

## **A Conversation about Value-Added Agriculture**

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### **Introduction**

Agricultural value-added initiatives have been identified as a means to help producers absorb the shocks brought about by globalization (Coltrain, Barton and Boland, 2000).<sup>1</sup> The pursuit of agricultural value-added initiatives, then, may be seen as a strategic response to the increased competition in agricultural sector and the rapid commoditization of its products. These trends themselves have been attributed to the increased globalization of trade resulting from various trade liberalization agreements involving the United States, such as the Canada-US Trade Agreement, NAFTA and the WTO (Amanor-Boadu, 2000).<sup>2</sup> Other factors influencing the commoditization of agricultural products include increasing consumer demand for convenient, ready-to-eat/cook, safe and nutritious food products and their willingness to pay premiums for such service-embedded products. The foregoing, rightly so, has extended the distance between producers and consumers, leading to the former receiving a declining share of the latter's expenditure on food (ERS/USDA, 2002).<sup>3</sup>

Although interest in value-added agriculture has been increasing, it is a concept that is poorly understood by many producers, policy makers and even academics. The paucity of understanding emanates from the fact that the concept has achieved a cliché status in a relatively short time and escaped the period of discussion and assessment necessary for ensuring effective comprehension. The concept has in recent years been used as a catch-all term when people want to emphasize a perceived improvements in almost anything – from value-added accounting (South Africa Breweries, 2002; Calhoun, Olivieri and Wolitzer, 1999)<sup>4, 5</sup> to value-added public relations (Harris, 1998).<sup>6</sup> Thus, value-added branding (Nilson, 1998), for example, is conceived of to be superior to plain branding and value-added consulting is expected to be better than ordinary consulting.<sup>7</sup> How and how much better “value-added” makes any activity it qualifies has not been discussed in the literature. Thus, value-added agriculture has been talked about as a superior form of agriculture but not much rigor has been brought to defining how to frame and measure the implied superiority.

This essay has two objectives. First, it attempts to bring some clarity to the “value-added” concept, with special attention to its application in agriculture. In doing this, we also differentiate the concept from another concept with the same name, but without the hyphen – i.e., value added – which has a longer history in economics and accounting for a long time. That differentiation will help us define how the superiority of value-added activities may be illustrated. Second, the paper attempts to provide a typology of value-added agriculture with the view of building an opportunity slate to help producers interested in pursuing such initiatives assess a broader opportunity scope.

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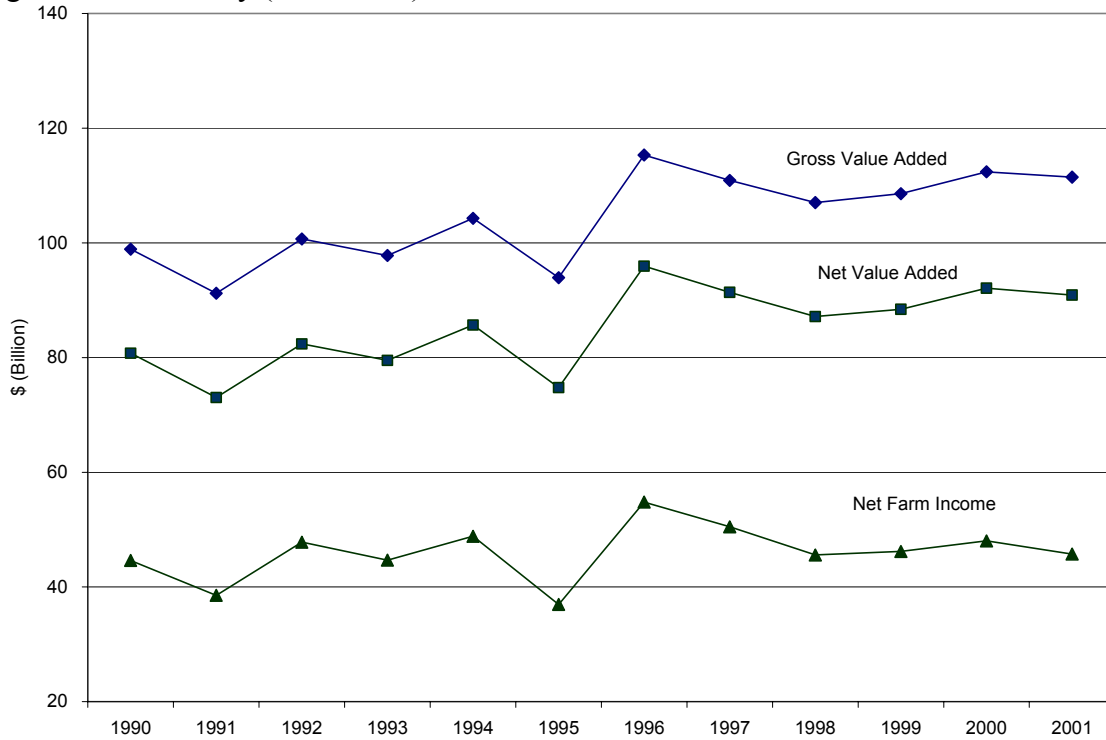
## **Added Value**

