THE CASE FOR BIOTECH WHEAT

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HOW THE INTRODUCTION OF MODERN GENETIC TECHNOLOGY IN WHEAT CAN HELP ADDRESS A COMPETITIVENESS CRISIS

National Association of Wheat Growers

U.S. Wheat Associates

North American Millers' Association

Independent Bakers Association

Wheat Foods Council

Abstract: Wheat production and area is on a long-term downtrend in the United States. Net returns per acre to farmers favor other crops in areas where options exist, and the differential is widening. Unless the wheat industry can successfully change the equation and restore its competitiveness, wheat is on a path to becoming a minor crop. This outcome would be unfortunate for every sector of today's wheat industry, from input suppliers to producers to consumers. While there are no silver bullets, biotechnology can make a significant contribution to changing this competitiveness equation, positioning wheat as a viable production alternative for producers. Fundamental to this entire effort is a commitment to choice in the marketplace: choice for customers who wish to procure non-GM supplies and for producers who meet this demand. Choice will be provided through market mechanisms between buyers and sellers and will be a critical part of this path forward.

INTRODUCTION

In June 2006 the National Association of Wheat Growers, North American Millers' Association, U.S. Wheat Associates and the Wheat Export Trade Education Committee published a paper entitled "Addressing the Competitiveness Crisis in Wheat." The paper described a U.S. wheat production sector that was faced with declining acreage and production; slower yield growth compared to other crops; relatively poor net margins for producers; very slow growth in domestic markets; and virtually no growth in export markets. The paper outlined some ways in which wheat industry sectors could work together to address these challenges, and served as a call to arms for a series of Wheat Summit meetings that followed.

FIGURE 1: ***Sectors represented in the Wheat Summit discussions***

The Wheat Summit meetings included representatives from throughout the wheat chain, from farmers and scientists all the way to branded food companies and retailers. The Summits led to joint recommendations on farm policy, transportation and infrastructure, domestic promotion, and research priorities, and established cross-sector activities that continue today on a number of issues. Summit participants also established a working group on biotechnology to explore and understand the issues biotechnology commercialization would present to the industry. These discussions continue in 2009, with leaders throughout the wheat industry collaborating to prepare the way for orderly and beneficial introduction of biotechnology in wheat. Industry organizations are also coordinating their work on topics like research funding priorities, dietary guidelines and other issues of mutual interest.

The problems of declining acreage and production, slow growth in yields and market opportunities, and threatened profitability will not be wholly solved by biotechnology. Many industry organizations are supporting a goal of the National Association of Wheat Growers to increase national average wheat yields 20 percent from 2008 to 2018 through work on both biotechnology and non-biotechnology efforts. But there is a general understanding in the industry that if the competitiveness problem is to be successfully addressed, application of technology that is available in other crops but not presently available in wheat will be necessary.

This paper is intended to describe the current conditions in the U.S. wheat production sector and discuss the ways in which biotechnology can contribute to correcting the crisis of competitiveness.

WHAT COMPETITIVENESS PROBLEM?

"Loss of wheat acreage to row crops, such as corn and soybeans, on the Plains reflects strong genetic improvements in those crops." – USDA/ERS Wheat Baseline, 2009-18.

Like any other business owner, farmers will produce the products that provide the greatest potential returns for the least amount of risk. Wheat producers who have options to produce crops other than wheat will compare the prospects for those crops and make their planting decisions accordingly.

