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Executive Summaries

RESEARCH

Inclusion of Low Income Sectors in Latin American Agribusiness *Michael D. Metzger, John Ickis, Francisco Leguizamón and Juliano Flores*

In this paper we examine three case studies on agribusiness ventures that have included low income sectors (LIS) into value creation activities and offer new knowledge in the struggle against poverty in Latin America. While the goal for each commercial enterprise is economic profit, the cases suggest that the pursuit of this goal and of wealth creation among LIS is not mutually exclusive.

We use the agribusiness chain analytical framework (Austin, 1981) to identify the roles played by LIS in the ventures studied. We examine how LIS inclusion has influenced business models and evaluate whether it has contributed to their competitiveness. While there are many barriers to successful LIS inclusion, ranging from logistical to social and cultural, we conclude that market-based initiatives enhance the potential to create economic and social value for both the firm and the LIS in the following ways.
First, the companies studied have developed business models that are consistent with the roles performed by LIS in the agribusiness chain, offering opportunities for further integration through the performance of value-adding activities. Second, in the cases studied the LIS were transformed from day laborers into entrepreneurs. Third, while logistical barriers may be difficult or impossible to overcome, they may be mitigated with modest technological investments and by organizing producers to facilitate transportation and communications.

The cultural divide between business managers and LIS may be bridged by dialogue aimed at changing distorted perceptions. Distrust may be addressed by modifying pricing policies to encourage quality. Integration of the LIS comes with changes in what Prahalad and Hammond (2002) refer to as an ecosystem that may be defined as a network of extended business value chains and their supporting actors, and the relationships among those actors found in the informal markets of the developing world. Relationships built on these ecosystems are hard to replicate by competitors, creating competitive advantages for the firm and social value for the LIS.

Assessing the Comparative Advantage of Albanian Olive Oil Production *Ana Mane-Kapaj, Ilir Kapaj, Chan-Halbrendt, and Orkida Totojani*

The Albanian economy's transition from a centrally planned to a market economy is associated with a considerable number of structural and institutional reforms that change production and

consumption of agricultural products. Like many other agricultural products, most oil (vegetable and olive) in Albania is imported. The imports occur and has been growing is because of the inconsistent and unreliable supply of local raw materials needed by the oil processing industry to produce sufficient quantity to satisfy demand. In addition, the distribution infrastructure linking to markets is also poor. The purpose of this study is to evaluate the profitability and comparative advantage of Albanian olive oil production in relation to major producing countries.

For the fulfillment of the research objectives, the Private Cost Ratio (PCR) and Domestic Resource Costs (DRC) ratio for olive oil production within the framework of the Policy Analysis Matrix (PAM) were used. The central and southwestern parts of the country were selected for the study area as most olive trees are located there. Primary and secondary data such as olive and olive oil production and domestic prices, other input prices (water, fertilizer), import and export taxes, world prices for olives and olive oil, were used for achieving the objectives. The result indicates that olive oil production in Albania is profitable because the ratio is between the intervals {0-1}, meaning that olive oil production is profitable from the private point of view. However, the DRC ratio is 2.2 indicating Albania currently has no comparative advantage in olive oil production. A sensitivity analysis was conducted to illustrate how the PCR and DRC ratios for olive oil production change with changes in various parameter coefficients. The most sensitive parameters that affect the competitiveness of olive oil production are productivity and prices of olive and olive oil. These are the parameters that were on used to conduct the sensitivity analysis. According to the results, if the Government of Albania wishes to make Albania olive and olive oil industries more competitive with world markets more technical and marketing assistance to producers and processors is recommended.

