RISKS AND RETURNS IN VALUE ADDED SUPPLY CHAINS FOR SPECIALTY CORN

By

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BIOGRAPHIES

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Abstract

This paper addresses the key factors affecting the risks and returns associated with producing specialty crops. The costs and returns for six types of specialty corn are compared with those of normal yellow corn to quantify the associated risks and returns. Finally, the authors will examine marketing alternatives for reducing risks and increasing returns for specialty corn crops.

Assuming equal yields, the returns above variable costs are highest for white food-grade, waxy, yellow food-grade, non-GEO, high oil, number two yellow, and organic corn, respectively. However, the amount of increased value to the end-user may not be enough to compensate all players for the added risks and costs. Continued consumer concerns with biotechnology and food safety can negatively impact specialty crop returns. Strategic partnering, including contracting, strategic alliances, and ownership integration (available through new-generation cooperatives), present opportunities for managing risks associated with food and feed production.

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Introduction

Biotechnology has created new opportunities for all participants in value added supply chains that increase profit opportunities as well as risks associated with the new opportunities. Through biotechnology research, new products with specialized traits for specific end uses are rapidly appearing in the market place. However, the new product discovery process from biotechnology is still in the introductory stages. Rapid advances in this discovery process are likely within the next five to ten years.

The biotechnology research process has enormous implications for change in the value added supply chain for crops. The process is creating a movement away from a marketing system that emphasizes commodity grain sold at the lowest price toward a marketing system that emphasizes value added products for customers who desire specific qualities in their product. Some examples of these specific qualities in specialty crops are high oil corn (HOC; seven percent oil on a dry weight basis or zero percent moisture), white corn, waxy corn, low fat soybeans, and cost reducing input seed products such as Round Up Ready soybeans and BT corn.

Farmers will be faced with new choices and decisions in farm production and handling as well as in marketing via new marketing channels. New relationships will evolve among new and old players in the supply chain, and all will face new risks. Farmers will face new risks in purchasing supplies, new crop production risks, added price risks, new financial risks, and marketing risks. The supply chain grain handlers and processors will also face many new risks when buying from farmers and when selling to customers who have very specific end use demands for the product. Meanwhile, customers will also face new risks because the increased emphasis on product quality means that the product only has value to them if it satisfies their demands. New management skills will be required for all participants in the new value added supply chain.

For consumers, price and value are still the major drivers. However, niche markets such as organics, natural, and non-biotechnology crops will continue to thrive. Nutraceuticals, a new word coined from the combination of food nutrients and pharmaceuticals, and other specialty foods will attract increased attention as the system deals with products for the improved nutrition of the elderly, lower and better fats and oils, nutrient fortification, and disease prevention and treatment.

Increased risks will require increased returns if the new value added supply chain is going to have a future. Biotechnology firms, farmers, handlers, processors, and end users will all want higher returns to compensate for the higher risks. The higher returns can be difficult to capture in a competitive market place. In the case of high oil corn and white corn, for example, farmers have seen the premiums for these crops start at attractive levels and then decline very rapidly to lower levels. In the past year, the agriculture industry witnessed the prospect of the premiums nearly disappearing for the new biotechnology crop and appearing for the traditional crop. Trade and consumer fears over the safety of the biotechnology crop (genetically enhanced organism, GEO, or transgenic) caused this reversal in the marketplace. In the midst of such concerns, the individual farmer faces a major decision of whether to adopt this technology. What can the farmer do to reduce the risks and increase the returns in this increasingly uncertain marketplace?

Objectives

This paper describes the most important types of specialty corn, their markets (end uses) and their traits. The costs and returns for six types of specialty corns (high oil corn, waxy, yellow and white food grade, organic, and non-GEO) are compared with those of normal yellow corn. This paper examines the key factors affecting risk and returns that farmers should consider in their commitment to produce specialty crops. The final objective is to identify marketing alternatives which might allow farmers and firms to reduce risks and increase returns.

Methodology

The methodology implements the case study approach to evaluate the objectives of the research, with specialty corn being the case example. The case study approach involved reviewing previous studies and reports, as well as conducting interviews with industry players in Ohio. Interviews were carried out with select university researchers, and data was collected from public and private sources and agribusiness trade groups. The authors will review the literature and collect information on existing strategic partnering arrangements, new generation cooperatives, and production and marketing contracts as alternative arrangements for risk management.