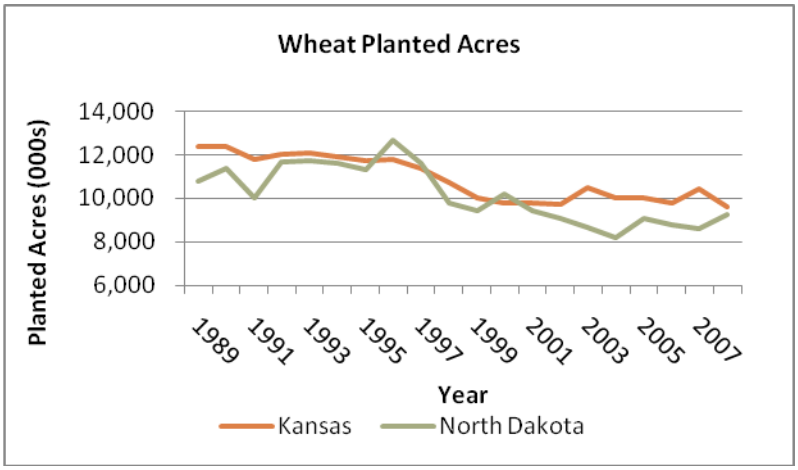

FIGURE 3: *Wheat planted area, North Dakota and Kansas. Source: USDA/ERS.*

North Dakota and Kansas are usually the top two producers of wheat in the United States, but wheat acreage in both states has declined precipitously due to better risk-return tradeoffs in other crops (see Figure 2). Kansas, known as the "Wheat State," now produces more corn than wheat. Even in the drier areas of the western Great Plains, where there has not historically been sufficient rainfall to produce corn, the advent of drought tolerance traits in the first half of the next decade is expected to expand the Corn Belt further west at the expense of wheat acres.

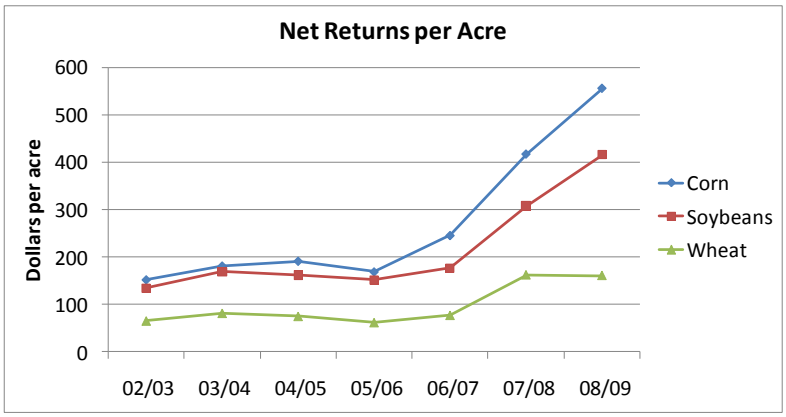

FIGURE 2 : *Net Returns per acre from corn, soybean and wheat production.*

Source: FAPRI-MU estimates, July 2008. Net Returns are defined as market value plus LDPs minus variable expenses (excludes land and fixed expenses). Assumes 2008/09 prices of $5.87 for corn and $13.24 for soybeans, and $6.87 for wheat. Costs increase sharply in 2008/09 for all crops.

Farmers give primary consideration to net returns per acre for competing crops when making planting decisions. Figure 3 shows data from the Food and Agricultural Policy Research Institute (FAPRI) comparing the net returns for wheat, corn and soybeans. Wheat net returns are consistently half or less the net returns for either of the other two crops. This spread widened markedly in the 2007/08 and 2008/09 marketing years. If producers can reliably earn more than $400 in net returns per acre with corn or soybeans but less than $200 for wheat, this reality will continue to drive the long term decline in wheat plantings. However, the divergence between net returns for these crops is present for all seven years in the FAPRI chart – in no year did net returns for wheat exceed either corn or soybeans. The competitive problem is therefore a longer term structural problem, not a symptom of recent volatility in commodity markets.

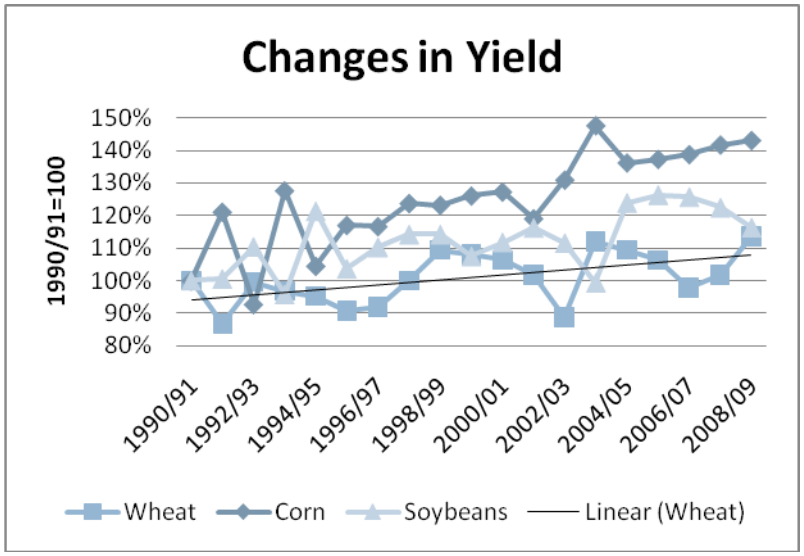

FIGURE 4: *Index of corn, soybean and wheat yields. Data source: USDA/ERS. Chart compiled by NAWG.*

