

# Ten conversations about identity preservation

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## Abstract

Dynamics in the global food system, along with a cascade of technologies, drive demands for capturing information and sharing information vertically within the supply chain. Food safety, genetic engineering, and animal welfare all have contributed to the need for enhanced information flow within the supply chain. Identity preservation in grains and oilseeds is an emerging issue that may influence the structure of agriculture in the longer term.

This research addresses the following questions. While demand for high-information grains appears to be growing, where and how along the supply chain is the value created and captured? Though it appears that the economy demands ever-increasing amounts of differentiation, why do opportunities for producers and life science companies to create and capture significant new sources of value remain elusive?

To answer these questions needs assessments were conducted with grain procurement executives. Their responses reveal the "buyer's calculus" where buyers balance investment in specific relationship assets with the market uplift or risk mitigation return it generates. Buying from a competitively structured industry has numerous benefits. There is a "cost" or tradeoff leaving the spot market procurement model in favor of a relationship-based model; hence the calculus. The current equilibrium state reflects the current risk-adjusted value proposition suppliers deliver to end users.

Though end-user benefits are on the horizon with the next generation of biotechnologies, their emergence is insufficient to guarantee farmers and life science greater returns. End users will always balance the risk mitigation and market uplift features of a supply offering with the risks of narrowing their supply base. To drive value up the chain, suppliers need to shift away from focusing solely on the products of the future and focus on the technologies, delivery systems, and organizational models that, when bundled with new products solve problems and make end users more competitive.

## 1. Introduction

Dynamics in the global food system, along with a cascade of technologies, drive demands for capturing information and sharing information vertically within the supply chain. Food safety, genetic engineering, and animal welfare all have contributed to the need for enhanced information flow within the supply chain. Identity preservation in grains and oilseeds is an emerging issue that may influence the structure of agriculture in the longer term. Firms within the food supply chain must decide what information to provide and how to provide it. This applies to collecting information from upstream suppliers as well as to supplying information to downstream customers. Components of this vertical information situation include farmer-supplier identity preservation to capture value and the buyer information needs concerning geographic location of production or seller identity in order to manage risk.

Opportunities appear to loom large to remove risk and improve quality in the grain supply chain through

preservation of product identity. Bender (2003) identifies six specific factors affecting the use and development of identity preservation (IP) systems: biotechnology, precision agriculture, measurement technology, food safety, competition, and the role of nontraditional players. Yet producers are frustrated at the low level of value available to them from IP demand.

Sporleder and Goldsmith (2003) report that most premiums for producing enhanced grains have settled in the range of 5% with a few products (e.g., non-GMO soybeans) garnering 10%. The majority of U.S. grains and oilseeds markets require minimal vertical information flows and the spot market is the primary form of governance (Martinez and Davis, 2002; Martinez and Reed, 1996). Contracting, though, has become a common governance mechanism for segregated grains and oilseeds (Martinez and Davis, 2002). In sum, United States value-added markets continue to struggle to develop and pay significant premiums (>5% of the commodity price) where identity is preserved.

**Objectives**

This research addresses the following questions: Why do premiums remain low? While demand for high-information grains appears to be growing, where and how along the supply chain is the value created and captured? Though it appears that the modern economy demands ever-increasing amounts of differentiation, this research explains why opportunities for grain producers to create and capture significant new sources of value remain elusive.

**2. Literature review**

**An identity preservation primer**

A starting point for understanding the varying structure and characteristics of current identity-preserved systems is to review the types of identity preservation systems currently utilized in the United States. Two primary distribution systems have traditionally existed for corn and soybeans (Bender, 2003). One distribution system has focused on commodity crops, and the other distribution system has focused on very high-value traits. A problem resulting from the reliance on two primary distribution systems is that neither channel can cost-effectively supply many of the more recent differentiated value-enhanced crops. Many of these new value-added crops are produced in larger volumes, relative to the very high-value trait crops. With the growing attention placed on biotechnology and genetic modifications and value-added crops, a need for market channels has developed that will allow distribution of a product that is identity-preserved, but in a less rigorous system than is used for very high-value crops (Bender, 2003).

Figure 1 represents a continuum of marketing channel systems, which range from commodity market channels to the very high value-added identity preservation systems. Many of the newer marketing systems developed for value-added corn and soybean markets lie between the traditional commodity and very high value-added IP market channels, such as, high-oil corn, white corn, waxy corn, high-oil soybeans, and non-genetically modified crops. Herein lays the challenge. The supply chain used for these crops is less production and management-intensive than for very high

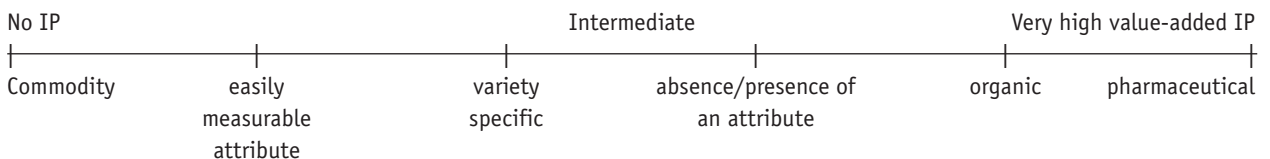
value-added IP crops. But it still requires segregation to preserve the identity of the differentiated crop. These intermediate crops, neither commodities nor high value crops, are the most dynamic segment of the grain market. The supply chain requires more information yet there is little margin to work with. The essential strategic question is how to develop systems that deliver the information demanded with minimal additional cost.