Types, Traits, and Uses of Specialty Corn

Several niche markets have emerged for different types of specialty corn as consumers and end users demand more and more specific quality traits that increase value in the supply chain. Some of the more common specialty types of corn are: (1) high oil corn, (2) waxy, (3) yellow food grade or hard endosperm, (4) white food grade, (5) organic, and (6) non-GEO corn. Of course, the market also buys large quantities of normal yellow corn or what may be called commodity corn. All the types of specialty corn have particular traits or characteristics related to compositional differences or the way they are produced that make them more valuable to end users in the marketplace. A description of these main types, key traits, production management issues, and end-uses is found in Table 1. The market niches are mainly consumer markets for processed corn products, industrial use, livestock feeding, and export. High oil corn is mainly used in hog, poultry, and dairy feeding for its higher oil/energy content. Waxy corn is used to produce waxy cornstarch, an important emulsifier, thickener, and stabilizer for the food industry, as well as in adhesives and in the paper industry. Yellow and white food-grade corns contain high amounts of vitreous endosperm (a glass like texture) relative to the amount of floury endosperm. The main uses for this composition are for dry milling and for alkaline cooking processes to make masa, tortilla chips, snack foods, and grits. Organic corn (normal corn grown without chemical fertilizers and pesticides) is used to make organic food products such as snack foods and cereals. Non-GEO corn is corn that has *not* been modified genetically through biotechnology processes to add specific traits such as insect and herbicide resistance; examples of BT corn that *have* been modified are Liberty Link, and Round Up Ready. Most of the specialty corns require increased levels of management expertise at the farm level and throughout the value added supply chain.

While market sales information is not available, estimates of the area planted in recent years indicates the importance of several types of specialty corn (Figure 1). Estimated 2000 U.S. high oil corn production area exceeds 1.2 million acres and was nearly 2.0 million acres in 1999. Yellow food-grade corn (hard endosperm) is estimated at 1 million acres for 2000 and white food grade corn is nearly 0.8 million acres. Waxy corn was about 0.7 million acres in 1999. Other corn, such as non-GEO, is estimated at 40,000 acres for 2000. Current production for organic corn is even lower. The rate of expansion can be rapid if market conditions are favorable. Farmer adoption rates for biotechnology products in the U.S. have been high, increasing from 13 percent of planted acreage in 1996 to an estimated 65 percent in 1999 (Figure 2).

Farmer Risks and Returns

In the production of specialty corn crops, farmers must be aware of the need to adapt to the different properties of each corn type. Proper management will be necessary for farmers to capture all of the possible value these crops possess. Several types of corn have a lower yield potential (sometimes characterized as yield lag or drag) than conventional normal yellow corn. Furthermore, temperature and moisture fluctuations can have a greater impact upon yields of specialty corn than has been experienced with the production of normal yellow dent corn. Some specialty varieties may also lack the insect or disease resistance of the normal varieties. Other agronomic characteristics (or other characteristics affecting crop profitability) such as field drying rates and test weights may also be influenced by the insertion of specialty traits into normal corn.

An aspect of management with which farmers may not have had experience is the option of contracting, which can allow farmers to capture the added value of these specialty corn varieties. Contracting can have advantages for the farmer who produces under contract. Setting a price under the contract, as well as knowing what premiums will be received, could be beneficial to the farmer. Farmers who produce under contract must also be aware of the following: that contracts may specify which production practices may be used, that identity preservation practices should be explained in detail, that the quality of the grain is to be higher than is normally required, and that when and where delivery may be made is especially important. A risk to the specialty corn producer might arise when the neighboring farm "wildcats"; i.e. it produces a crop for the incentives without having a market. Wildcat producers can eliminate or substantially reduce the size of the premium received by other specialty corn producers.

The revenue, costs, and returns above variable costs show that all the specialty corns, except for organic corn, have returns above variable costs higher than No. 2 yellow corn (Table 2). However, depending on the amount of yield drag on high oil corn or white food-grade corn, the returns may not be any better than normal yellow corn.

High oil corn farmers have premiums that are declining because of increased acreage in recent years. However, the premium for high oil corn is still sufficient to cover the increased costs of production (Table 2). The main expense item that increases is seed cost because high oil corn must be planted at a higher rate than traditional corn. Additionally, a technology fee is assessed to purchasers of high oil corn seed.