There are also dramatic differences in yield growth trends between wheat, corn and soybeans. Data from USDA's Economic Research Service (ERS) has been compiled in the accompanying chart to show this comparison. A regression line on wheat yields shows the trendline below both corn and soybean yield gains in every year except one over the 19-year period starting in 1990. The annual growth rate in yield for corn is four times that of annual yield growth in wheat, so the longer the industry remains on the current trendline, the deeper is the competitive hole from which wheat must extract itself.

The bottom line is that farmers will produce what the market rewards. If incentives from the market encourage farmers to plant less wheat and more of other crops, that's what they will do. Since wheat provides 20 percent of the world's calories,[1] and the United States is the world's leading wheat exporter, ensuring that wheat is a competitive crop in the United States should be a major priority.

WHY DOES THIS MATTER?

Smaller Supplies for Wheat Users

Declining production of wheat is a concern to the milling, baking and food businesses that rely on wheat as a primary ingredient. Smaller supplies of wheat, produced only in areas where more profitable alternatives do not exist, will translate into supply challenges for the food industry. Smaller production regions also leave the

[1] Gibson and Benson, Iowa State University Department of Agronomy, January 2002.

U.S. wheat crop more vulnerable to weather or plant disease problems. To the extent that wheat production is pushed onto marginal acres, crop failures become more likely.

Opportunity Costs of Not Having Biotechnology

The economic concept of opportunity cost is affecting wheat competitiveness compared to other crops. Dr. Bill Wilson, an agricultural economist from North Dakota State University, has compiled data documenting negative supply curve shifts for wheat production resulting from the advent of biotechnology traits in competing crops.[2] A negative shift in a supply curve implies that at the same price, less of a product will be produced than before, or conversely, producers will require a higher price than before to produce the same quantity of wheat. While the higher price sounds attractive to producers, these changes cause concern among the rest of the wheat industry.

Wilson's data estimate that drought tolerance in corn and/or soybeans will result in a 60¢ per bushel opportunity cost for wheat production on the same land. In other words, if the market wants to bid an acre away from these drought-tolerant corn and soybean varieties and back into wheat, the market price of wheat will need to rise by 60¢ per bushel of wheat. Wilson also estimates that the introduction of RoundUp Ready 2 Yield soybeans in 2009 will increase the opportunity cost of wheat production by approximately $1.49 per bushel of wheat. Those spreads will translate to significant costs for food companies, and if new traits continue to be introduced in other crops while wheat is left behind, those opportunity cost spreads will widen.

Producers certainly enjoy an opportunity to sell their crops at higher prices caused by short supplies. But at some point higher prices may provide an incentive for food companies to reformulate away from wheat, which would be bad news for producers.

Struggling to Meet a Growing World Demand

The United Nations' Food and Agriculture Organization (FAO) estimates that global food production will need to double between now and 2050 to feed a population that is estimated to grow to nine billion people.[3] Producing sufficient food for this growing population on a finite land base in an environmentally sustainable manner is a monumental challenge. Much of this population growth will occur in parts of the world least equipped to handle it, and limitations on the supply of new land that can be farmed mean that most of the additional production of food will need to be done by intensifying production on existing lands. Producing more wheat with fewer inputs in a sustainable manner will be essential in meeting the needs of our planet's population.

[2] Taken from a presentation by Dr. Wilson to the boards of NAWG and U.S. Wheat Associates, February 2008.
[3] "We must mobilize US$30 billion dollars a year in order to double food production so as to feed a world population of nine billion in 2050." Jacques Diouf, Director-General, FAO, Sept. 17, 2008, address to the Italian Parliament in Rome.