Wood (1978) illustrates the concept of added value with the example of a primitive man who went into the forest, harvested a tree and used it to build a house and some furniture.<sup>8</sup> He also indicated that the manufacturer who purchased raw materials and other services and converted them into products through the manufacturing process and sold it for more than the cost of purchased materials and services has added value in the same way as the primitive man did. And a farmer who feeds his corn to his cattle and sells them for more than the cost of seeds, fertilizer, chemicals, breeding animals and other brought-in inputs has also added value. The concept of added value is not limited to physical products but also to services. Thus, the physician, the entertainer and the beautician all add value even though they may use very little physical inputs.

Economists have long measured added value using the metric value added. It is the difference between value of shipments and the cost of all purchased inputs used in the production. Value added can be estimated at the firm level and aggregated across firms in an industry to get industry value added. When summed across all industries, we get the value added of the whole economy, or gross domestic product (Sato, 1976, Wolfe, 1999).<sup>9, 10</sup> Thus, in the words of Wolfe, value added is an important economic barometer. At the firm level, value added is defined as the gross value of output less purchased inputs and contract labor. At the industry level, it is divided into two values: gross value added and net value added. Gross value added is the value of an industry's output of goods and services less the value of its intermediate consumption of goods and services while net value added is the value of output less the values of both intermediate and fixed capital consumption (Ial, 1999).<sup>11</sup> The relationships among gross and net value added and net farm income for the US agricultural industry is presented in Exhibit 1.

Value added is, thus, a measure of the "wealth generated by the efforts and ingenuity of mankind" (Wood, 1978, p.1), and avoids problems of double counting when aggregated across firms and industries. Thus, between 1990 and 2001, we note that the wealth in US agricultural industry increased from under \$100 billion in gross value added and about \$80 billion in net value added to about \$111.5 billion and almost \$91 billion respectively, an average annual growth rate of about 1.6 percent in both cases. On the other hand, net farm income, which is net value added less payments to stakeholders (employee compensation, rents, real estate and non-real estate interest, etc.) was about \$44 billion in 1990 and only \$45.7 billion in 2001, with an estimated average annual growth rate of about 0.9 percent over the period.

Exhibit 1: Gross Value Added, Net Value Added and Net Farm Income for US Agricultural Industry (1990-2001)



Source: Economic Research Service/USDA, 2002

### Value-Added

Turning our attention now to value-added (the concept), we find that it does not lend itself to the same level of formal manipulation as value added (the metric). It is used more as an adjective, modifying activities, processes or products. Thus, value-added marketing is aimed at being different from marketing as a tall boy is different from a boy. A review of the literature however indicates that little or no attempt has been made to define the concept, much less present a way of evaluating how much difference it brings to the activities, processes and products it qualifies. For example, Harris (1998) while using the term “value-added” in the title of his book, overlooks providing a definition for it, probably because he assumed that its meaning is unambiguous. Applying the concept to marketing, Nilson (1998, p. 3) notes that “the successful company must. . . ensure that it is adding tangible and abstract values to the products and service it supplies, and in doing so ensuring that it is offering customers superior perceived value.” The USDA (2002) applied the concept to agriculture, indicating that value-added agriculture occurs whenever a change in the physical state or form of an agricultural product or the adoption of a production method or handling process leads to an enhancement in the customer base for the product and a greater portion the consumer’s expenditure spent on the product accruing to the producer.<sup>12</sup>

Using the ideas embedded in the USDA description of value-added agriculture, we can define value-added business initiatives as those in which particular members of a supply chain are rewarded for performing activities that have hitherto been performed by downstream firms in the supply chain, or for performing activities that are deemed

valuable but have thus far been overlooked by the supply chain. The size of the reward is directly proportional to the customer satisfaction engendered by the activity and not by the work or effort on the part of the organization performing.

