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## PRICE DISCOVERY CHALLENGES IN THE GRAIN INDUSTRY

### PRICE DISCOVERY 2000 AND BEYOND

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#### **Abstract**

Traditional commodity markets no longer transfer enough information between the producer, processor, and end-user to ensure that grain and oilseed content is aligned with end-use applications. Unless all mutually advantageous bargains are transacted, markets fail. Our present market coordinated structure needs to respond to a shift from trading containers to trading content.

Organizational structures emerge in response to economic opportunity. The world has changed with an explosion of such information technologies as genomics, bioinformatics, precision measurement and the Internet. Price discovery and risk transfer, the foundation of market exchange, are being replaced by value discovery, and information transfer.

The creation of new relationship based organizations along with inputs from biotechnology and information technologies results in a dynamic, responsive and balanced agricultural system capable of meeting consumer food demands for the 21st century.

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*Shape clay into a vessel  
It is the space within that makes it useful. Lao-tzu 400 B.C.*

The ancient Chinese philosopher Lao-tzu recognized the usefulness of the space within a container. The container's content contributes to its usefulness. A soybean seed is a container. Value lies within the seed, a unique combination of protein and oil and amino and fatty acids. Soy protein contains, for example, varying quantities of isoflavones that decrease cholesterol and reduce certain cancers. Soy oil consists of several fatty acids appropriate for human and industrial use. Low linolenic oils are healthy for humans. High linolenic oils are best utilized as industrial solvents.

Traditional commodity markets no longer transfer enough information between the producer, processor and end-user to ensure that grain and oilseed content is matched to end-use applications. Unless all mutually advantageous bargains are transacted, markets fail (Hayek 1945). Our present market coordinated structure needs to respond to the shift from trading containers to trading content.

#### **Traditional Market Coordination**

Regulated commodity exchanges are like hub and spoke networks. The hub represents a closed circle of member owners. Membership entails access rights to the trading floor where trades take place in open outcry. Physical presence is necessary to capture full advantage of exclusive information flow resulting from buy and sell orders entering the trading pit. The spokes represent registered firms, which are either exchange members or firms associated with exchange members for purposes of access. Non members are prohibited from floor access but do have order access for placing buy/sell orders with members. The rim surrounding the spokes represents the introducing brokers and associated persons registered to solicit orders from the public. The exchange's hub and spoke network collects price information, aggregates it on the trading floor, and distributes the results in the form of a single price.

Traditional commodity markets trade a homogenous product that meets standardized minimum quality factors for delivery to a specific location on a specific date. Financial exchange is facilitated through a clearing organization, which acts as a buyer for every seller and a seller to every buyer. Buyers and sellers transfer price risk through anonymous exchange. This structure encourages trading between anonymous buyers and sellers, thereby reducing search and discovery costs for all participants. The clearing organization guarantees financial performance which eliminates the need for personal contact. The result is an efficient and economical mechanism for commodity allocation.

Producers operate in a near perfect competitive market characterized by many buyers and sellers, a homogenous product, equal access to production technologies, and ease of entry/exit. Minimal returns are the result of perfect competition (Saxowsky and Duncan 1998). Producers are unable to differentiate their commodity production, which leaves cost reduction as the primary strategy for enhancing

profitability. Successful producers reinvest gains in additional land which escalate expenses and further drives the need to expand their land base. Absent government support, efficient producers expand commodity production and inefficient producers are unable to compete.

Producers face three alternatives in order to avoid the lack of profitability associated with perfect competition: expand farm size, as mentioned above; form horizontal alliances with other producers; and/or enter vertical alliances with commercial food, marketing, and processing companies.

Commodity markets are one of many alternative coordination mechanisms. Peterson and Wysocki (1997) and Mahoney (1992) describe a coordination continuum ranging from spot markets at one extreme to vertical integration at the other (Figure #1). Spot markets achieve efficiency through arbitrage. Homogenous, substitutable commodities are allocated spatially and temporally based only on price. Relationship and trust are secondary. Information feedback is restricted to price premiums or discounts based on standardized quality terms. Spot markets trade containers.