While much research has been conducted on the costs of identity preservation, little work has been conducted on the value proposition of IP. The cost-based research view (see Bullock and Desquilbet, 2002; Kalaitzandonakes et al., 2001; Maltsbarger and Kalaitzandonakes, 2000) is flawed because it looks at these new market conditions only from the top down (i.e., the supplier’s viewpoint). Such analysis is simpler because it takes known costs and systems of operation and adds the additional features required to preserve the identity at the margin. This static approach, which looks at adding costs to suppliers’ systems, does not allow for adaptation, new investment, new entrants, substitutes, or buyers’ perspectives. The conclusion from such a perspective is that IP is costly to the system and burdensome to those least able to afford the additional costs (i.e., farmers and first handlers).

**3. Methodology**

The research in this manuscript is based on an alternative analytical perspective, that the value proposition drives the cost model. If demand is high, suppliers will be drawn to the market, the innovation process will be frenetic, and the cost model will be dynamic. If demand is soft, few supplier resources will be mobilized, and innovation will be much more incremental. The cost model therefore becomes a function of the value proposition. From such a perspective, the high costs for farmers and first handlers using a cost-plus approach (described previously) accurately reflect the underlying value (small) contributed from incremental behavior. To better understand the IP proposition, one must begin with demand, the needs of end users, which then reveal the underlying pulling forces serving as incentives for suppliers to partake and the system to adjust. Beginning with end users and working backward reveals not only how

**Figure 1. Marketing channel continuum.**



the system adjusts in an attempt to service its needs but also the incentives for agri-food firm procurement to search for input or process substitutes.

To understand the needs of end users, needs assessments (see Goldsmith et al., 2002; Johnson et al. 1987; Soriano, 1995; and Yin, 1994 for a detailed discussion of the methodology) with senior executives in the US and Mexico who were responsible for the firm's purchasing raw commodities<sup>1</sup> were conducted (Table 1). Ten companies were the subjects of the interviews. U.S. raw agricultural inputs were the main source of the respondents' supply base. Respondents were directly responsible for the purchase of soybeans, corn, or small grains. Final demand was either for feed or food use; conventional or organic.

The semi-structured interview was composed of two categories of questions. In the first category (90% of the interview), researchers methodically asked a series of questions for the buyer to describe how inputs were purchased. Buyers were not directly asked about identity preservation. The needs assessment approach minimizes interview bias because the focus is on a subject well known to the interviewee, in our case raw agricultural product procurement. Needs, the procurement process, and market for substitutes became evident working through a detailed description of each buyer's "problem." Maps emerge of the

procurement system that forms an overview of the norms of the industry, which in our case describe the state of demand for product information (both by the supplier and the buyer) and the role agricultural producer-suppliers play or could play in meeting end-user needs and making the buyer more competitive<sup>2</sup>.

Previous work has described the changing information needs along the value chain in the post-modern agri-food economy (Sporleder and Goldsmith, 2001; Sporleder and Goldsmith, 2003). Not only is the quantity of information transmission increasing but the quality and dynamics of the information is changing as well. It is almost as if our ability to measure, capture, organize and transmit information is outstripped by the dynamics of the markets for information. Customers require greater and greater customization, governments are increasingly vigilant over safety and security issues, and suppliers increasingly recognize the need to be compensated for their value-add. From this it can be assumed that information need is increasing and that increased vertical and horizontal transmission of information would result. But empirically most raw agricultural product transactions still continue with a minimal amount of information exchange. Premiums to producers remain small and end-user traits in grain and livestock have seen less demand than expected. The

**Table 1. Overview of interviews.**

#	Location	Size	Food or Feed	Commodity	Position
1	US	Large	Food/Feed	Corn/Soybeans	VP Procurement, Director Field Operations
2	US	Large	Food	Grain	VP Procurement
3	US	Large	Food	Grain	VP Procurement
4	US	Small	Food/Feed	Soybeans	CEO
5	US	Small	Food	Grain	VP Procurement, CEO
6	US	Large	Feed	Corn/Soybeans	Director Commodity Purchasing, Commodity Buyer
7	US	Small	Food	Soybeans	Programs Manager, Marketing Manager, Agronomy Manager
8	US	Large	Food	Corn	VP Procurement
9	Mexico	Large	Food	Corn	Plant Manager, Director Plant Procurement
10	Mexico	Large	Food	Corn	VP Procurement, CEO

<sup>1</sup> Semi-structured interviews, most of which lasted between two and three hours, were conducted in the executives' offices. For proprietary reasons, interviews were not taped, but two researchers were present at each interview. Respondents were drawn from contacts within the industry and were known personally by at least one of the researchers. The respondents represented major food firms with a significant presence in the US as well internationally.

<sup>2</sup> In the final minutes of the interview (10%) subjects were asked for their opinions about how research and policy could help U.S. farmers be better suppliers. Were there gaps where supply could be indirectly improved? Was there research in which land-grant universities could engage that would make U.S. suppliers more valuable and in turn make the subject firms more competitive in their markets? Similar questions were asked about other agricultural institutions such as USDA (GIPSA), Extension, and the commodity groups.

following results from semi-structured interviews with procurement executives provide an alternative explanation for this phenomenon, where more vertical information is not always better.