Vulnerability to New Threats

The U.S. and other developed countries are world leaders in agricultural innovation, but if wheat researchers are precluded from using and deploying those innovations, the consequences for farmers in both developed and developing countries – to say nothing of consumers - will be dire. Aside from the challenge of meeting a growing global demand for food, an emerging wheat stem rust pathogen known as Ug99 may lend increased urgency to expanding the toolbox at plant breeders' disposal. This pathogen was first identified in Uganda in 1999, but has since spread to the Arabian Peninsula and Iran. It is only a matter of time before it spreads into major wheat production areas in Asia and eventually finds its way to the United States. At the present time, there is little genetic resistance to this new strain of wheat stem rust; approximately 75% of current varieties in use in the U.S. are susceptible to Ug99.[4] If new resistance genes cannot be found within the wheat genome, it is likely that a biotechnology solution will be necessary to provide strong and durable resistance.

Stem rust is a serious disease – and not the only one that challenges wheat production. In order to sustainably produce sufficient and safe food for a growing world population on a finite amount of land, and to protect it from plant pathogens and insects, access to new technology will be essential.

Weakened Industry Infrastructure Compounds the Problem

Future investment and innovation in the wheat industry is suffering due to lack of access to the latest technology. The next generation of scientists is choosing to work in crops that utilize the latest tools; graduating plant breeders and molecular biologists are drawn to the crops where the action is and where the rewards are. Consequently, new tools and techniques are developed and scientists are trained in crops where they have a chance to be utilized to their full potential.

Furthermore, an industry in decline will be less able to effectively advocate its policy positions before government, win public support for research investments, have sufficient leverage to secure favorable trade agreements, mitigate cost impacts from regulation or engage in strategic partnerships with others in agriculture. Unless wheat production is a growing and going concern, companies developing new equipment and products will focus their primary development efforts on crops with larger markets.

BENEFITS AND PRIORITIES

How can biotechnology help solve these competitive challenges? First, it is important to note that there will be no silver bullets. No single technology can deliver on a promise to make a crop competitive. However, the rapid adoption of biotechnology traits in other crops in many producing countries around the world, and grower testimonials in support of these traits, lends credence to the idea that biotechnology can make a significant contribution.

[4] Information on susceptibility of wheat varieties to Ug99 was generated by USDA and included in the 2008 and 2009 research priority books of the National Wheat Improvement Committee and NAWG.

The highest priorities for trait development, as indicated by an informal poll of various wheat industry sectors participating in the Wheat Summit discussions, were in the area of abiotic stress tolerance, and in particular, tolerance to drought. Water availability is becoming a major sustainability issue for agriculture, and traits that would allow production of more wheat with less water would be very beneficial to farmers and to society as a whole. Other priority traits of interest included tolerance of other sorts of abiotic stress (heat, cold, freeze), increased yields, nutrient use efficiency (particularly nitrogen) and resistance to plant diseases like stem rust, stripe rust, head blight and others. Lower on the list but still important include specific end-use or nutritional properties and herbicide tolerance. Unstated but assumed is that new varieties will meet or exceed existing standards for quality. Productivity is the overriding theme of all of these traits.

The general public is also raising its expectations for meeting sustainability goals in agricultural production. The *Field to Market* (FTM) coalition,[5] of which NAWG is a member, is attempting to define and establish objective measurements for sustainability in agriculture. FTM defines sustainable agriculture as "meeting the needs of the present while improving the ability of future generations to meet their own needs," focusing on three specific critical outcomes:

- Increasing productivity to meet future nutritional needs while decreasing impacts on the environment, including water, soil, habitat, air quality and climate emissions, and land use;
- Improving human health through access to safe, nutritious food; and
- Improving the social and economic well-being of agricultural communities.

Biotechnology traits can contribute to all three of these critical outcomes, and in so doing, enable the wheat industry to meet expectations from society for abundant, high-quality, safe food at competitive prices, produced in a sustainable way.

PROVIDING CHOICE, ENSURING SAFETY

Consumer Opinions

The International Food Information Council (IFIC) has conducted surveys on U.S. consumer opinions on food biotechnology for over ten years. Their most recent survey (2008) included the following findings[6]:

- Consumers' overall confidence in the U.S. food supply remains high at 68 percent.
- Food biotechnology is not a consumer labeling demand. Only 14 percent of Americans would like to see additional information on food labels, and those who want to see biotech labeling are less than 1 percent. Sixty percent support the FDA policy of requiring labeling only when the change introduces an allergen or substantially changes nutritional content.