Implementation of a Traceability and Certification System for Non-genetically Modified Soybeans: The Experience of Imcopa Co. in Brazil

Victor Pelaez, Dayani Aquino, Ruth Hofmann, and Marcelo Melo

This paper analyses the productive opportunity taken by a family-owned Brazilian soybean crusher (Imcopa) in adapting its production system for selling soy and its derivatives with non-GM certification. Four fundamental elements of reasoning were taken into account to guide the analysis of the company experience in the non-GM chain: benefit-cost ratio; information asymmetry; rationality of actors; and growth of the firm. Access to information about company was initiated through a workshop organized in November 2005 with the support of the Agricultural Secretariat of Parana State. Subsequent interviews, carried out in 2006 and 2008, were based on semi-structured questionnaires aimed at obtaining a background of the company's growth trajectory, its structure of production, investment and operational costs of the traceability and certification system, and the productive opportunities identified by company's managers which led to the decision of setting up the non-GM segregation system. Such a decision procured for Imcopa an increase in annual sales by 18 times in 18 years, from $70 million USD in 1998 to nearly $ 1.3 billionUSD in 2008. Furthermore, the possibilities of commercialization of non-GM soy and its derivatives in the international market have provided Imcopa a wider insertion into a commercial network of feed and food products. This allowed the company better rationale to diversify its activities by identifying and exploring new market niches. The reason for the creation and maintenance of a non-GM soy chain, in which Imcopa participates, was to respond to the demand created by international food companies which were not willing to risk associating their labels with GMOs. This research was sponsored by the Co-Extra (GM and non-

GM supply chains: their Co-Existence and Traceability) European FP6 Research Program (contract 007158).

Competitiveness of Zacatecas (Mexico) Protected Agriculture: The Fresh Tomato Industry *Luz E. Padilla Bernal, Agustin Rumayor-Rodriguez, Oscar Perez-Veyna and Elivier Reyes-Rivas*

The protected fresh tomato production-industry in Zacatecas has undergone accelerated growth in recent years. Free trade, market globalization, new trends in the agro-food sector, as well as the food and financial crises, are impacting its competitiveness. In this study competitiveness of the industry of fresh tomato production under protective structures in Zacatecas was evaluated to provide elements that contribute to the design of policies aimed toward development of sustainable competitiveness. Two research questions were answered by this study: Are the export-oriented production units more competitive than those that sell their produce only on the domestic market? Do the production units with a higher level of technology have more developed competitive capital?

A systemic competitiveness model was applied considering six economic levels (microeconomic, mesoeconomic, macroeconomic, international, institutional, and political-social), and the way in which each of these levels is contributing to the formation of the industry's systemic capital was determined. Moreover, a SWOT analysis for the development of systemic competitiveness was performed. The information was obtained through interviews with technicians and/or owners of the production units and complemented with interviews with researchers and government authorities. It was shown that a high level of technology is a necessary, but not sufficient, condition for achieving sustainable competitiveness.

Measuring Demand Factors Influencing Market Penetration and Buying Frequency for Flowers in the U.S. *Marco A. Palma and Ronald W. Ward*.

The demand for flowers is driven in part by demographics, seasonal occasions, purpose (i.e., gift versus self), price, and geographical differences based on regions in the U.S. Furthermore, the demand response was decomposed to market penetration and frequency of buying with penetration being the major component in the demand equation. Important differences in the demand drivers were seen across the four types of flowers (i.e., cut-flowers, flowering plants and greens, dry/artificial flowers, and outdoor flowers). Also, the drivers influenced both market penetration and frequency of buying with the level of importance quite different across the drivers within each flower type.

Demand for flowers in all forms is a direct reflection of consumer preferences and differences across the population. Measuring this demand and its two components is essential for understanding and influencing longer-term growth and opportunities for marketing flowers in the U.S. For example, for cut-flowers age and seasonality are the two demand drivers having the greatest potential negative impact on demand, followed by purpose, regional differences, and gender, which produce smaller relative effects on the number of total transactions. Furthermore, for each of these variables most of the increase in demand is attributed to market penetration. The results were used in a simulation model to calculate the potential positive and negative effects of different variables in the total number of transactions. The results point to promotion and advertising programs that target the negative effects of demographic variables to try an

increase the number of transactions. For example, in the case of cut-flowers, the age effect and seasonality negative effects probably have the most potential to gain from the big negative range; while the regions, purpose and gender have slightly lower negative impacts. The regional differences shown in the models should give guidance to better demographic regional targeting to the extent that there is flexibility in the regional selection. Finally, targeting income groups appears to have considerably less potential relative to the other demand drivers for fresh cut-flowers.