## 4. Results and discussion

The following results emerge from the detailed discussions with procurement executives about the buy-side and its needs. Several issues are of interest. The first is the quantity and quality of information needed within the bundle of attributes purchased by the firm. More may not necessarily be better. If more is not always preferred to less, why is that? Why might the buy-side prefer less information? Central as well to these discussions with the executives is the choice of transaction governance structure; the spot market where transactions are arms length, flexibility and substitutability are maximized, and information flows are minimized versus coordinated markets where transactions are relational and information is critical. This trade-off on the buy-side is conceptually captured in a discussion of the "Identity Preservation Half Pipe."

### Results 1: Supply chain needs for vertical information

Four underlying transaction features, central to the concept of vertical information need, were revealed through the needs assessments conducted on procurement executives.

#### A) *Seller's IP*

The first case of vertical information need, that emerged from our interviews, is the incentive for sellers to maintain their identity as their products go forward as differentiated or even branded; identity preservation. This affords the seller a premium in the market provided there is underlying value to the differentiation, and there exists some degree of inimitability. For example, one of our interviews involved a global organic grain supplier that has built a complex system to deliver indefatigable quality to very discerning foreign food manufacturers. By preserving the identity, the firm (not the farmers) is able to capture the tremendous value created through its proprietary grain-assembly process. In the identity preservation case, information flows downstream from the supplier to the buyer. The value derived from managing the knowledge and preserving the identity through the marketing channel is not a function of the grain so much as the delivery system that is able to customize an offer to each customer. The concept of identity preserved grains is really nested beneath the more sustainable business model of identity preserved grain systems.

#### B) *Buyer's traceability to mitigate risk*

A second form of information need, though not common among our procurement executives, in the marketing channel is for the buyer to demand information from upstream suppliers, traceability, to mitigate risk, such as in the StarLink™ case (Washington Post, 2000). In the StarLink™ case because food-grade corn is especially at risk due to pollen drift problems, firms need assurances and process verification that minimize the risk of contamination from foreign pollen. This second case of vertical information flow is not the result of the supplier creating value (identity preservation) and sending it down the supply chain, but the buyer being exposed to risk (traceability) looking up the supply chain for relief.

Three of the firms interviewed in this research project handled food-grade corn, and commingling with unapproved hybrids was a concern. Though there was concern none of the firms felt the risk or benefit high enough to necessitate full integration. As described in the above continuum, knowledge intensity increases moving from left to right; as does the information cost per unit. Discussed in more detail below, firms seeking to avoid unwanted pollen in their food grade products would theoretically be expected to need to control their chain to avoid the commingling risk. While theory (Williamson's Transaction Cost Theory) might posit that full integration is necessary for firms faced with acute risk; or that a public goods problem exists and sufficient purity can not be met with government intervention (Goldsmith et al, 2003; Goldsmith, 2003), firms in actuality have a variety of mechanisms along the continuum to vertically manage their information. For example a common practice by firms in the study was to manage the risk through proprietary grain assembly systems utilizing 5% premiums and coordination with farmer suppliers, not full integration. With such a model the information flow is bidirectional from the buyer specifying expectations and from the quasi-independent supplier demonstrating responsiveness by fulfilling the contracts specifications.

#### C) *Product segregation not identity preservation*

The third form of information need involved segregation not identity preservation. In Case A above, the seller has an incentive to maintain information through the marketing channel by means of identity preservation in order to be compensated properly. In Case B above, the buyer has an incentive to control information flows to mitigate supply risk. In the segregation case the linkage between the identity of the supplier and product is broken. The segregated product is the transaction unit, not the IP bundle. Segregating-only significantly reduces the informational costs, increases transaction flexibility, reduces holdup

opportunities, and leverages greater scale economies compared with an IP product. This was a very common practice among our interviewed firms, whereby suppliers were given production protocols but the grain from the program was then commingled. The identity of the producer was not preserved, nor was the geographic origin.

Two examples of this process involved populating a region with high-quality seed, training services, and recommendations about cultivation practices. The buy-side firm, though, never took a position employing active coordination or contracts. Producers were paid for quality off of a proprietary pricing grid at or following harvest. The probability of receiving a higher price was increased through the use of the recommended best management practices. In this case vertical information flow is unidirectional: from the buyer back to the supplier. This differs from the bi-directional flow in Case B above.

*D) Commodities*

The final case of information need, the commodity transaction, emerging from our interviews was the most common and actively practiced by the firms in our study. Under the commodity information model the need for vertical information flow is minimal, products are commingled or blended so that anonymity prevails. The lack of information is beneficial for buyers as well because transactions are more simplified, rapid, and substitutable than the more informationally intense exchanges described above. While the benefits of informationally-laden grain products are readily apparent, the costs to buyers from such purchases are less appreciated. Though discussed further below, the firms described needs and buying practices that reflect an opportunity cost (in addition to the higher cost of goods sold) for leaving the commodity procurement model. For all grain buyers, except those with the highest needs for information (extreme right-hand-side of Figure