Vertical integration is on the opposite end of the coordination continuum. Vertical integration substitutes the use of external contracts or price with internal information transfer. Vertical markets achieve efficiency through lower transaction costs including negotiation and enforcement, price advantage, and improved information flows. (Mahoney 1992) Vertically integrated firms involved in production, processing and distribution capture the full benefit of improved seed content.

Legal contracts, mutual agreements and cooperation fall at the mid-point of the coordination continuum between spot markets and vertical integration. All three structures require a personal relationship. A buyer must know the seller and the producer must know the consumer if they are to negotiate an agreement. Unlike spot markets, which rely on anonymity, relationship based structures require personal interaction, open information flow, and mutual understanding of each other's requirements. These personal alliances are plausible agricultural organizations for the future.

### **Market Coordination in Agriculture - Alliances for the Future**

Relationship based structures, such as production alliances, increase coordination efficiency by reducing the number of sellers. For example, How does a tofu manufacturer in Japan interested in purchasing a specific soybean variety locate a producer in Illinois? How does a producer determine optimum genetics in order to provide the best quality soybean for the tofu manufacturer? What is the best logistic method for shipping a plant to Japan? Producers need to consider organizing alliances in order to pool financial resources, employ marketing expertise, and utilize production capacity to meet end-user volume requirements.

Some producers and corporations are responding quickly to new opportunities emerging in the food industry by forming alliances. Alliances are formal or informal groups of individuals or firms organized around a common purpose for sharing information, transferring knowledge, and targeting resources for member benefit. Alliances effectively reduce the number of individual buyers and sellers in the marketplace, which makes it easier to align and coordinate the food system. The following organizations are examples of such alliances.

The Soybean Producer's Information Guild<sup>1</sup> is a pilot project jointly funded by the Illinois and Iowa Soybean Operating Boards. The project seeks to identify both market opportunities and barriers present in the current soybean industry. The Guild is comprised of soybean producers and focuses on developing relationships between members and end-users.

Guild representatives market member's assets for the benefit of the membership. Differentiated commodities create new opportunities for those who seek to capitalize on its unrealized value. For example, biotechnology unlocks embedded information in raw commodities that differentiates previously indistinguishable commodities. Producers interested in capitalizing upon the profitability in differentiated

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<sup>1</sup> Related information available at <http://www.agribiz.com/IQS>

markets need to organize and develop a market that defines differentiated value. But most individual producers do not have the time, resources, or contacts to develop differentiated market opportunities. The Guild project organizes interested producers into a formal structure designed to identify end-users, market the groups capabilities and capacities, collect and aggregate information, and access experts for economic, agronomic and marketing analysis.

The Kearney Area Ag Producers Alliance (KAAPA) is a farmer-direct source for premium, value enhanced grains. KAAPA farmer members form a producer cooperative to efficiently market capabilities for specific end-user clients. Their goal is to establish a labeled or branded product known for its quality and specific traits. The alliance provides members with research services such as variety evaluation plots and bin sampling for attribute analysis. KAAPA is committed to developing a system that provides long-term profitability and decreases annual risk for its producer members and clients.

Optimum Quality Grains,<sup>2</sup> L.L.C is a corporate sector marketing alliance. Optimum, a joint venture of the Dupont Company and Pioneer Hi-Bred International, Inc., leads the way in providing technology and building partnerships for the value-enhanced grain system of the future. Their vision for agriculture is not to produce more grain, but to produce grain with more value. This subtle but crucial difference reflects the shift from mass production to an end-user value focus.

Consolidated Grain and Barge Company<sup>3</sup> (CGB) is a corporate effort interested in building alliances. CGB, operating 60 plus grain elevators located on the Mississippi, Illinois and Ohio Rivers, purchases grain directly from thousands of producers. CGB's Premium Grains program is based on building and improving relationships with growers and end-users of value enhanced grains. Their focus is based on the belief that success enables both spectrums of the food chain, producer and end-user, to succeed.