The reward for performing activities that have hitherto been performed by or of value to others downstream in the supply chain may be higher prices, increased market share and/or increased market access. It must be large enough to increase the total profitability of the performing organization in the post value-added activity state vis-à-vis the pre value-added activity state. If the total profitability of the performing organization is not higher with the value-added activity, then the activity cannot be deemed have contributed any value to the supply chain or to customers, and thus fails to qualify as a value-added activity.

Let us clarify the foregoing with an example. Suppose a cattle producer who is a major supplier to a slaughter plant decides to sort his deliveries to a slaughter plant to increase the slaughter efficiency in the plant. Suppose also that the processor agrees to reward the producer with \$1 per head increase in price for sorting the animals such that the standard deviation of the weight and size of any group is minimized. We can assume that this is the maximum value the processor is willing to pay to benefit from the sorting activity and anything beyond that it will be profitable for the processor to maintain the status quo. As long as the total cost (variable and fixed) of sorting is less than \$1 per head, then the activity qualifies as a value-added activity. On the other hand, if it the total cost to the producer is \$1 or more per head to sort the animals, then the sorting activity fails to qualify as a value-added activity. Indeed, if the producer should perform the sorting activity, she is going to be worse off in the post-activity state than she was in the pre-activity state. Suppose the cost of sorting the cattle is found to be \$0.50 per head, then the reward for the activity is \$0.50, implying that the cattle producer's profitability has increased by \$0.50 per head. Suppose also that there is another cattle producer who decides to change his genetics and management systems so that his cattle not only have more uniform characteristics but have higher desired meat traits. Suppose the total cost of this alteration is \$3 per head and the producer is able to extract \$3.50 from the processors, leading to an increase profitability of \$0.50 per head. This means that the producer who changed his genetics and management systems is no further ahead than the one who merely sorted the cattle. That is, both producers generated the same level of net satisfaction. On the other hand, if it cost the producer who changed his genetics and management systems \$3.25 per head and he can only extract \$3.50 rent, then the producer who just sorted has created a superior customer satisfaction.

Looking at value-added business initiatives from this perspective forces a focus on the rewards emanating from the activity, instead of on the activities themselves. Thus, producers contemplating value-added agriculture can move away from evaluating activities to evaluating the net outcomes of the activities. Another important perspective the foregoing definition brings to the discussion is the dynamic nature of value-added activities. Studies show that the familiarity with a service or product over time leads to a decline in the level of satisfaction that is achieved from its use even when the service or product itself does not change (Chung, 1969).<sup>13</sup> This implies that over time, the willingness of customers to reward for the same service or product declines as their *perception* of the satisfaction generated by the product or service declines. But it is not only perception of declining satisfaction that exerts pressure on the reward level for

value-added products/services over time. For as noted by Baumol, Panzar and Willig (1982), in the absence of significant sunk costs, economies of scale and scope are neither necessary nor sufficient to sustain positive rents.<sup>14</sup> In other words, when the barriers to entry are low, e.g., low cost of imitating the value-added initiative, then the market for the value-added product/service becomes contestable (Panzar and Willig, 1977).<sup>15</sup> Contestability leads to erosion of rewards emanating from the value-added activity over time as others enter the market and present similar or superior offerings more efficiently. The foundation of contestable markets is the first mover's success: the presence of super-normal profits in a particular activity will attract competition unless there are significant entry barriers. Therefore, the grease that sustains competitiveness in value-added activities is to utilize the accrued advantage to pursue continuous innovation which contributes to maintaining customer satisfaction and increasing the entry cost for potential competitors.

### **Typology of Value-Added Initiatives**

If we think about value-added activities as those that are rewarded for performing a task more efficiently than has been performed by a downstream firm, or those that perform activities that have hitherto been ignored by the supply chain, we position ourselves to see significant opportunities for such activities. In this section, we develop a broad framework for value-added activities and focus our attention on agriculture to develop a typology of value-added initiatives that may be considered.