In examining the budget for producing waxy corn, the costs of production are the same as the No. 2 Yellow corn budget. The only changes are the inclusion of a premium of about $.20 per bushel that increases the return above variable cost to $184.71 per acre.

Food grade corn farmers also see changes only to the revenues side of production. White food grade corn farmers can expect to see a greater premium (up to $.50 per bushel) for their crop compared to yellow food grade ($.15 per bushel). Yield loss can be a factor in white food grade corn that reduces returns compared to yellow food grade corn or normal corn. While food-grade corn has no added expenses, care needs to be maintained to provide a high-quality crop for the processors.

Organic corn production faces the greatest difference from producing traditional corn. Organic fields must be kept free of chemical fertilizers and pesticides for four years before certification can occur. Here, costs increase because of the need for alternatives to pesticides and chemical fertilizers. In addition, the organic farmer must consider the cost of cover crops if used; for these budgets, crown vetch is used. For organic corn production, the return above variable costs ($37.98) is substantially less than for normal yellow corn ($158.71).

With all the current concern over genetically enhanced crops, opportunities exist for farmers to capture the added value that some customers place upon non-GEO corn. Farmers of non-GEO crops need to take care to ensure their field is out of the pollen drift of a field with a genetically modified crop, and that identity preservation techniques are utilized as well. High oil corn, for example, can be contaminated by pollen drift from neighboring fields. Other costs and factors of production remain the same. The return above variable cost is $171.71 per acre compared to $158.71 for No. 2 yellow corn.

Risks and Returns for the Grain Handlers

The grain handling system will require major adaptation to handle specialty corn and other niche-market grain products as they appear in the market place. Increased coordination and management among growers, handlers, and end-users is necessary, and increased investment in new facilities and equipment will be required by farmers to handle specialty products. Training of grain elevator personnel along with expensive NIRS testing equipment (near-infrared spectroscopy), which costs about $25,000, is required to measure oil content and other grain quality attributes of new products.

The current grain marketing system is not structured for identity preservation. Instead, the system is designed to handle, store, and ship large quantities of a homogenous commodity. The current system has a small number of large bins, uses large ships, and large trains. Identity preservation requires the opposite: a larger number of smaller storage bins, smaller ships or compartments of ships, and smaller unit trains and/or dedicated railcars.

Risk Reducing and Revenue Increasing Strategies

Advances in biotechnology permit the movement away from homogenous commodity corn to a product with specific traits for an end user. This advance in capability creates the opportunity for increased profit and increased risk for the producer and the entire value added supply chain. Farmers who want to consider producing for these specialized markets may choose to assume all the production and price risk. They may choose to plant the crop with the idea of finding a buyer later--much like a wildcat oil driller. One alternative to this wildcat approach is to contract with companies who want to buy the specialized product. These contracts have both advantages and disadvantages (Table 3). The major advantages include the opportunity to earn a premium over normal corn for the specialty crop, access to new technology that may be available only through the contract, a secure market for your product, reduced financial risk because the price or a premium is established, and reduced marketing risk because the buyer, price, delivery time, delivery place, handling methods, and other items are defined. Some of the disadvantages include: loss of producer control over many management production and marketing decisions;

risk that a company fails to pay for goods delivered or that it pays less due to quality problems; the fact that yield losses on many specialty crops can be 5 to 15 percent; the contract may be short term yet require long term investment decisions for equipment and storage; increased returns may be limited if market prices increase due to contract specifications; and crops must be identity preserved, which usually increases harvest, handling, and storage costs.

New generation cooperatives offer an alternative method for farmers to reduce risk and increase returns for specialty crops. New generation cooperatives differ from conventional cooperatives because they function as closed cooperatives in which only the members who own shares in the cooperative have the right to market a specified amount of production to the cooperative based upon the number of shares owned. Some of these cooperatives have been formed in corn processing, soybean processing, pasta making, and other specialty crops.

Farmers form and join new generation cooperatives to enhance their incomes. These cooperatives usually provide the opportunity to add value to the commodity or product being produced. By adding value, revenues can be enhanced, resulting in higher prices for the producer. The value enhancing process usually is related to form, place, or time utility. This value enhancing process does carry risk, however, because in the end the value added product must meet the needs of the customer. Niche markets frequently provide good opportunities for new generation cooperatives. The Minnesota Corn Processors Cooperative, the Thumb Oilseed Producers' Cooperative and the North Dakota Pasta Cooperative are good examples of recent value added cooperatives.