E-MARKETS<sup>4</sup> and Precision Foods, Inc. focus attention on information technologies that build marketing alliances. E-MARKETS is an information technology based company that directs creation of virtual coordination tools linking end-users, seed and life science companies, processors, grain warehouses, and producers. Virtual contracting tools, such as the OSCAR Contracting System,<sup>5</sup> enable users to search for contracting opportunities, provide transparency for available acreage and premiums offered by participating elevators, and enter directly into production contracts.

Precision Foods' Inc.'s INTEGRO™ Analytical System<sup>6</sup> provides the seed, grain and feed industry with real time information needed to convert commodity grain into nutritional products. Near Infrared Spectroscopy delivers precise, accurate, constituent values for seed, grain and feed ingredients. Calculating actual values, rather than book values, gives feed formulators the opportunity to increase the nutritional value contained in feed grain. Ration formulation adjustments use actual constituent values to reduce feed cost, increase animal performance, and enhance grain value.

### **Capturing Embedded Value in the Food System**

The traditional market coordinated system provides price discovery for commodity grains and oilseeds. Price reflects container value based on standardized grades, which serve as proxy for quality. Federal grain standards reflect end-use requirements, but fail to recognize information embedded in the grain. Grain standards measure the container but not the content. But price is not synonymous with value. Price reflects cost while value represents return. Value exists at three levels: value embedded in seed content, value embedded in attribute consistency, and value embedded in information flows.

There are two strategies to extract value embedded in seed content: alter the seed content through biotechnology, and/or segregate commodity grain based on compositional value. Biotechnology rapidly

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<sup>2</sup> <http://www.oqg.com/>

<sup>3</sup> <http://www.oqg.com/>

<sup>4</sup> <http://www.e-markets.com/>

<sup>5</sup> <http://oscar.e-markets.com/>

<sup>6</sup> <http://www.integrosystem.com/>

transforms agriculture from trading undifferentiated commodities to trading commodities based on consumer valued attributes such as extractable starch or metabolizable energy. Plant biotechnology selects certain plant traits in order to develop new plant varieties. Gene stacking is the insertion of more than one agronomic or quality genetic trait to an organism (Coon, 1998). These traits are accorded value which include enhanced nutritional, environmental, quality, and metabolic modifiers (Reasons, 1999).

Segregating commodity grain based on composition increases end-user value. Commodities possess significant attribute variability (figure #3). Animals consume corn for energy. Feed formulators assume all corn has the same calorie content. What happens when actual corn energy levels vary from the formulation level? What is the cost of wasted energy? The value of consistently higher quality corn to a wet miller is approximately \$0.15 - \$0.20 per bushel, due to increased process efficiency and better capital utilization. Processors may ultimately purchase attribute specific corn to protect themselves from the diversity of corn in the market channel (Eckhoff, 1995). Attribute specific production is the selection of varieties based on compositional factors designed to enhance, eliminate or expand specific traits beneficial to an end-user.

Another opportunity associated with grain segregation is expressed in the attached graph (figures #4 and #5). Variability is present in this small sampling of commonly produced soybean varieties.<sup>7</sup> How does our present marketplace distinguish between healthy and unhealthy oils within the traditional commodity flows? Our present market coordinated system ignores content variability. Potential end-use value goes unrecognized. Producers select varieties without regard to value since no feedback exists in a market coordinated system other than price.

Attribute consistency results when variety selection at the producer level is harmonized with processor or end-user requirements. Consistency can also result from improved attribute segregation at the grain warehousing level. Grain warehouses can precisely measure grain at the dump pit, allowing operators to direct grain flow based on differentiated composition. Feedmills utilize precision measurement that match formulation with actual attribute levels rather than relying on book estimates. Consistent feed formulation results in consistent feed conversion, which produces enhanced quality for the consumer.