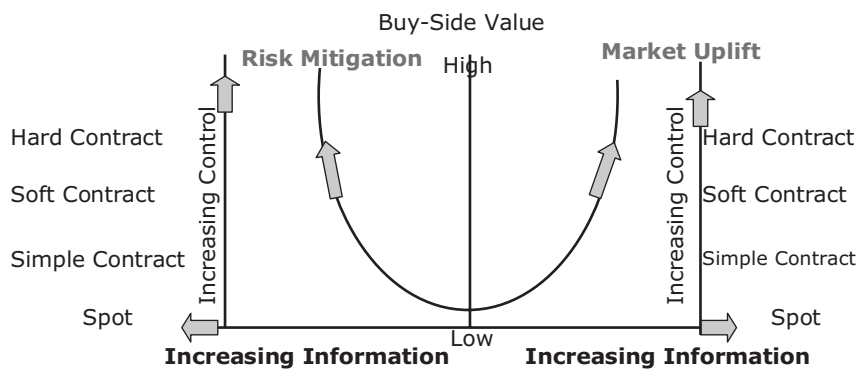
1), there is a fundamental tradeoff for buyers and sellers as to their benefits and costs of bundling information with the grain.

**Results 2: The identity preservation half-pipe**

Preference for information flows may differ between buyers and sellers. For example, sellers may think that their differentiated product warrants a premium in the marketplace as compensation for additional costs incurred in production and handling. The firms in this study report that they may not be willing to pay for the product because the added information is insufficient to afford the necessary market price premium, or uplift (Figure 2, right-hand side of half-pipe), or to mitigate significant risks (left-hand side of half-pipe).

The IP Half pipe conceptually captures the triadic relationship between strategic importance to the buyer, supply risk, and governance choice. Highest on the half-pipe are key strategic inputs, such as Intel processor chips for IBM or baby food for Gerber. Intel as a seller has an incentive to preserve the identity of their chips because of the rent stream that flows from their brand in the marketplace. Gerber as a buyer representing the other side of the half pipe has an incentive to control its supply chain to mitigate quality risks devaluing its brand. Both are strategic to the buyer (Gerber and IBM) and they accordingly engage in relational transactions (contracting) with their suppliers. They avoid the spot market. Information is intense; bundled around the baby food in the form of assurances and around the chip in terms of innovation leadership and quality. Associated with the strategic relationship between grain transactions, as described by the respondents, do not populate the upper end of the half-pipe but rather lower end.

Imagine a farmer producing a high-quality white corn for an end user, such as a snack food manufacturer. The firms'



**Figure 2. Identity preservation half-pipe: incentives for supply-chain control by buyers in relation to likely governance structures.**

procurement executives ask: Does preserving the identity of the supplier of white corn make the snack food more valuable in the end user's market? Can the end user exercise more pricing control because of the source of white corn, the notion of market uplift? And is the supplier unique in the ability to provide the input? If so, the vertical information has currency, the supply base is limited, price premiums prevail, the transaction moves up on the half-pipe, and some sort of contract will govern the transaction. Ingredient branding is an example of the presence of market uplift. IBM is willing to pay the premium to Intel and share their brand (Intel Inside™) because it affords IBM pricing power in the marketplace, and there is only one Intel. While going on the spot market for computer chips is possible, the branded or identity-preserved chip has currency and captures value in the marketplace for IBM. A similar example for a food product is the ingredient branding of NutraSweet™ in ice cream.

Similarly, the demand for vertical information may be high to attenuate buyers' risk, even if the corn were unbranded (common). For example, Gerber Foods invests in its supply chain by developing IP systems to ensure that no GMOs are present. The lack of the input attribute (GMOs) is strategic to the brand, vertical information has currency, the supply base is limited, price premiums prevail, the transaction moves up on the half-pipe, and some sort of contract or coordinating structure will govern the transaction. Alternatively, market uplift and risk may both be trivial, making intensive vertical information flows unnecessary (low on the half-pipe, Figure 2). For the interviewed firms this is a common case where segregation of the product is valued while the identity of the producer or processor is unimportant. In this case the vertical information flow is product specific (Case C above). The product, not the supplier or product bundle garners the premium. For example, the firms describe a very common situation where suppliers are not obligated to only one client. The seller of corn produces several corn varieties, channeling each to a

different destination, each pulled by a separate program with a premium. Segregation is important for value creation and capture, but the supplier's identity is of minimal value.

**Result 3: Transaction governance (contracting) and vertical information needs**

Correlated to the buyer's needs is an associated transaction governance structure (the vertical red lines of Figure 2). Discussions about transaction governance, buy-sell arrangements, revealed that the lower the value to the end user, either because the need is low or ample substitutes exist, the less restrictive the contract and more informal the relationship between the farmer supplier and the buyer. Governance structures described by the firms fall into three classes of contracts that pertain to the identity preservation proposition: hard contracts, soft contracts, and simple contracts and two types of spot markets arrangements (Table 2).

*Governance type A: Hard contracts*

Hard contracts are tight specification (either process or outcome) contracts that incur penalties for compliance failure or even indemnification of the buyer. An example of a hard contract is the way in which Burger King governs its transactions with its perishable food suppliers. Burger King specifies and offers for bid its perishable food needs. The seller, in accepting the contract, not only agrees to supply the specified product but also is liable for breach of contract (Barrier, 2002). In the case of the Hudson meat recall (see Martin, 1999), Burger King as the buyer was immediately relieved of all its purchase obligations. Hudson Foods was liable for the added costs of procurement, and brand damage and damage control (i.e., additional advertising) (Barrier, 2002). Such hard contracts are not uncommon between processors and food manufacturers or retailers, but hard contracts do not exist upchain between grain procurement and farmer suppliers.