[5] Field to Market: The Alliance for Sustainable Agricultural Outcomes. http://www.keystone.org/spp/env-sustain_ag.html.
[6] http://www.ific.org/research/biotechres.cfm. *Food Biotechnology: A Study of U.S. Consumer Attitudinal Trends,* 10/28/2008.

- Communicating specific benefits may enhance perception. The majority of consumers (53 percent) would purchase foods from plants produced through biotechnology for specific benefits.

Consumer opinion in foreign markets is more variable. Some markets in Latin America express little concern so long as food safety and quality considerations are met satisfactorily. Other markets, primarily in Europe and North Asia, register a much higher level of consumer concern. The Asian Food Information Council conducted a consumer survey and released a report on December 26, 2008, measuring consumer perceptions in Seoul, Beijing, New Delhi, Manila and Tokyo.[7] Findings from that report included:

- The most important information consumers in Asia look for on food labels is the expiry date, followed by food additives, vitamin contents and trans fat (South Korea). Most consumers are content with existing information on food labels, and food biotechnology was not mentioned spontaneously as something consumers wished to see on labels.

- A majority of consumers in China, Taiwan and India expect benefits from biotechnology within the next five years, but much smaller numbers in South Korea and Japan hold this view.

- Consumers largely accept plant biotechnology if the technology contributes to a more sustainable way of producing foods.

A summary comment from the report is particularly illustrative:

> *"The survey underscores the fact that learning about the benefits of biotech foods has a significant impact on consumers' perception and acceptance. Science-based information promoting an understanding of the benefits of biotechnology foods should be communicated to the public, using non-technical, easy to understand language. In today's environment the benefits of biotechnology in the context of sustainable production of food has dramatically increased in importance. Education programmes need to include information on this aspect of biotechnology as well as the quality, safety and nutritional benefits."*

Choice

Customers make choices with the money they spend on food, and the most important aspect of food production systems is to provide what customers demand. Some customers will embrace the availability of technology that makes food production more efficient, but others will make different choices and will be prepared to pay the necessary costs of producing food without using new technology. This dynamic is already a part of the wheat industry as some consumers place a higher value on organic production and are willing to pay the premiums necessary to obtain organic wheat products. Perceiving a market opportunity, some farmers, millers and food companies have chosen to operate in this niche and are running profitable businesses to meet organic demand. The dynamic is also present in corn and soybeans with respect to biotechnology traits, and the wheat market is expected to develop in a similar fashion.

[7] Food Facts Asia Issue 34 - How do consumers in Asia feel about Biotech food? http://www.afic.org/foodbiotechnology.php?news_id=858.

The principle of choice will extend to all customers of U.S. wheat, whether they are domestic or export buyers. One-half of the United States' wheat production is exported to offshore markets, and it will be critical to meet the needs of these buyers as biotechnology moves forward. U.S. Wheat Associates is engaged in discussions with foreign buyers through their established relationships to identify and address their concerns and communicate the production, acreage and competitive trends driving the need for new technology.

While a tolerance of zero is not achievable in biological systems, wheat supplies that meet commercial criteria as non-biotech will be available to customers and will be incentivized by market mechanisms such as premiums and discounts. With commercially-achievable tolerances for low level presence, the grain handling industry will be able to meet customer demands for non-biotech wheat. Buyers and sellers will determine the terms for these arrangements.

Comprehensive evaluation of food safety effects prior to commercialization will also be very important. Millers, bakers and food companies in the wheat business have been involved in the discussions from the very beginning, and their input insures that food safety and quality considerations are addressed. Trait developers will be expected to obtain food and feed regulatory approvals in the United States and major export markets with functioning regulatory systems prior to commercial introduction of the trait.

CONCLUSION

With regard to wheat competitiveness, little has changed since the first paper was released in 2006. Wheat production and area is on a long-term downtrend in the United States, and net returns per acre to farmers favor other crops in areas where options exist. This situation will intensify and expand with the advent of drought tolerance traits in corn and other crops. Unless the wheat industry can successfully change the equation and restore the competitiveness of wheat, wheat is on a path to becoming a minor crop. This outcome would be unfortunate for every sector of today's wheat industry, from producers all the way to consumers.

While there are no silver bullets, biotechnology can make a significant contribution to changing this competitiveness equation and positioning wheat as a viable production alternative for producers. If these new technologies are available in other crops but not in wheat, the wheat production sector will continue its acreage and production decline toward status as a minor crop.