INDUSTRY SPEAKS

Defining a Strategic Agribusiness Agenda for 2010-2020 *Marcos Fava Neves and Roberto Fava Scare.*

This article addresses the importance of having a research agenda that is useful to industries, government and organizations in the future. The authors propose and share 10 topics with the research community. It builds upon the sustainability of business operations critical in the next era, 2010-2020, and the importance of considering the company as a network of relationships and contracts. These topics include: empowerment, simplicity, technology, emerging consumers and markets, integration of economy, climate and environment, risk management and network value reengineering. A research agenda is outlined for each topic.

EXECUTIVE INTERVIEW

Rabobank's Success in Uncertain Times: An Executive Interview with Frans van Bijsterveld *Richard Hooper*

The end of 2008 ushered in a severe and sweeping economic change throughout the global economy. In an Executive Interview conducted during IAMA's 2009 World Forum and Symposium in Budapest, Hungary, Frans van Bijsterveld, Global Head of Food & Agribusiness Research at Rabobank explains why Robobank is one of the few financial institutions that has not been heavily affected. Rabobank continues to remain successful in these uncertain times because of it's careful selection of customers and sole focus on Food and Agribusiness (F&A) outside of the Netherlands, as F&A is typically far more resilient than other sectors.

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Inclusion of Low Income Sectors in Latin American Agribusiness

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Abstract

We examine three case studies on agribusiness ventures that have included low income sectors (LIS) into value creation activities to reduce poverty in Latin America. While the goal for each agribusiness is economic profit, we find that this goal is not inconsistent with wealth creation among LIS. We use the agribusiness chain analytical framework to identify the roles played by LIS in the ventures studied, and we explore the ways in which LIS inclusion has influenced the performance of the agribusiness chains and contributed to their competitiveness.

Keywords: Agribusiness, Poverty reduction, Latin America

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Introduction

In recent years (Prahalad and Hammond 2002) have proposed the idea that large corporations might "serve the poor profitably" with the purpose of simultaneously developing markets in which the poor reside and reducing poverty in the developing world. The growing body of research in this field of study and practice has been referred to as the "base of the pyramid" (Hart and Christensen, 2002), or "inclusive business" (SEKN, forthcoming) in Latin America. The thrust of this work suggests that where development organizations have been largely ineffective at reducing poverty among the world's poor, the private sector may hold the key (SEKN, forthcoming). The following case studies on innovative agribusiness ventures that include low income sectors (LIS) may offer new knowledge in the struggle against poverty in Latin America. For more than forty years, Mellor and others have pointed out, with convincing data, that "agricultural growth and only agricultural growth effectively mitigates poverty in low income countries with a substantial agribusiness sector" (Mellor, 1999). Because poverty in developing countries is largely rural, any rural income increase has a disproportionate impact on global poverty (Economist, 2007). Agro-industries have created a demand for agricultural sectors to produce greater quantities of more diverse crops, and, farming employment has grown as a result (Austin, 1992). These processing industries thus hold a promise to drive agricultural growth and rural poverty reduction.

In this paper we examine three case studies on agribusiness ventures that have integrated LIS into value creation activities. These cases were developed by INCAE in collaboration with ten other Ibero-American business schools and Harvard University as part of the Social Enterprise Knowledge Network. The goal for each agribusiness is economic profit, but as we shall see in the cases, this does not imply that wealth creation among LIS is a mutually exclusive goal. Regardless of underlying motivations, the key questions we explore in this paper are,

How do these agribusiness ventures incorporate LIS into their value chains?

What factors are relevant to explaining the success of each venture?

Which of these factors are common among the three ventures in creating economic and social value?