**Table 2. Procurement channel overview.**

Governance Type	Information quantity	Premium level	# of suppliers	Market structure	Supply risk	Currently available to producers?	Example
Hard Contract	Large	High	Low (4)	Monopolistically competitive	High	No	Flour, meat
Soft Contract							
Simple Contract	Small	Low	High	Competitive	Low	Most Common	Food-grade corn
Pump Priming							
Spot Market (includes wildcatting)							All commodities

The firms were unable to identify one case in which litigation ensued because a producer-supplier failed to meet a supply contract (one historical case was the hedge-to-arrive situation in Minnesota and Ohio in the late 1990s). Hard contracts, except for the highest valued products, do not exist. For example, a major U.S. cooperative failed to meet its obligation to supply a high-quality food-grade grain contract to one of the interviewed firms. The co-op failed to fulfill its obligation because commodity prices had risen and the farmer-members opted to market their crop in the spot market. The most notable aspect of the anecdote was that the food manufacturer and its branded food product were not compromised by the behavior of the cooperative (its supplier). The firms describe historical procurement norms, even in quality markets, that dictate that the company does not become overcommitted to one supply source because of structural supply risks (e.g., weather or disease) that exist in the grain trade. The explanation then for the relationship between low value-add, low premiums, soft contracts (low on the IP half-pipe (Figure 2)) is the ineffective supply risk management.

This is because grain supply has been, and continues to be variable, either in terms of quality or quantity. As a result, the buy side is forced to hedge through buffer stocks or alternative supply sources. One difficulty for farmers in their attempt to capture more value in the supply chain is because they expose their customers to this supply variability. This inherent problem forces buyers to engage in numerous strategies to protect themselves from being caught in a short supply situation. Being caught short in the market is extremely costly for manufacturers working to keep factories operating at capacity or for retailers striving to keep fresh product in front of the store traffic. Not only may facilities not be operating at full capacity, but costs of goods sold rises dramatically in a stock out environment.

Though farmers attempt to provide high-quality supply using new business models, such as the new generation cooperative, they often neglect to develop the resources and organizational structure to address the most fundamental of buyer needs: the mitigation of supply risk. The results of this study show that in many cases buyers, in dealing directly with farmer-suppliers, are being asked to increase their supply risk exposure in order to gain access to new, quality products. Is the reward worth the increased risk? Farmers and their cooperatives need to address supply risk and buyer exposure to move up the half-pipe to the region of hard contracts, higher premiums, and greater value capture.

#### *Governance type B: Soft contracts*

Soft Contracts involve process and quantity specification, but compliance failure involves no legal liability. The results

showed that organic contracts in Illinois are highly specific and third-party verified, but they involve no legal liability for failure to deliver. In the case of poor performance, producers forego the premium and drop off of the select-supplier list. The market for suppliers, even for organic, is contestable with numerous suppliers around the globe willing to supply. Procurement executives report that information technologies make monitoring disparate supply sources easier every year.

#### *Governance type C: Unspecified soft contracts*

The most common contracts described by the firms are unspecified soft contracts. These specify minimal management processes (e.g., variety or hybrid list and quantity), and third-party verification is not employed. Often these proprietary programs are designed and maintained by first handlers and processors to divert grain through their own channels. Premiums are moderate (~5% of the commodity price), and failure to comply is met without significant price or access-to-market penalties. A common practice for buyers upon receipt of grain not to specification is to simply find a secondary market. The product is not returned to the supplier as is common in other industries. This helps the seller because a different destination is not needed for each quality produced. And it may even help the buyer procure more broadly and more cost effectively because suppliers don't bear the risk of a load being rejected.

#### *Governance type D: Pump priming*

End users interviewed also describe an even less intrusive procurement program. Common in food-grain supply chains is the strategy of "pump priming" without contractual obligation. Here, end users do not work directly with farmers but focus more on a region improving the quality and reliability of the local supply base. This is done by supporting research in the region, distributing specific varieties or hybrids, and supporting management education in terms of best management practices and the varieties or hybrids usage. This raises the modal quality level in the region, and the farmers then can sell at or post harvest into the firm's proprietary price grid. No farmer is excluded ex-ante from delivering through the program. This allows the buyer the best of both worlds: higher quality without a substantial reduction of the competitiveness of supply through contracting. End users do run the risk of other buyers free-riding. This occurs when a firm attempts to raise the quality of grain in a region through pump priming and more than one buyer is present in the market. When grain quality is raised, all buyers in the market would benefit.

*Governance type E: Wildcatting*

Finally, also occurring in the market place is the delivery of enhanced grain products without a contract- wildcatting. In this instance, producers operate outside company programs by attempting to produce contract-type quality and market to buyers post-harvest for a premium. This practice helps to fill voids in post harvest markets that may emerge due to low production, poor quality, or increased demand.

