together the necessary basic science, adaptive science, production, and marketing skills. These centers should also serve as a center for publicity and a lobbyist for the future. The centers could be

industry-university consortiums, multiple university-USDA centers, and/or an expanded version of current USDA utilization labs. Funding could come from a matching of public, private industry, and farm checkoff funds.

Research in the USDA Land Grant University complex has been heavily committed to production-oriented research. With the expected move to a more free market farm policy, a continued reduction in the share of income consumers spend on farm commodities, and a decreasing proportion of malnourished people, an imbalance between production and consumption research may contribute to surpluses and, therefore, to larger federal expenditures on farm programs and lower farm returns. This criticism of imbalanced research could also be directed at the distribution of research expenditures chosen by many commodity groups.

Expanding new commodities and new uses research will probably require a painful reallocation of federal and state agricultural research dollars given the current budget situation. However, increased spending on such research could improve farm income, reduce farm program costs, and yield a better mix of consumer products. Achieving these objectives would enhance the national stature of public agricultural research and the land grant mission and is more consistent with a free market farm economy. A bold new world is needed. It is time to grow not just two blades of grass where one grew before but to consume two units of output at the same price where one was consumed before.

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