To answer these questions, we shall use the agribusiness chain analytical framework described in the following section, which enables us to identify the roles played by LIS in the ventures studied. After having described the framework, we shall examine the three cases to understand how LIS integration has influenced the structure and performance of each agribusiness system. The final section includes a summary discussion of the success factors in each case and presents some conclusions in reference to our initial questions.

Analytical Framework for Agribusiness Chains

An agribusiness chain (Austin 1981, 3) includes the raw materials processing stage and any upstream and downstream activities. Thus, agribusiness chains include operations spanning from agricultural input production activities to end product delivery to consumers. These operations

involve the transformation of agricultural products grown on the soil and livestock-derived goods. These transformation processes vary widely, from cleaning and packing to chemical alterations, but they are all characterized by three features of their raw materials. First, raw materials are perishable and cannot be stored for long periods of time, especially fruits and vegetables. Second, most harvests are seasonal, while food product demand is usually stable. Third, farm product quality is much more variable than that of manufactured products. These traits impose logistical and operating challenges for agribusiness management and create opportunities as well as barriers for LIS incorporation as business partners.

The challenges of agribusiness coordination were first studied by Davis and Goldberg (1957), who developed a framework known as "the agribusiness commodity system," later applied by generations of Harvard Business School students to analyze case studies. In developing nations, James E. Austin (1981,1992) demonstrated the analytical prowess of this framework and elaborated a protocol to evaluate agribusiness projects. We will use the David and Goldberg framework as modified by Austin to examine strategies to integrate the LIS in agribusiness ventures as shown in figure 1.

The three major links in the chain identified by (Austin 1992) include: acquisition (field), transformation (factory), and trade (market). The first refers to product planting, growing and harvesting processes. In the factory link, these agricultural raw materials are transformed, and issues associated with end product packaging, storage and transportation to distributors are addressed. The market link handles matters relating to the identification of consumer preferences, market segmentation, demand forecasting, pricing, the choice of distribution channels, advertising and promotion, and marketing management. The tasks involved in each link are performed by primary actors –farmers, processors, distributors and other parties directly managing products. Support actors in agricultural ministries and financial institutions may provide technical assistance, loans and other services, as well as coordination elements that enable efficient product flow. Close coordination among field, factory and market links becomes crucial due to agribusiness products' seasonality and perishable nature.

The value of the Austin analytical framework lies in its ability not only to identify value activities carried out by each actor in the chain, but also to determine who holds the greatest negotiating leverage at each stage and why. Indeed, this framework complements the "five forces" industry analysis model introduced by Michael Porter (1980) –competitive pressures among rivals, buyers and suppliers, newcomers and substitute good producers, as well as the value chain with its primary and supporting activities (Porter 1985). These models prove useful for gaining a better understanding of how LIS integration in agribusiness value chains can create both economic and social value.

Methodology

Within the field of agricultural management and economics, case study research has a well-established tradition (Sterns, Schweikhardt, and Peterson 1998). When used in conjunction with a set of well defined objectives, guided by a theoretical framework, the case study methodology has a wide range of scholarly applications for analyzing agribusiness models and thereby contributing to theory building. When rigorous protocol is applied to the case study

methodology many insights not available from historical time series analysis may also be made (Westgren and Zering 1998). We now turn our attention to the specific cases studied by way of introducing each business, the barriers each enterprise encountered implementing their business models with the LIS, the practices used to overcome them, and the economic and social value created.

Latin American Agribusiness Case Studies in Social Inclusion

Nine of the cases developed in Latin America by the Social Enterprise Knowledge Network reveal a range of roles performed by LIS in agribusiness –mostly at the field link, sometimes at the processing link, and less frequently in the market. We highlight three of those cases in this paper as they typify social inclusion innovations in the critical field link of the agribusiness chain, please see Figure 1.