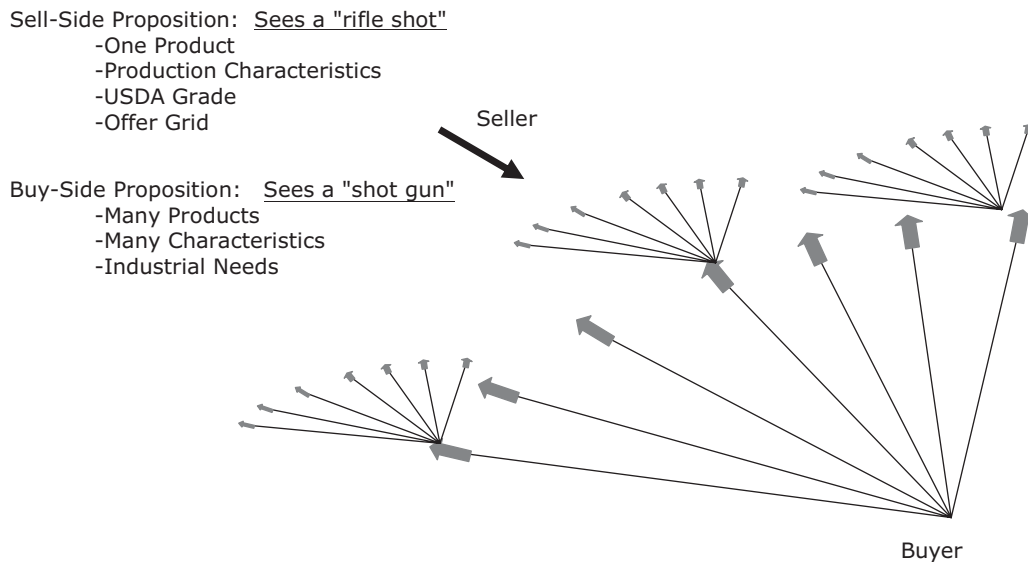
**Results 4: Incentives for vertical information flows: the buyer's problem**

The most significant finding from the conversations was how different the perspectives were between the buy and sell sides (Figure 3). While suppliers are selling a product, such as white corn, the buyer's proposition is much more fragmented. Firms buy numerous inputs, and raw agricultural products are simply one of those inputs; each input in turn is valued idiosyncratically for attributes<sup>3</sup> associated with end use.

Continuing with the white corn example, the buyer is buying the starch, protein, and vitamins. The buyer is also purchasing foreign matter, water, and cracked kernels. Added to this list of attributes is quantity, price, delivery location, packaging, transportation, storage, and credit. The "corn" therefore is really a set of attributes and suppliers are

differentially able to supply each attribute and buyers differentially buy each attribute. Many producer ventures focus on the selling of a high quality product, say white corn, but neglect the other attributes in the bundle. Buyers may be willing to accept an inferior foreign matter level, for example, because of superior characteristics of other attributes. Additionally and very important, is that not only is there cross-substitution across the bundle, but buyers can substitute industrial inputs for agricultural inputs. For example, in the processing of white corn for masa, steep time can be controlled both by the quality of grain and by the amount of time the product is cooked. The buyer doesn't have to, and may even prefer to, take an inferior product and turn it into a high quality output rather than sharing the value creation by buying a high quality input in the first place. Thus what the buyer sees looking up the chain may in fact be a shotgun of uses, opportunities and substitutes, while the seller unfortunately sees a rifle shot and focuses solely on the product.

Ceteris paribus, the firms report that preserving the identity downstream or knowing the origin or identity of the upstream suppliers is costly. This cost can arise from third-party verification systems, system complexity, asset-specific investments to accommodate monitoring, and the bureaucracy. Segregation without identity preservation is less intense in terms of vertical information flow, and



**Figure 3. Differing perspectives of the same transaction: supplier looking down the chain vs. the buyer looking up the chain.**

<sup>3</sup>This is consistent with Lancaster's (1966) notion that products really are consumed for the set of attributes. Understanding these attributes reveals the underlying demand.

therefore less expensive on a per-unit basis. Obviously the efficiency advantage of the commodity system is its low informational costs in which products are readily substitutable and buyer and seller options are most flexible. The valuation of product components and the underlying incentives of the sell-side agent can differ significantly from those of the buy-side agent. Vertical information flows are costly for buyers in numerous ways. Undifferentiated commodity purchases afford great flexibility through substitutability, common understanding of grades and standards, and the ability to commingle. Buying from a competitive commodity market also affords buyers the opportunity to manage price risks through buffer stocks and futures markets. Commodity purchasing is quick, low cost, and repeatable, with supply chains that exhibit well-established trade customs. Investment in vertical information capture and analysis adds new and uncertain costs and perhaps sunk investments to facilitate procurement. Because of this trade-off between information quantity and quality and cost, buy-side firms are selective as to which inputs warrant investment (i.e., investments that are truly strategic). Economic agents in the supply chain prefer to avoid asset-specific investments.

Analysis of commodity-retail price spreads demonstrates the declining role of the commodity input in the consumption experience. One value of commodities to end users is that they are low cost. The buyer creates and captures value by taking a low-cost input and converting it into a higher-value product (turning a sow's ear into a silk purse). Higher-cost or premium inputs have to be justified in terms of their market uplift or risk mitigation features. This makes incentives antithetical between the buyer and the seller. The buyer then constantly scans for alternatives to reduce costs, either through engaging substitutes (e.g., high-oil corn and oil substitutes) or promoting greater supply (e.g., food-grade grains).