In order to capture added value from specific traits, value has to be measured. What is measured is rewarded. The traditional commodity market depends on the 1916 United States Grain Standards Act for communicating end-use product quality. Grade standards for corn include minimum test weight per bushel, heat-damaged and total damaged kernels, and broken corn and foreign materials. These physical factors serve as proxy for content quality. But grain quality determination today utilizes sophisticated technologies such as Near Infrared Spectroscopy capable of measuring compositional content including amino acid percentages, fatty acid composition, storage proteins, extractable starch, and metabolizable energy. Animals consume corn for energy and soybeans for amino acid. Value is therefore based on energy content, not broken kernels or test weight.

Attribute specific production provides processor, feeder, and food manufacturer with customized inputs matched to specific product traits and quality. Attribute variability across seed genetics is significant as evidenced in Figures #3, 4 and 5. Aligning input specifications with desired output, results in the potential for new product development, differentiation, and ultimately increased consumer value. Increased consumer value can then flow back through the food system, providing incentives at all levels to further refine and improve the process.

The third source of value is embedded in information flows. OSCAR, a virtual contracting tool utilized by OPTIMUM Quality Grains LLC, capitalizes on embedded information flows resulting from the contracting relationship. When a producer contracts for attribute specific production through OSCAR, an agreement is created for the producer, the participating grain warehouse, and OPTIMUM. Notification is forwarded electronically to the producer's local seed and crop protection salesperson. One transaction serves as a

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<sup>7</sup> The Illinois and Iowa Soybean Boards provided project funding to measure several hundred, soybean varieties planted on test plots operated by the University of Illinois Department of Crop Sciences (<http://w3.aces.uiuc.edu/CropSci/>). Illinois Crop Improvement provided NIR analysis.

catalyst for multiple information transfers. Future applications might include transaction-generated linkages, which trigger financing activities, transportation requests, risk management orders, or targeted sales promotions.

Producers employing virtual contracting services might appear on preferred customer databases that provide interested end-users quick access to experienced growers. Information embedded in transactions can lower search and discovery costs, improve planning and forecasting, lower transportation costs, and reduce inventory requirements.

## **Conclusions**

Different organizational structures emerge in response to economic changes. For example, the poultry and pork industries migrated towards vertical integration in response to consumer demands for safe, consistent, and low cost products. Vertical relationships convey consumer preferences across the entire food chain. Row crop agriculture will gravitate towards vertical forms of control unless producers are able to integrate new technologies and form new relationships.

The world has changed with the explosion of such information technologies as genomics, bioinformatics, precision measurement, and the Internet. Price discovery and risk transfer, the foundation of market exchange, are being replaced by value discovery and information transfer.

The creation of new relationship based organizations such as horizontal alliances combined with investments in biotechnology and information technology results in a dynamic, responsive and balanced agricultural system capable of meeting consumer food demands for the 21st century.