The case of Tierra Fértil includes the LIS as fresh and perishable product suppliers for Central American supermarket chains. In the two other cases, Irupana and the Costa Rican Entomological Supply (CRES), the LIS also provide perishable produce for downstream processing –organic grains received by Irupana from Bolivian farmers are naturally processed, while butterfly pupae (the correct term for what are commonly called "cocoons") delivered to CRES by Costa Rica's breeders are classified, packaged, and exported to exhibitors. In the case of Irupana some farmers become factory employees, doubling their wages as a consequence.

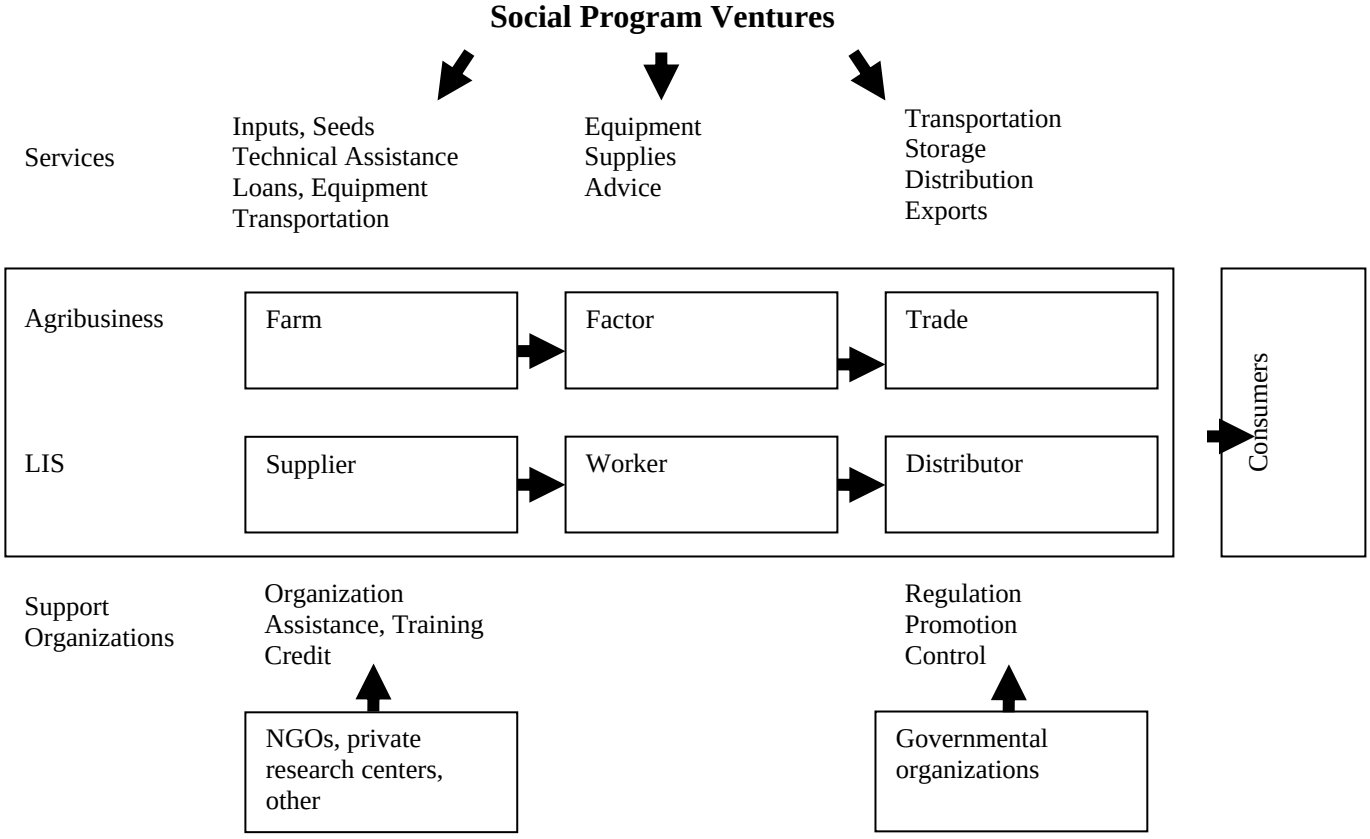

Figure 1. Participants in an Agribusiness Ecosystem

Tierra Fértil

The Tierra Fértil Program was created in 1974 by Enrique Uribe, Costa Rican entrepreneur who had founded the CSU supermarket chain, in response to increasing customer demand for freshness, variety, and hygiene in their purchase of fruits and vegetables. Previously, CSU had purchased these items in public markets, where middlemen known as "coyotes" sold produce acquired directly from small farmers, whom they typically visited with pickup trucks and sometimes negotiated the purchase terms before the crops were harvested. The farmers often accepted low prices in exchange for credit with which to purchase agricultural supplies. Tierra Fértil began by introducing safe, hygienic packaging and improving transportation, often picking up produce at small farms. This resulted in a reduction of waste in classification, packing, transportation, reception, placement on shelves from 25% to under 5%. In the 1980s, a campaign to promote rational agrochemical use was orchestrated by Tierra Fértil through an alliance with a public marketing agency, providing information and training to small farmers throughout the country. The potential for export of fresh and processed products to the United States, Canada and Europe prompted CSU to raise its quality, hygiene and service requirements even more in the 1990s, so Tierra Fértil worked with small producers to enhance production discipline and attention to planting, harvest, storage and transportation details.

As the number of CSU outlets continued to grow, it became harder for the company to manage the washing, packing, and storage operations, which required ever greater numbers of employees and more space. The company therefore made the decision to transfer these activities to the farmers, providing the machinery and materials. Farmers who failed to adjust to these heightened demands chose to leave the program, though according to a Tierra Fértil technician, many later returned because they had become accustomed to the orderly and hygienic processes, and "because we are so demanding, they are learning." CSU applied a "fair price policy," paying suppliers a price based on the statistical mode of the price paid by the nation's leading wholesale market, CENADA, plus a premium for compliance with the company's presentation, safety, and packaging requirements.