Finally, production agriculture is fraught with risk. Endemic to grain and oilseed production is variability caused by weather, seasonality, and hemispheric differences. Buyers have scant incentive to directly engage sellers and thus avoid incorporating upstream risk into their operations. Buyers prefer, when possible, to shift risk to the farmer supplier. This risk shifting by buyers to farmer suppliers through commodity markets has not limited the number of ready suppliers, either locally or globally. The study firms, from organic buyers to livestock feeders, reveal a thick market of farmers eager to supply their needs. Also, as agro-industrial capital becomes more global the commodity supply is enhanced.<sup>4</sup>

<sup>4</sup> This is especially relevant to nonperishable commodities and in light of the rapid increase in on-farm storage in both the United States and South America.

For example, in terms of risk mitigation, when the Grocery Manufacturers Association explored how to address pharma farming in the Midwest (see Schuff, 2002 for the case of Prodigene) to serve their European clients, their response was simple. They would not invest in high-cost procurement systems with traceback in the United States. Instead they would simply move off shore with their soft contract and commodity procurement model. They appear capable of finding the competitively produced supply outside the Midwestern United States.

## 5. Managerial implications and conclusion

### Buy-side proposition

Understanding identity preservation business opportunities requires an understanding of the buy-side proposition (Table 3). While more vertical information in the agri-food supply chain is seemingly better, no entity, from first handler to the final customer (organic and pharma being two exceptions) seems willing to pay the price. Respondents did not report any inability to procure the enhanced grains and oilseeds they needed nor did they express general frustrations with the current procurement process. Critical for managers of supplying firms is to understand how procurement does or does not affect the competitiveness of the client. As numerous authors point out, most transactions are transactional, few are relational and strategic (Rackham et al, 1996; Wayland and Cole, 1997; Sherman et al, 2003), meaning that buyers are judicious about the level of investment and knowledge bundling associated with their inputs. The challenge then for suppliers is to better understand how buyers buy in order to be more targeted as they attempt to create more value and improve their pricing power and move up the half pipe.

### Supply risk and the buyer's calculus

Information is costly, so buyers balance investment in specific relationship assets with the market uplift or risk mitigation return it will generate. Buying from a competitively structured industry is beneficial as suppliers compete for buyers' businesses. After spot market transactions, the most common governance structure in the grain sector is a soft contract that involves segregated commodities and small premiums. This equilibrium whereby buyers and sellers invest few specific relationship assets reflects the current risk-adjusted value proposition farmer suppliers are delivering to end users. In the aggregate,

**Table 3. Managerial implications.**

Topic	Result	Implication
• Disappointingly low premiums	Buy-side Proposition is not well understood	Suppliers need to understand how buyers buy and the associated supply risks imparted to buyers from enhance grains and oilseeds.
• Supply Risk and the Buyer's Calculus	Non-arms length relationships with suppliers may increase, not decrease, risk relative to returns	While transaction theory posits that greater coordination/integration reduces risk, contractual relationships with grain and oilseed suppliers may in fact introduce more risk into the client's business. Suppliers need to understand the buyer's calculus and the risks of narrowing one's supply base.
• Value Creation	1. "Silk Purse Problem"  2. High internal opportunity cost of capital	1. Buyers along the supply chain seek to captain the chain, creating and capturing value.  2. Buyers weigh the ROI of investing in procurement versus other internal opportunities. Suppliers then are challenged to provide sufficient value (risk reduction or return) to allow the buyer competitive rates of returns on the procurement investment.

at this juncture, it appears buyers are willing to exchange less information for a more competitive supply base. The market appears to be working. Plenty of farmers around the world are willing to supply, and buyers appear to have access to the raw inputs they need. For farmers to move up the value chain, the challenge is not simply the creation of an improved product, but making buyers forgo the benefits of commodity supply. Though end-user benefits from enhanced grains and oilseeds exist, with even more on the horizon with the next generation of biotechnologies, their presence is not enough to guarantee farmers greater returns. End users will always balance the risk mitigation and market uplift features of a supply offering with the risks of narrowing their supply base. This is the buyers' calculus.

**Value Creation**

Given that grain and oilseed transactions for the most part are low value transactions, and supplies and suppliers are increasingly abundant globally, buyers have two structural incentives to prefer commodities to identity preserved inputs. The first is issue of rent sharing across the supply chain. All firms, not just buyers, would prefer to create and capture value rather than share value, all things being equal. This is the "silk purse" phenomenon discussed above. Each stage in the grain supply chain from life science through to manufacturing wants to captain the supply chain and be the value creator and capturer. Spot market or soft contract purchasing allows buyers to not have to share the value they subsequently create.

The second structural incentive favoring commodities over information-laden products is the way commodities help firms maximize returns from procurement investment. Discussed above was the notion that the more strategic an input, the higher up the half-pipe a supplier could move. Given the number of direct and indirect substitutes available to buyers for grain and oilseed inputs, return on procurement investment becomes critically important. A buyer with ample substitutes does not want to over invest in its supply chain. This is consistent with Transaction Cost logic and the "make or buy" decision. The respondents' logic can be described using a decision tree. They first ask: of all the investment projects the firm needs to make should such investment occur in procurement. For example, where is the marginal investment dollar best spent for a branded food manufacturer, in brand marketing or in procurement? This is back to the strategic role that grain and oilseed inputs do or don't play for food and feed buyers. If the answer is yes and ROIs are sufficient to warrant investment in procurement, then the buy-side firm asks, should such investments be directed at grains and oilseeds. Food buyers, more so than feed buyers, have a smaller portion of the end product value originates from grains and oilseeds. For example, producer prices in the US are currently 25% of retail prices for pork, having fallen 51% in the last 24 years (ERS, 2003). This would argue that over time raw agricultural products have a decreasing role in the underlying value the consumer enjoys. The third layer of the decision tree would be that if investment is warranted, should procurement be internalized where a food firm for example has its own proprietary seed and grain system or does quasi-integration

through contracting provide sufficient control and risk mitigation?