Conclusions

Emerging specialty products will require more market integration and coordination from all players of the grain marketing system to succeed in the new product oriented consumer market place. Agricultural biotechnology firms, seed dealers, producers, handlers, and end-users must become more closely coordinated in many of their activities.

Producers face additional production and marketing risks. In return for the higher risks, they will want higher returns. Premiums currently being offered to growers for several specialty corns may not be adequate to assure a continued supply to the market. Moreover, these premiums vary by type of corn, location, quality content, year, and type of contract. Premiums used in the present estimates are: white food grade ($.50 per bushel), waxy corn ($.20 per bushel), yellow food-grade ($.15 per bushel), non-GEO corn ($.10 per bushel, high oil corn ($.17 per bushel), and No. 2 yellow corn and organic corn (both $0 per bushel). Assuming equal yields, the returns above variable costs are highest for white food grade, waxy corn, yellow food grade, non-GEO corn, high oil corn, No. 2 yellow corn, and organic corn, respectively. Organic corn returns are very low at the present time because yields are much lower than for other specialty corn.

An example of a specialty corn production risk is when high oil corn (HOC) increases value to livestock end-users. The estimated HOC value depends on the oil content and the price of fat substitutes. Collectively, the value ranges from $0.20 to $0.77 per bushel. The price of fat effectively sets an upper limit on the value of HOC to the livestock user. As a result, the amount of increased value to the end-user may not be enough to compensate all players for the added risks and costs. Future economic success will likely require the stacking of new traits on HOC (higher levels of certain amino acids, low phytate, or highly available phosphorus) to gain added profits. Also necessary is an equitable distribution of value among all players.

Grain handlers face new investments in plant and transport equipment to handle the specialty products. As producer and end-user contracts become more specific for these new products, more management time and improved management will be needed. Handlers will also want higher margins to pays for their added costs.

Consumer and producer acceptance of biotechnology products in domestic and world markets continues to be a major issue. Consumers, producers, and others question the safety of the new products to our food system. For example, some types of GEO corn cannot be sold to the European Union (EU) market. The World Trade Organization (WTO) and others will be important trade organizations that assist consumers and producers in deciding what products will be traded on world markets and how intellectual property rights will be protected.

Strategic partnering, which includes contracting, strategic alliances, and ownership integration, presents potential relationships for controlling risks associated with food and feed production. New generation cooperatives also offer potential for reducing the risks and increasing the returns to farmers.

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Table 1: A Comparison of Corn Types, Traits, Management Issues, and End Uses

Corn Type	Traits	Management / Cultural Issues	End Uses
No. 2 Yellow	Traditional dent corn	No restrictions so more management options may be considered	Livestock feed, ethanol production, industrial purposes, countless others
High Oil Corn	Oil content of 6 to 8%, many varieties use TOPCROSS; male sterile and pollinator plants	Isolation required, lower yield potential, higher planting rates, higher susceptibility to insects	High energy livestock feed, export markets
Waxy	Over 99% amylopectin, versus 75% amylopectin and 25% amylose in normal corn	Need for identity preservation and lower yield potential	Emulsifiers, thickeners and stabilizers for food industry, adhesives and livestock feed
Yellow Food Grade (Hard Endosperm)	High quality yellow corn often with white cobs for food processing	Processors desire high quality crop, identity preservation practices need to be observed	Food products like: tortillas, snack foods, cereals and grits
White Food Grade (Hard Endosperm)	White kernel color, over 98% white to meet minimum standards	High quality crop is desired, isolation from normal yellow corn, need for identity preservation	Food products like: tortillas, snack foods, and grits
Organic	"Normal" corn grown without using chemical fertilizers and pesticides	No use of chemical fertilizers or pesticides; higher reliance upon tillage practices	Organic food products: tortillas, other snack foods, cereals
Non GEO	Corn that has not been genetically modified for insect or herbicide resistance	Need for identity preservation	Used primarily for export markets with concern over genetically modified crops