Coltrain, Barton and Boland (2000) suggest that there are two types of value-added initiatives: innovation and coordination. Innovation is often used in its technical sense as the introduction of new products, new processes and/or the opening of new markets. Gjerding (1997)<sup>16</sup> argues that this perception of innovation limits its usefulness in economic and management terms, pointing to the expansion of the term to cover organizational change since in many instances technical changes in processes require an adaptation of new organizational configuration of firms (Gjerding, 1996)<sup>17</sup> and even industries (Freeman & Perez, 1988).<sup>18</sup> Christensen (1992) indicated that the chain of causality is not unidirectional, since organizational change is important in order to enhance the ability of the firm to develop and exploit new products and processes.<sup>19</sup> Within this framework, then, innovation type value-added initiatives can be defined to encompass activities that improve “existing processes, procedures, products, and services or creating new ones” (Coltrain, Barton and Boland, p. 5) using existing or modified organizational configurations.

Coordination is the harmonious functioning of all parts of the system. There are often significant opportunities in enhancing the coordination of products, services, information along the supply chain to create significant rewards and enhance value along the chain. Chopra and Meindl (2003) note that a lack of coordination creates a *bullwhip* effect in which fluctuations in orders, for example, increase as one moves downstream from retailers to processors and producers.<sup>20</sup> The effect of something like the bullwhip effect is that the cost of fluctuation increases with its amplitude. This cost is exacerbated for upstream firms because downstream firms are usually able to transfer part of their uncertainty cost upstream (Cyrenne, 1997).<sup>21</sup> For example, a decrease in the price of flour at the retail level causes a larger decrease in wheat prices over time. The implication from this is that upstream firms, such as producers, have greater opportunities

in enhancing coordination systems in their supply chains. Hence, coordination-type value-added initiatives focus on the vertical and horizontal relationships among the producers, processors, handlers, distributors and retailers. In the spirit of the reward-focus framework we are using for value-added initiatives, the progenitor of the coordination must be capable of extracting a positive net benefit from the effort in order for the coordination activity to qualify as a value-added initiative.

We have identified six dimensions in which innovation and/or coordination may occur to generate value-added initiatives. They are time, location, product/service, process or methods, incentives and information (Exhibit 2). For example, innovating under the time dimension could lead to enhancing the speed with which a particular product or service is provided to increase its value for someone downstream in the supply chain. Png and Reitman (1994), looking at service time competition, observed that on average, consumers are willing to pay 1 percent more in gasoline prices for a 6 percent reduction in congestion.<sup>22</sup> The benefits of creating rewards on speed is additive because it could also lead to a higher turnover in resource utilization. An example of coordination under the time dimension is just-in-time delivery which is an inventory control system that replenishes and delivers products to a customer just as a current supply is depleted. It requires flexibility, efficiency and precision in the transportation and handling system and an understanding of the bottlenecks leading to current inventory patterns. Once the supplier and the customer agree on the bottlenecks and how the supplier can enhance efficiency with the just-in-time delivery system, value emanating from efficiency improvements and savings on inventory costs flow into the supply chain. Giving customers the types of products they want where and when they want it is very important and if a supply chain is suffering from convenience gaps, then innovating on addressing that gap can yield significant rewards. This has been the business model of 7-Eleven since its founding in 1927, and it has successfully elevated convenience to an art, focusing on what it calls the five fundamentals of convenience – product assortment, quality, cleanliness, value and service.

Exhibit 2: Typology of Opportunities in Value-Added Initiatives

<b>VALUE-ADDED OPPORTUNITY SLATE</b>		
<b>DIMENSION</b>	<b>INNOVATION</b>	<b>COORDINATION</b>
<b>TIME</b>	<b>Speed</b>	<b>Just-in-time Delivery</b>
<b>LOCATION</b>	<b>Convenience</b>	<b>Efficiency</b>
<b>PRODUCT/ SERVICE</b>	<b>Form</b>	<b>Logistics</b>
<b>PROCESS/ METHOD</b>	<b>Technology</b>	<b>Strategic Alliances</b>
<b>INFORMATION</b>	<b>Safety, Ethics</b>	<b>Information Systems</b>
<b>INCENTIVES</b>	<b>Motivators</b>	<b>Transparency</b>