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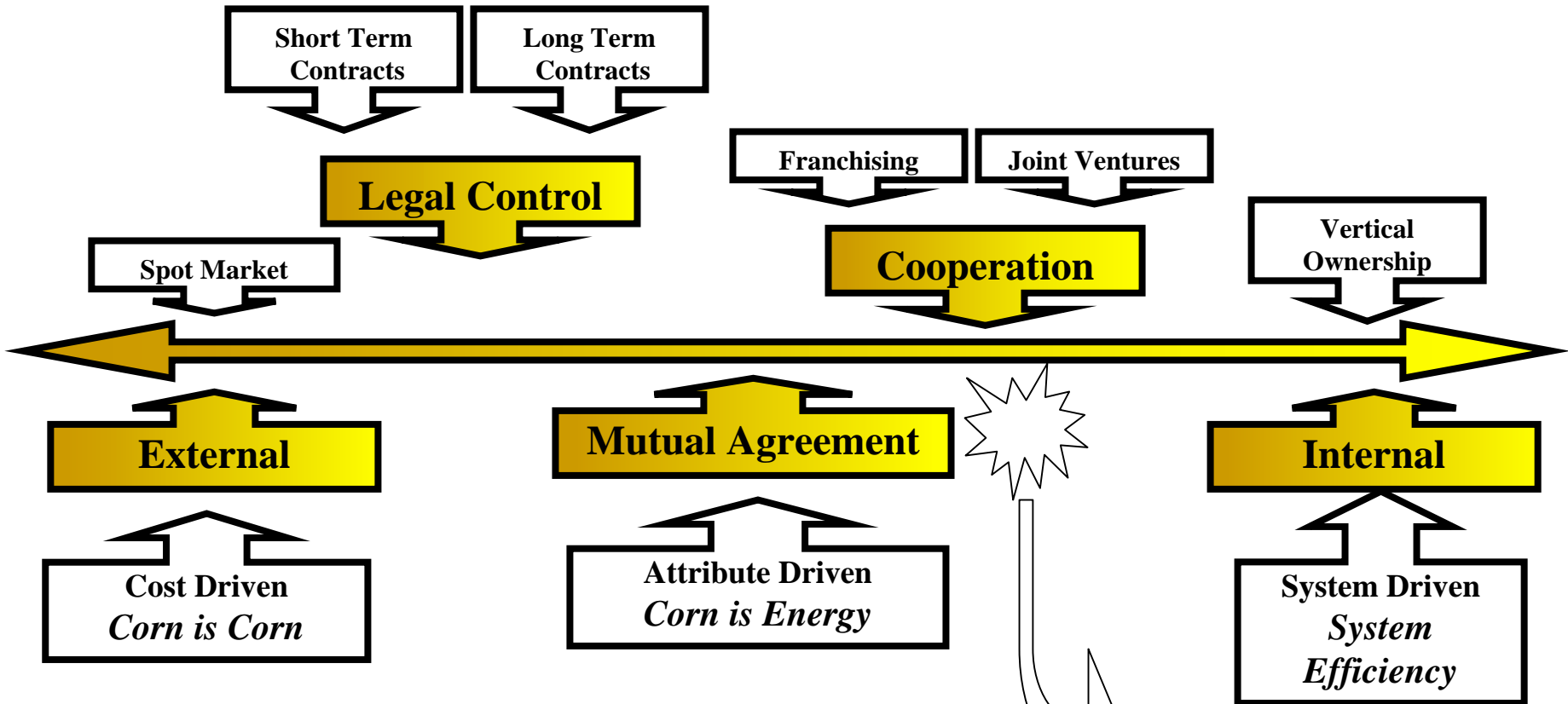
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# Figure #1

## Coordination Alternatives



•The Vertical Coordination Continuum and the Determinants of Firm-Level Coordination Strategy” by Christopher Peterson, Allen Wysocki, Michigan State University 97-64

•The Choice of Organizational Form: Vertical Financial Ownership Versus Other Methods of Vertical Ownership” By Joseph T. Mahoney, Strategic Management Journal, Vol.. 13, 559-584 1992

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# Figure # 2

## Attribute Specific Hybrids

Reduce Substitutability

Iowa Grain Quality Initiative

Quality factors important to corn end uses

Factor	Average Iowa Value Long-term	Importance <sup>a</sup> by End-Use			
		Feed	Wet Milling	Dry Milling	Alkaline Cook
Protein (%)	8.0	++	--	+	+
Oil (%)	3.6	++	++	--	-
Starch (%)	60.0	x	+ <sup>b</sup>	x	x
Density (g/cc)	1.260	+	--	++	+
Test Weight (lbs./bu.)	56	+	+ <sup>c</sup>	++	+
Thins (%)	40	x	x	++	x
Thousand Grain Weight (g)	350	x	x	+	x