By 2007, Tierra Fértil was providing technical assistance and other kinds of support to more than 1,600 small and medium-sized vegetable, fruit and grain producers throughout Costa Rica, most of whom had no previous access to loans, technology, or markets. Tierra Fértil provided advice on what to grow and when, based on CSU's knowledge of consumer preferences. The program instructed growers on quality and timely planting, so that harvests would help to mitigate supply seasonality.

Irupana

Irupana Andean Organic Foods is a Bolivian company dedicated to the purchase and export of organic agricultural products cultivated by poor farmers of the Andean, Amazonian and Chaco regions of Bolivia. It was founded in 1987 by Javier Hurtado and his wife Martha Cordero with the intent of helping the marginalized poor of rural Bolivia through private business that provided the family farmer access to international markets, financial and technical assistance, and through "fair trade" initiatives sponsored by NGOs (non-governmental organizations) that sought premium prices for quality organic produce.

When Javier started his new venture, one of his first steps was to identify poor coffee producers in the rural communities of the city of Irupana in the Southern Yungas region of Bolivia. These coffee growers possessed farms of less than ¼ hectare and had no access to formal markets, but instead relied on informal markets which offered them few incentives to increase volume or improve quality. This changed when Javier's new company, Irupana, showed interest in contracting with them as suppliers and began to export Bolivia's first 100 percent organic coffee.

Irupana rapidly diversified its product offering and by the 1990s the company was selling 80 different types of organic products, from Andean cereals, such as quinua, amaranto, cañawa, to organic soy, honey, wheat, and a variety of fruits. Irupana paid its suppliers premiums of up to 20 percent for product quality, cleanliness, and on-time delivery for these organic products. In time, under these policies and with the provision of technical assistance, Irupana's supplier network expanded to reach over one thousand families. Irupana's distributors grew to include 18 storage facilities and 300 retail stores, as well as large supermarket chains in major Bolivian cities such as La Paz, Cochabamba, and Santa Cruz.