Under the information dimension, it is increasingly becoming evident that a certain segment of the consumer market is interested in the safety or the ethical issues surrounding the production of their food and food products. The growth in Community Supported Agriculture (CSA) farms around the country is indicative of this trend.<sup>2</sup> Production method (organic, biotechnology, free range, etc.) are all offering opportunities for innovation while building strategic alliances to achieve specific processes offer opportunities for superior coordination that yield rewards. Innovation under product or service dimension (i.e., change in the form of the product they supply through some processing) has been the main idea of value-added agriculture for most producers. But as we see, it is only one of the many initiatives that may be pursued if one looks at the supply chain and looks for gaps under the different dimensions. Incentives are the factors that modify behavior in the supply chain, the most common being price. However, innovative price mechanisms can be developed to enhance value throughout the supply chain. For example, by structuring a productivity pricing agreement with a processor, a producer group can enhance their total net revenues while increasing the competitiveness of their customer. Enhancing transparency in the incentive systems that are implemented could lead to significant benefits, especially when one is attempting to attain a critical mass of production to access a particular market through horizontal alliances.

We have presented the typology of opportunities in value-added initiatives in a two-dimensional format simply to aid our explanation and the discussion. It is important to recognize that the opportunities are multi-dimensional in nature, where different dimensions can be combined even as the two principal types – innovation and coordination – are combined to create high value propositions. For example, a producer (or a group) can extract rewards from a processor by organizing other producers to supply specific quality and volumes of grain or livestock to deliver to a processor at specified times. This effort will encompass the time, location, product/service, production method and information dimensions under both innovation and coordination.

### **Opportunity Slate for Agricultural Value-Added Initiatives**

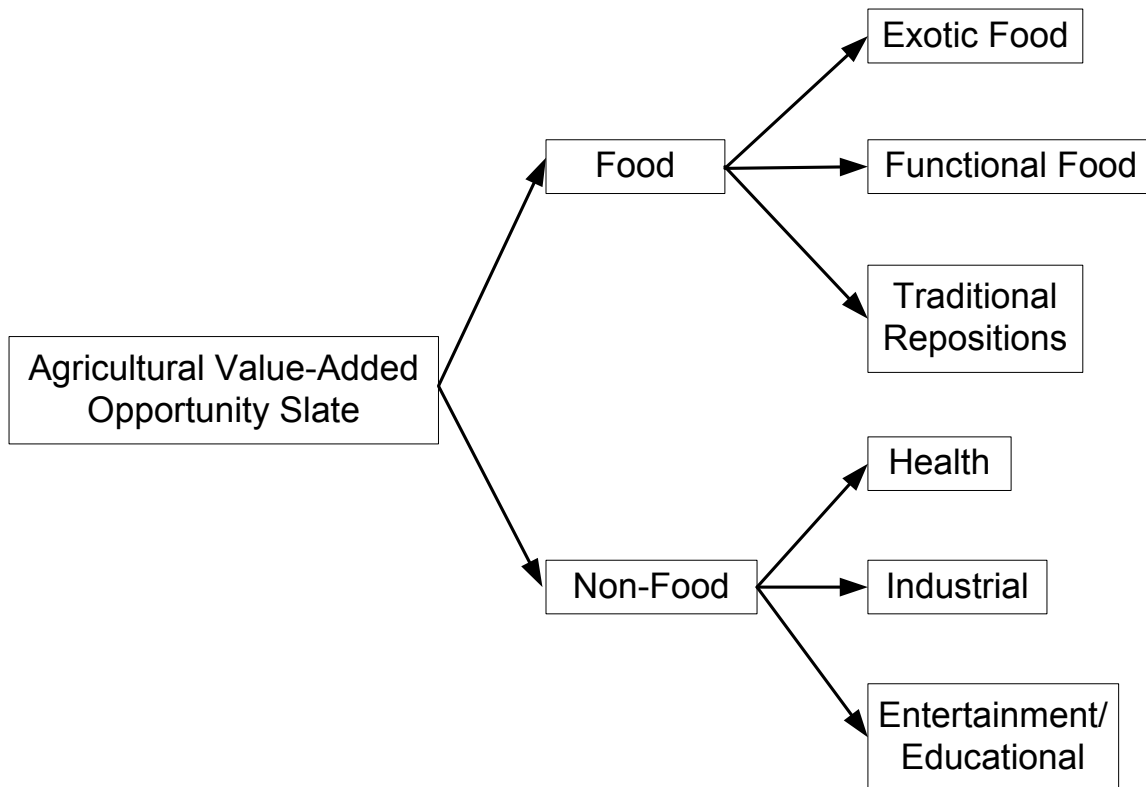
We may identify two principal categories of opportunities for agricultural industry stakeholders in search of value-added activities: food and non-food (Exhibit 3). Under food, we identify three main categories of opportunities: exotic foods (which are food products that have not been grown in the region before), functional foods (which are food products shown to have special nutritional benefits beyond calorific value), and traditional repositions (which involves new presentations for traditional food products). Under exotic foods, we believe there are opportunities for US producers to supply products that are in demand by increasing segments of the immigrant population. For example, a walk through Chinatown in any major city will present a site of exotic vegetables and fruits and some aquatic fauna, most of which are imported for the immigrant consumers. Could innovation in production methods facilitate import replacement with a superior value proposition – fresher, tastier and safer? Research initiatives supported by National Institutes of Health, and even some of the food industry stakeholders, including producer cooperatives, have been showing that certain food