Source: Frerichs, et al. 1999 and personal interviews

Table 2: Revenue, Costs, and Returns for Selected Corn Products

	No.2 Yellow Corn	High Oil Corn 7%	Waxy Corn	Yellow Food Grade Corn	White Food Grade Corn	Organic Corn	Non-GEO Corn
Key Parameters:							
Acres	1	1	1	1	1	1	1
Yield Per Acre (Bushels)	130	130	130	130	130	110.5	130
Spot Price (Per Bushel)	$2.50	$2.50	$2.50	$2.50	$2.50	$4.00	$2.50
Premium (Per Bushel)	$0.00	$0.17	$0.20	$0.15	$0.50	$0.00	$0.10
Income							
Revenue	$325.00	$347.10	$351.00	$344.50	$390.00	$442.00	$338.00
Incremental Expenses							
Technology Fee	$0.00	$11.11	$0.00	$0.00	$0.00	$0.00	$0.00
Seed Cost	$31.00	$33.33	$31.00	$31.00	$31.00	$29.40	$31.00
Fertilizer	$59.00	$59.00	$59.00	$59.00	$59.00	$139.50	$59.00
Chemicals	$22.00	$22.00	$22.00	$22.00	$22.00	$95.00	$22.00
Drying	$13.00	$13.00	$13.00	$13.00	$13.00	$11.05	$13.00
Trucking	$4.00	$4.00	$4.00	$4.00	$4.00	$3.32	$4.00
Fuel, Oil, Grease	$9.00	$9.00	$9.00	$9.00	$9.00	$9.00	$9.00
Repairs	$7.00	$7.00	$7.00	$7.00	$7.00	$7.00	$7.00
Miscellaneous	$13.00	$13.00	$13.00	$13.00	$13.00	$89.60	$13.00
Int. on Operating Capital	$8.30	$9.00	$8.30	$8.30	$8.30	$20.15	$8.30
Traditional Variable Costs	$166.30	$180.44	$166.30	$166.30	$166.30	$404.02	$166.30
Return Above Variable Costs	$158.71	$166.66	$184.71	$178.21	$223.71	$37.98	$171.71

Sources: Moore, Ohio State Farm Budgets 1999, Frerichs, et al. 1999, and personal interviews

Table 3: Producer Specialty Crop Contracting Considerations

Advantages of Contracting	**Disadvantages of Contracting**
Price Premiums	Possible Loss of Producer Control and Reduced Flexibility
Access to New Technology	Risk of Not Being Paid
Market Availability	Possible Yield Drag of Specialty Varieties
Reduced Financial Risk	Long Term Investment/Short Term Contracts
Reduced Marketing Risk	Limited Producer Returns
Identity Preservation	Identity Preservation