Basis 15% moisture

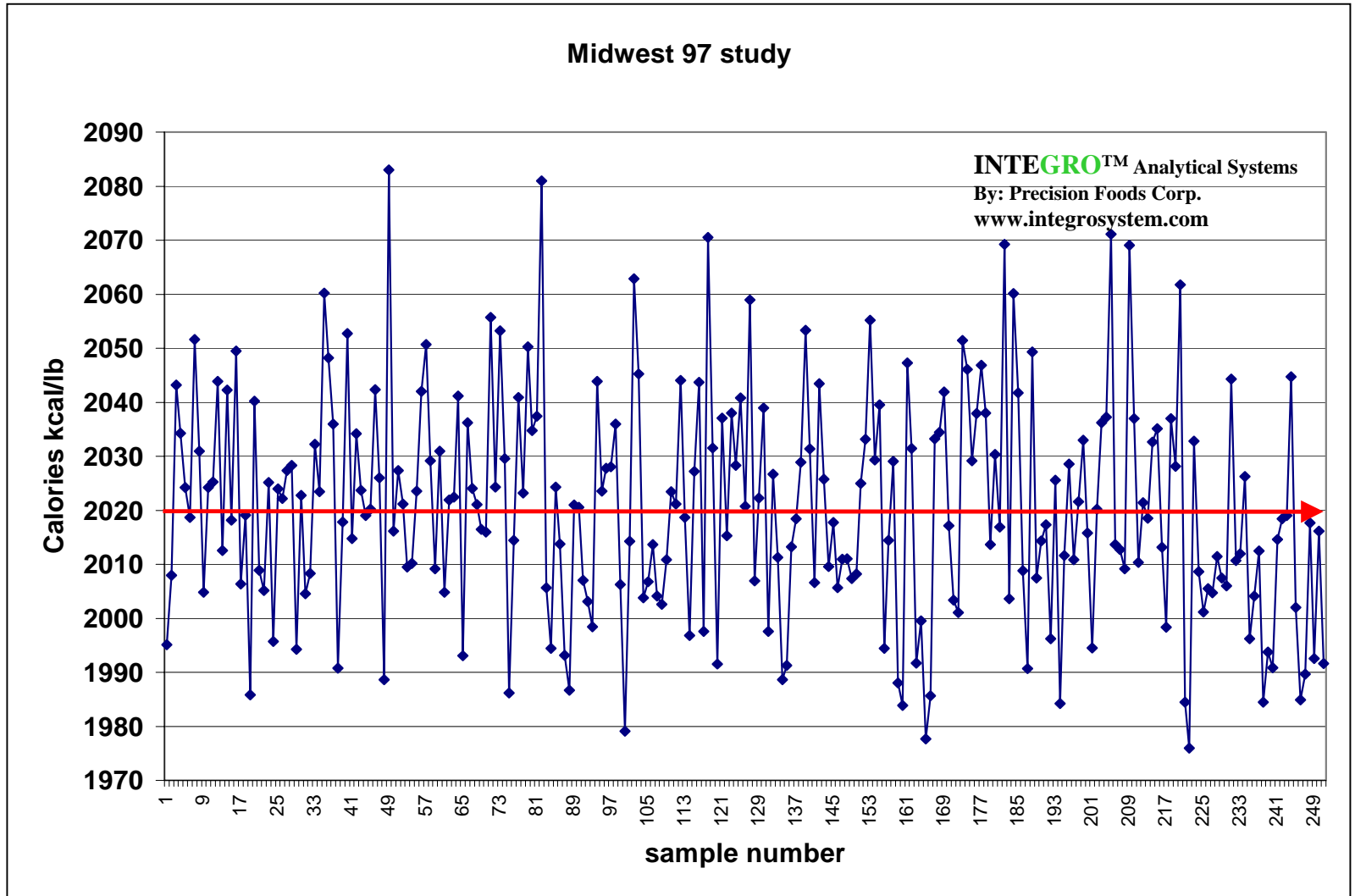
<sup>a</sup> + = important to be higher; ++ = very important to be higher; - = important to be lower; -- = very important to be lower; x = not a major consideration

<sup>b</sup> If extractable. Harder corn may have high starch, but may be relatively unextractable.

<sup>c</sup> Up to 55-57 lb/bu. Very high test weight is indicative of hard corn, which is difficult to wet mill.