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<sup>2</sup> There were about 1000 community supported agriculture farms in the US in 1999, according to the University of Massachusetts Extension and Agroecology Program (<http://www.umass.edu/umext/csa/about.html>).

products may present functional benefits beyond calorific value. Examples of these products are lycopene in tomatoes, limonoids in citrus, lignans in flaxseed and glucosinolates in cruciferous vegetables. All these products are purported cancer fighters. The Agricultural Utilization Research Center (AURI) in its January-March 2003 Ag Innovation News, pointed out that the current US nutraceutical market is \$16.7 billion and is expected to grow to \$28 billion by 2006. The growth will be driven by research and the information emanating from it will influence consumer behavior. The support of organizations such as the American Dietetic Association will also fuel demand for such products.

Exhibit 3: Agricultural Value-Added Opportunity Slate by Broad Categories



Organic foods fall under the traditional repositions category as do meat products that are cut to satisfy taste and aesthetic preferences of immigrant customers. Animal and plant sources of chemicals have been increasing with improvements in the science of biotechnology. For example, bioengineering of tobacco to express certain proteins for the production of monoclonal antibodies could create opportunities for tobacco producers who are willing to alter their production technologies and formats. Similarly, industrial use opportunities are increasing with research into various renewable or biodegradable alternatives to current products. For example, ethanol, biodiesel and other renewable energy opportunities have emerged for agriculture as society struggles with the real or perceived hazards of petroleum-based hydrocarbons. Finally, as farmers connect to consumers and present them with value offerings about agrotourism, the opportunity to extract rents from entertainment and/or educations increases. The foregoing will seem to suggest that science, emerging environmental and social problems and improving



awareness of consumers will continue expand the opportunity slate for value-added agriculture.

### **Agricultural Value-Added Initiatives: Case Examples**

A selection of the business case studies discussed by Coltrain, Barton and Boland (2000) shows that all the companies' initiatives fell under they coordination type of value-added initiatives (Exhibit 3). This is because they were all producer cooperatives which required coordinating horizontal relationships to deliver the value proposition. However, some of them innovated by opening up new markets or developing new processes or products.<sup>3</sup> For example, Phenix Manufacturing of St. Peter, MN, has developed wood-replacing material from soybeans and biodegradable plastic from corn and wheat starches as alternatives to petroleum-based products. Similarly, North American Bison Cooperative presented a new red meat product in the market.

Exhibit 4: Type of Value-Added Business Proposition for Selected Cooperatives

<b>Company</b>	<b>Innovation</b>	<b>Coordination</b>
21st Century Grain Processing Cooperative		X
American Crystal Sugar Company		X
Dakota Growers Pasta		X
Golden Oval Eggs		X
North American Bison Cooperative	X	X
Northern Lights Vegetable Cooperative	X	X
Phenix Manufacturing	X	X
Spring Wheat Bakers	X	X
US Premium Beef, Ltd	X	X
VALDACO	X	X
All Natural Beef Marketing Cooperative	X	X

Exhibit 4 maps the Coltrain, Barton and Boland case studies by their typological dimensions using the description presented of their value propositions. All the companies are involved in some form of product transformation involving the raw agricultural products produced by their owner-members. However, a few of them are also presenting process improvement. For example, while Golden Oval feeds the corn of its growers to its hens (product = feed), it also processes the eggs for industrial users, offering them the convenience of receiving ready-to-use egg ingredients. If we assume that they are able to generate a positive return on the investment they made – i.e., the layer and egg processing operations – then their operations qualify as value-added initiatives with product, time and process dimensional attributes. On the other hand, if the total return on investment is not positive, then they need to analyze where value is being lost and make the necessary adjustments.