As Irupana approached the new millennium, the export of organic produce from Bolivia reached more than 6,700 metric tons with a value of over $10 million, principally of coffee, quinua, and castaña. With almost half of Irupana's quinua exports from 1990 to 2000 destined to the European market and another 41 percent to the United States, the growing international demand for this native Bolivian product was confirmed.

By 2006 Irupana had grown to 150 employees and worked with 1,700 family providers. The economic impact of the business on its providers included premiums of 20 to 25 percent paid to rural farmers for quality produce and on-time delivery. The relationship with Irupana represented a 50 percent increase in family income for these rural family farmers, which prior to their relationship with Irupana was on average $700 per year, and a secure and growing international market for fair trade produce.

CRES

Costa Rican Entomological Supply (CRES) was started in 1983 when Joris Brinckerhoff, then a Peace Corps volunteer in Costa Rica, was searching for a new venture idea that would contribute to the country's economic development without damaging the ecology, and breeding butterflies for export met his criteria. For seed capital he sold his car in the United States and borrowed some money from his family. An importer and wholesaler from the U.K. visited his installations and agreed to take an initial shipment of live pupae for resale to butterfly exhibitors. Boosted by this success, Joris raised an additional $25,000 among relatives and purchased land for a new company headquarters in La Guácima, a rural area near the international airport.

During its first year of operations, CRES produced all the pupae that it exported. In 1986, several employees proposed becoming independent, breeding the pupae in their own installations, and selling them to CRES. Joris accepted the proposal, and it was agreed that these new breeder-entrepreneurs would be paid a price equivalent to 70% of the export price, then $2.40 per unit. The percentage of pupae exports that were acquired from independent breeders increased from 1.2% in 1987 to 18.4% in 1990.

Word of the opportunity for gain from butterfly breeding spread rapidly in the rural areas of Costa Rica, where work was seasonal and few agricultural laborers earned the minimum wage, equivalent to $235 per month. By 2006, over 97% of the pupae exported by CRES were obtained from suppliers located throughout the country. During the rainy season from May through November, it was common for breeders to produce between 500 and 600 pupae per week whereas in the dry season, production levels of 150-250 pupae per week were more common.

For many years, CRES was the only major exporter. In 1992 a second company entered the industry, and in 2003, a third competitor began a professional advertising campaign with a message that emphasized environmental protection and concern for their employees and suppliers. In addition, numerous individual buyers such as "Andrés," "Sergio" and "Luis" were beginning to appear in the market, accepting pupae that had been rejected by CRES for cash, at giveaway prices. Costly price wars ensued, with prices collapsing 30% in 2005, but CRES recovered the following year due mainly to an increase in the volumes exported to Europe. CRES seeks to maintain leadership in the industry through the quality and variety of its products and services, permitting the company to set higher prices which, in turn, enabled it to provide adequate remuneration to the national network of suppliers that it has built up over the years. CRES offers 50 species of butterfly pupae from all microclimates of Costa Rica, where the different varieties of food plant needed to support them could be grown. Unless the client gives other instructions, CRES attempts to assemble a shipment that includes 20% of the "premium" species (Morpho and Caligo), and no more than 5% for any one of the remaining 25 to 32 species that are normally included.

Factors Contributing to Successful Inclusion

The many factors contributing to the successful inclusion of LIS by Tierra Fértil, Irupana, and CRES may be clustered into three areas. The first is consistency of the LIS with the requirements of the "business model" or way that each agribusiness system is designed to produce a profit. The second is creation by the LIS of competitive advantage over rivals. The third is execution capacity, by which the barriers to successful inclusion are overcome.

Consistency with Business Model Requirements

The inclusion of LIS was consistent with the requirements of each business model. That of CSU-Tierra Fértil is based on operations that create a superior value perceived by customers as worthy of higher prices. This supermarket chain caters to upper-middle income customers who prefer one-stop shopping and whose diet includes fruits, salads and other healthy foods. Among the few ways to stand out among their competitors is to offer, through a program like Tierra Fértil, fruits and vegetables with variety and freshness. Additional costs incurred to ensure this differentiation include: training for producers, refrigeration, transportation and handling. Higher costs are offset not only by higher prices but also by customers' choice to do all their shopping at these supermarkets rather than at competing stores.