For managers these two structural features imply that rarely is one single product innovation going to transform the buyer's procurement model given the underlying low value of the transaction and the opportunity costs of capital within the firm. The buyer is not simply concerned about the grain/oilseed itself, but the bundle, the switching ease (costs) to avoid hold-ups and outages, and the opportunity costs of capital. For managers to drive value up the chain, producers and life science firms need to shift away from focusing solely on the products of the future. Instead, then need to focus on and invest in technologies, delivery systems, and organizational models that, when bundled with new products, solve end-user problems and make end users more competitive. This may involve an enhanced product but more than likely will involve an enhanced bundle that drives costs and risks out of the system.

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## Appendix 1. Needs assessment framework and questions.

Needs assessments enable the gathering of valid and reliable information from respondents by focusing on the valid and the useful (Kaufman and English, 1978<sup>5</sup>; Soriano, 1995) by means of focusing on the operational. Bias or confusion is minimized because the target is not wants, dreams, and strategic ambitions, but instead the day-to-day operational behavior of the system. In this way needs assessment is an inherently inductive approach and creates a neutral data collection environment. By compiling data about an entire system, needs emerge that are fully consistent with the underlying system. Respondents are only asked to describe and assess what they know. Deductive approaches, such as surveys or problem-based questionnaires, can not only bias responses due to their directed nature, but may contain responses inconsistent with the underlying system at play. This is particularly relevant when engaging grounded research in systems where structural change may be present, as is the case here. In such cases, history or convention may be problematic as they can interject elements inconsistent with the reality of the current system<sup>6</sup>.

There are no direct questions about risk management, particular quality attributes (i.e. non gm), governance (contracts), supply chain design, etc. The needs assessment approach allows answers to these questions to emerge from the description of the system (procurement) and the respondent's assessment of whether each activity node is performing well or poorly. All responses were maintained in strictest confidentiality. No firms or individuals were identified throughout the entire process. All respondents received a final version of a research report.

Grain Procurement Executives Needs Assessment Instrument- a semi-structured process

Objective: To understand the performance and an assessment of each procurement activity node in order to reveal buyers' needs.

1. Introduction
  - a. What are your responsibilities?
  - b. How long have you been with the firm?
  - c. For which commodities are you responsible for procuring?
2. Supplier Activities
  - a. Where do these commodities enter the company?
    - i. In what form do they arrive?
    - ii. Volumes and "packaging"?
    - iii. How often are they purchased?
    - iv. Where is title exchanged?
    - v. How are they transported?
  - b. How many suppliers are involved?
    - i. Who are examples of your suppliers?
      1. Producers, Handlers, Pre-processors
    - ii. Who do you deal with from the sell-side?
    - iii. How much trade is conducted with any one supplier?
  - c. How are transactions governed?
    - i. Describe the transaction process<sup>7</sup>.
  - d. What are the metrics and attributes of the purchase?
    - i. What sorts of performance assessments are conducted vis-à-vis the product attributes involved in the transaction?
      1. How & when do you measure these attributes?
      2. Do the metrics and attributes vary by supplier?
      3. How is product and transaction performance measured?
  - e. Describe the communication process with suppliers
    - i. What are common questions asked to suppliers?
      1. From suppliers?

<sup>5</sup> Kaufman, R. & F.W. English. (1978) *Needs Assessment: Concept and Application*. Educational Technology.

<sup>6</sup> See Goldsmith et al. (2002) for an example of where needs assessment was more effective revealing system behavior than a direct survey.

<sup>7</sup> i.e. contract

2. How do you interact/communicate with suppliers?
  - a. How often and in what form?
3. Intermediary Activities
  - a. What logistics are involved?
    - i. Types of activities
    - ii. Who manages the logistics?
    - iii. Who arranges transportation?
    - iv. How do you relate to them?
    - v. How do they relate to the supplier?
4. Internal Activities
  - a. From reception, where do the products go and how are they handled?
  - b. Is there a pre-processing stage?
  - c. If so what steps does that involve?
    - i. Where does it go?
    - ii. Who handles it?
    - iii. How long does it take?
  - d. Who is the final user?
    - i. In what form is it used?
  - e. How is the grain internally transferred?
    - i. Organizationally and physically?
    - ii. What are the metrics and attributes of the transfer?
    - iii. What sorts of performance assessments are conducted vis-à-vis the product attributes involved in the transfer?
    - iv. How is performance measured?
  - f. Describe the communication process with internal customers
    - i. What are common questions asked to them?
      1. from them?
    - ii. Direct users
    - iii. Down chain users
    - iv. How do you interact/communicate with direct users?
    - v. How do you interact/communicate with down chain users?
      1. How often and in what form?