# Figure # 3

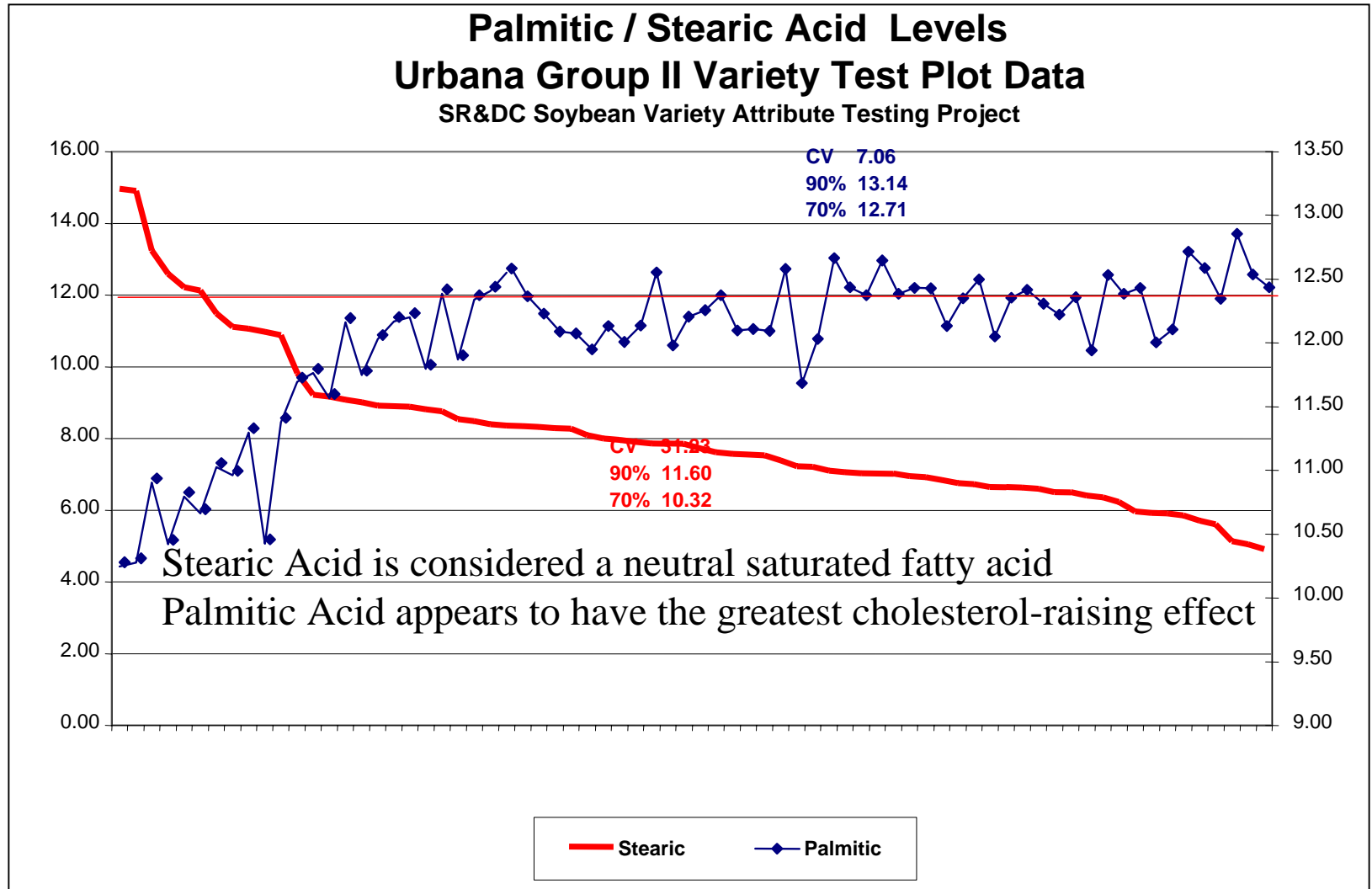
## Energy Variability in Commodity Grain



# Figure # 4

## Soy Oil - Palmitic / Stearic Acid

Off the Shelf Choice - Where is the feedback system?



# Figure #5

## Linolenic Acid

