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THE IMPACTS OF BIOTECHNOLOGY ON THE GRAIN PROCESSING INDUSTRY

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In this paper, the initial impact of biotechnology in the grain industry is discussed. It is argued that the expected "going-in" value of grains bioengineered for quality improvements has not been fully realized. Anticipation of this value, however, has induced innovation for more cost-effective ways of extracting added value from common grains through information technologies. In the future, however, the emergence of higher-value grains will lead to the expected value creation; and will promote the development of high-efficiency, dedicated processing facilities that promote the extension of value through to the end customer.

Key words: biotechnology; value-added; grain processing

The emergence of biotechnology in the seed and grain industries has generated tremendous excitement throughout all of the "value clusters" within the supply chain. However, not all of the excitement results from the realization of new levels of value as was originally envisioned.

Originally, industry visionaries saw tightly integrated vertical linkages between companies involved in seed genetics, technology, grain origination and handling, primary grain processing, secondary grain processing, and distribution/marketing to end customers. These vertically integrated "alliances" would compete one against another.

What is emerging are "value clusters" that are less tightly integrated and are structured more in a matrix formation than a straight line. In other words, a company's competitor at one level in the value chain may well be its partner at another level. This complexity is certainly apparent in the grain processing industry.

Initial Emphasis

As in most emerging high tech industries, the initial focus was on researching and developing new seeds that deliver higher levels of value to customers as finished grains. Linking seed genetics and technology provided this opportunity.

The "going-in" assumption (desire) was that adequate value would be captured through the finished grain to pay for added costs and risks realized in the production, handling, processing, and distribution

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components of the value chain. Little focus was given to developing the other components of the value delivery and capture chain.

Today's reality is that not enough commercial value has been realized from the first wave of biotechnologically enhanced grains to offset the extra costs and risks at all levels of the supply chain. This is particularly true in the domestic U.S. food and feed grains markets.

The new "high oil corn" products provide an example. Many producers perceive that they do not receive enough price "premium" above commodity grains to offset the added cost of seed, initial yield drag, and other production risks normally incurred. Many grain handlers do not receive adequate added value to offset added costs of grain segregation and identity preservation. Most large, domestic livestock feeders do not receive enough added value to convert to high oil corn as a replacement for other less costly, more readily available sources of energy in animal feed.

Grain processors are facing redesign or modification of facilities in order to properly handle the enhanced attributes in the new genetically modified organisms (GMOs). Many fermentation processes do not realize added value from the high oil corn products, so these processors continue to use common corn as a raw material.

Because the value realized through the value chain from the first commercial products has not matched the "going in" value expected, many of the initial alliances are being restructured or "re-thought." It appears that "high oil corn" may become a true commodity before any of the added value is captured other than at the seed research cluster level.

Food And Feed Grains Processing Today

Applications of value-enhanced grains in the food and feed grains processing industries are being challenged by common grains processors. Some very large global grain processing companies have invested tremendous capital over the years to add value to common grains through processing. Some of these companies are not currently positioned within any of the vertically integrated biotechnology "platforms." Therefore, they will continue to seek new and, perhaps, less costly ways of adding value to common grains through processing rather than invest in seed research and technology to generate new GMOs.

In fact, the challenge presented by seed and technology companies has caused many innovations in handling and processing food and feed grains that may not have occurred as quickly otherwise. The use of information technology in the handling and processing of common grains provides cost-effective ways to extract added value from common grains.

Farmland Industries provides an example. Farmland knows that wheat grown in certain geographic areas tends to contain more of certain traits desired by millers and bakers than wheat grown in other geographic areas. Farmland is presently conducting an inventory of the wheat now stored in its terminal elevators. The objective being to determine the level of traits which are contained in the wheat stored in individual units. This simple process of inventorying wheat traits is now feasible due to new grain testing technologies and information database management techniques. By managing inventories in this manner, Farmland is able to extract added value from customers desiring wheat containing a specific level of trait for their processing. This is certainly a less costly method of enhancing grain for food and feed than engineering a new grain which contains enhanced levels of this trait.

The industry is also learning that common food and feed grains, which are produced within specific production parameters and within specific geographies, will produce grains with value enhanced traits desired by processors. This is done by targeting production of common grains, controlling harvest, measuring the resulting trait levels within the grain, segregating grain into storage based upon these traits, and then marketing these grains to customers who value them. As an example, Farmland Industries and HybriTech U.S. are presently conducting a joint wheat production project for a specific end customer.

The impact of biotechnology has been to energize the food and feed grains industry. Certainly, many GMOs will be established as valuable, critical products within this arena. Few have had that level of direct impact yet, but future ones will. However, the discovery process for new GMOs has led to discoveries of ways to add value to traditional grains through better production, handling, analysis of grain traits, and processing. This has created a new set of production and processing dynamics that the grain industry has not experienced previously.

New Grains, New Processing, New Value

If the food and feed grains industries have not yet hit the "home run" they are seeking through GMOs, other industries have the potential to do so. The present efforts by life sciences companies to develop GMOs that produce pharmaceuticals and neutraceuticals in plants hold great potential value. These products will be more cost-efficient substitutes for commercialization than many of the present food and feed grains have been. These new products provide substantially higher levels of value to consumers than current products offer. They also offer the potential to be more directly consumable by humans with less processing than current pharmaceutical and neutraceutical products provide. This creates an equation in which value is enhanced and costs are reduced, a sure opportunity to hit the "home run" sought through biotechnology.

In addition, the emergence of high-value, niche grains will promote the development of high-efficiency, dedicated processing facilities that promote the extension of value through to the end customer. Much of this processing capability may evolve from companies that have not been traditional processors. As a result of their close contact with end markets, they may find that they can enter the niche processing arena efficiently and maintain and capture higher levels of value.

The net effect is that biotechnology has provided product and processing enhancements not foreseen when the initial research began. As with all new, emerging industries, the evolution is not linear. There is a great amount of circling and doubling-back that takes place until the real areas of new value to the market are discovered.

Interest in grain processing has been renewed not only for applications to new GMOs, but also for applications to long-existing, common grains. These new methods of processing common grains are also sources of added value, frequently at far less cost than new biotech grains require.

The future will be exciting.