<sup>3</sup> Brief description of the companies as presented in the Coltrain, Barton and Boland (2000) paper is presented in the appendix.

Exhibit 5: Map of Selected Companies' Value-Added Businesses by Typological Dimension

Company	Time	Location	Product/Service	Process/Method	Information	Incentive
21st Century Grain Processing Cooperative			X			
American Crystal Sugar Company			X			X
Dakota Growers Pasta			X	X		
Golden Oval Eggs	X		X	X		
North American Bison Cooperative		X	X			
Northern Lights Vegetable Cooperative			X	X		X
Phenix Manufacturing			X	X	X	
Spring Wheat Bakers		X	X			
US Premium Beef, Ltd			X	X		
VALDACO	X		X			
All Natural Beef Marketing Cooperative		X	X		X	

The foregoing shows that there are opportunities for agricultural producers in developing value-added initiatives with time, location, information and incentive dimensions because there are very few of them in operation. All Natural Beef Marketing Cooperative, for example, is marketing its products to high-end restaurants in the Kansas City area and differentiating them from other beef products by emphasizing the organic characteristics. American Crystal Sugar has implemented innovative incentive system that enhances the quality of beet sugar supplied by its growers, leading to higher productivity of the processing facility and hence higher probability of value maximization. The transparency of American Crystal Sugar's incentive system facilitates a clear understanding of the consequences of compliance and non-compliance. VALDACO, on the other hand, offers location benefits to its customers (who are also its member-owners) in the supply of superior swine genetics. It will be interesting if the company can organize the marketing of its members finished products and reap further coordination benefits.

In the foregoing discussion of the case studies, we have assumed that the companies are being rewarded by their supply chains or their markets, qualifying them as value-added initiatives. What this suggests is that it is very difficult for anyone to look at an operation and classify it as a value-added initiative without a better appreciation of the operation's financial performance vis-à-vis other firms not presenting its offerings or in comparison to its performance prior to undertaking the value-added initiatives. In other words, a true value-added initiative needs to be benchmarked against a priori activities or non-presenters.

## Conclusion

This essay was motivated by a nagging desire to develop some discipline in our discussions about value-added agriculture. The difficulty of distinguishing between the economic metric of value added and the descriptive concept of value-added formed the foundation for the framework the essay was built on. In distinguishing the metric from the concept, it became apparent that the concept should itself be structured such that it can provide more information to decision-makers to help them utilize it more efficiently. Thus, we did not deem it enough to be able to say one was involved in a value-added business; we thought it was more informative for one to be able to assess how well a particular initiative was being rewarded compared to others. This information, we argued, will help producers considering value-added initiatives to rank order and select the ones that most effectively met their financial and other objectives.

We defined value-added initiatives as those in which particular members of a supply chain are rewarded for performing activities that have hitherto been performed by downstream firms in the supply chain, or for performing activities that are deemed valuable but have thus far been overlooked by the supply chain. We pointed out that there are two principal types of value-added initiatives: innovation types and coordination types. We also suggested that there are at least six dimensions for classifying the different types of value-added initiatives: time, location, product/service, process/method, information and incentives. We then used case studies described by Coltrain, Barton and Boland to illustrate the preponderance of value-added agricultural initiatives under the product dimension and the paucity of initiatives under the information, time and location dimensions.

One of the principal challenges to the application of the result-oriented definition we have presented here is the willingness and ability to overcome the cognitive hurdle involved with transitioning into new perspectives. However, producers who are contemplating value-added initiatives especially need to make this leap so they can fully understand the effect of the initiative on their current economic situation given the new markets and new competitors as well as new industry structures, conducts and performance indicators that such transitions usually engender. While this cognitive challenge can sometimes be very difficult to overcome (Amanor-Boadu, 2000), the very success of any value-added business initiative in agriculture depends on the producer-owners effectively making this cognitive shift.<sup>23</sup> By focusing on results – i.e., improved total net benefits – producers can position themselves to see their roles in the value-added business initiative from the appropriate perspective, helping them make the necessary cognitive adjustment to their new role in the supply chain. The shift can also help producers to more effectively identify initiatives under different dimensions and organize these opportunities to maximize their reward potential and inimitability power and minimize their risks and execution difficulties.

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