Source: Cullman Jackson, 1999

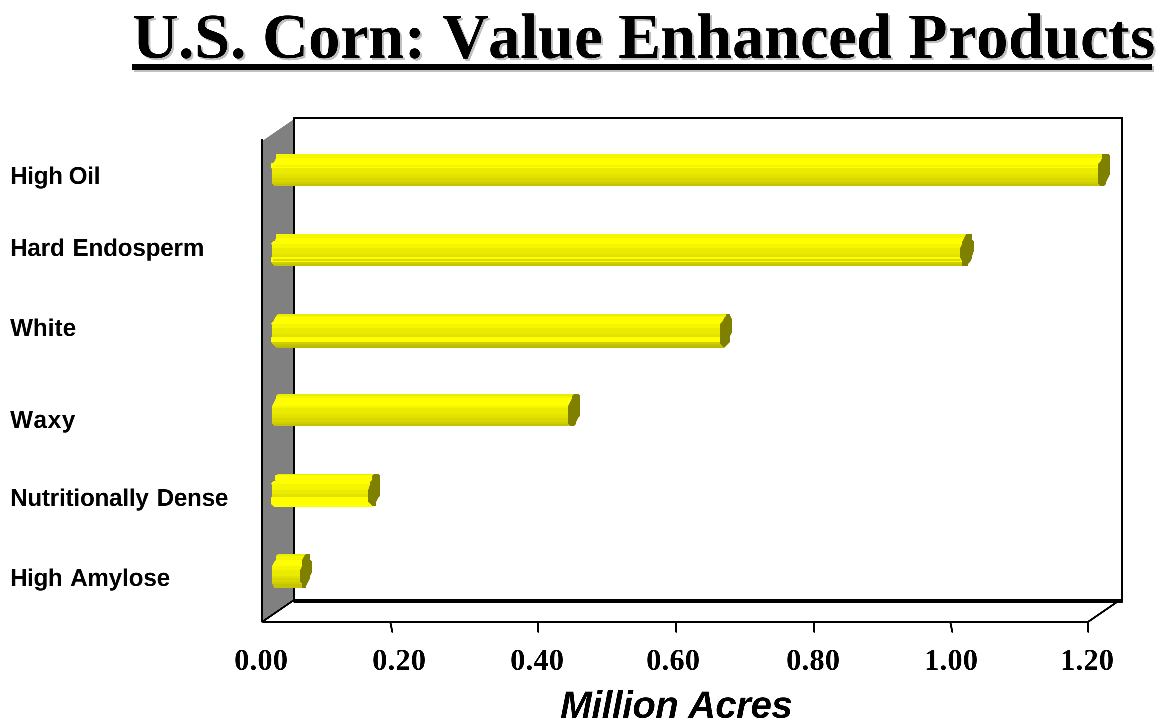

Figure 1.

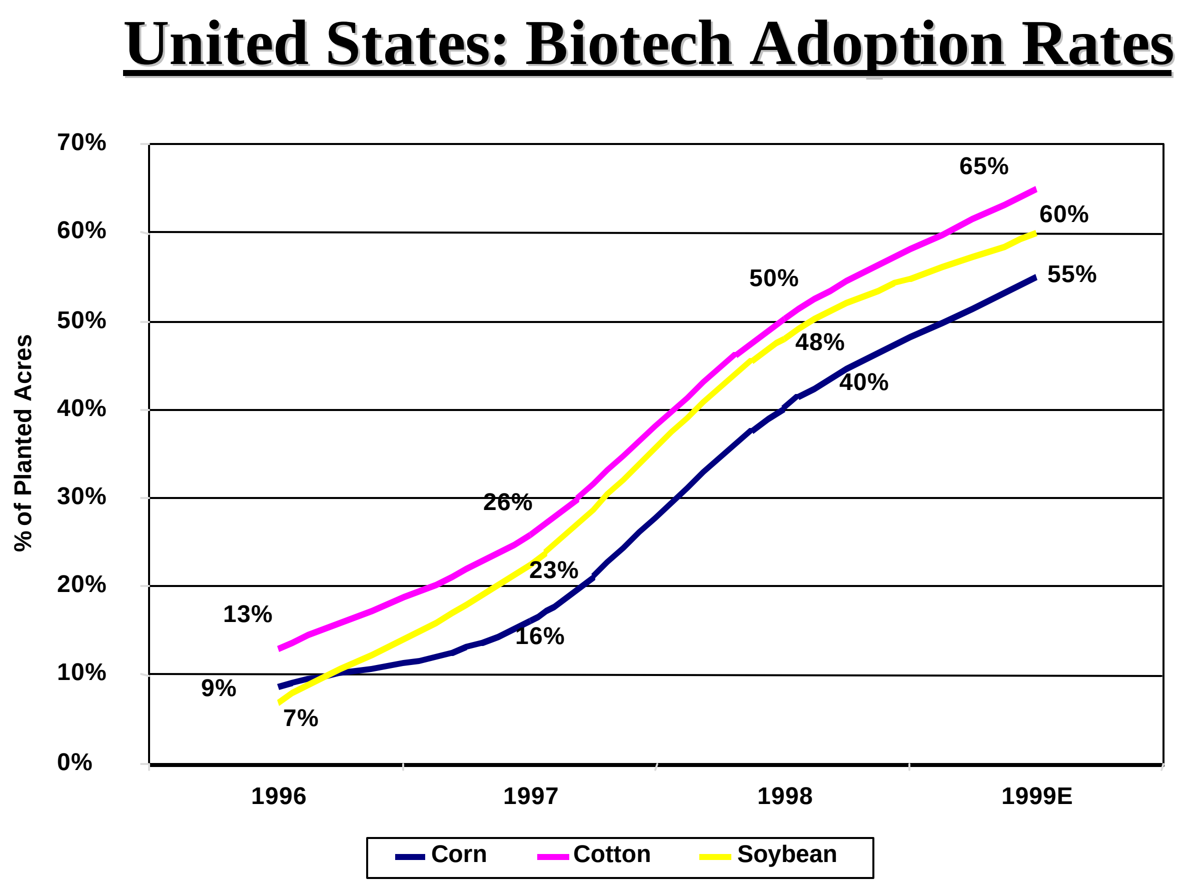

Figure 2.