Irupana's business model is based on premium prices that a health and ecology-conscious consumer segment is willing to pay for organic products supplied by indigenous farmers in a vast

region that encompasses the Andes, Amazonia and Bolivia's Chaco area. This model differs from that of CSU-Tierra Fértil in that Irupana focuses on a consumer segment, in both domestic and exports markets that values and is willing to pay a premium for a specific product characteristic.

The CRES business model is based on satisfying butterfly exhibitors in Europe and North America with on-time deliveries of live pupae, obtained from a network of breeders of butterfly pupae, in all micro climates of Costa Rica. The CRES business model also includes transformation activities (classification, packing and exports) that are valued by the exhibitor clients. It is innovative but replicable, and threatened by the emergence of new competitors.
In each of these agribusiness chains, LIS are fully involved not only in field operations but in an array of activities that include the transformation and, in the case of Irupana, the marketing of agribusiness products. Small farmers have traditionally been excluded from downstream activities in the agribusiness chain, separated by intermediaries and, therefore, uninvolved in supply, manufacturing and marketing operations. The engagement of small producers in Tierra Fértil, Irupana, and CRES business models has enabled their access to greater economic and social benefits.

A Source of Competitive Advantage

In the previous section, we examined how the integration of LIS suppliers in the agribusiness chains of Tierra Fértil, Irupana, and CRES was consistent with the business model of each company. These case studies also reveal that LIS inclusion has effectively contributed to the competitive advantage of the respective agribusiness systems, creating win-win situations for the LIS and the commercial firms.

The Tierra Fértil program was built in Costa Rica as a result of competitive pressures that fueled the need for a the CSU supermarket chain to ensure an ongoing supply of fresh produce to outdo competitors on superior quality, freshness, assortment, hygiene and safety. LIS integration in the system was essential, as produce variety was only attainable through the acquisition of produce from regions with diverse weather conditions and geographically dispersed small farmers. However, variety in itself is not a source of competitive advantage –it may be purchased in the wholesale market. A true competitive advantage comes from providing a combination of attributes sought by customers. This combination is hard to imitate because it requires investments in training and forging long-term relationships with LIS.

CRES, like Tierra Fértil, introduced a new business model that favored the incorporation of a LIS producers' network. Butterfly exhibitors' demand for a greater variety of species drove this agribusiness to recruit independent breeders from diverse microclimates throughout Costa Rica. Yet, in contrast to the settings where large retail chains like CSU operate, entry barriers in the butterfly farming business are low, and new competitors were able to imitate the CRES model. Now, CRES has focused its efforts on providing customers with detailed information on the geographies and microclimates where its pupae originate. This requires a close collaboration with suppliers who report these data on a continuing basis.
Irupana, a pioneer in organic product manufacture and marketing that has been broadly recognized by organizations such as the World Economic Forum, has pursued a high

segmentation strategy to concentrate on a market niche, offering a wide assortment of organic food products to a narrow segment of European and American customers. These products are elaborated with crops such as highly nutritious quinoa, amaranth, cañawa, soy, wheat and a variety of fruits grown by indigenous farmers in the Andes, Amazonia and Bolivia's Chaco regions. In a market dominated by large single-crop plantations, many subsidized by their government, Irupana targets a niche of consumers who are willing to pay premium prices for organic products with positive social and environmental impact.

Irupana´s large assortment of organic crops is made possible by means of an extensive LIS supplier network in eastern Bolivia, where land is least suitable for mechanized farming. Several governments have tried to promote farming in these mountainous, rocky regions to no avail. In fact, the lack or deficiency of natural or basic resources that prevents large scale industrial farming acts as a deterrent for competition, creating an opportunity for Irupana and its organic food business. As in the case of Tierra Fértil, this mountainous terrain turned into an advantage for the production of a vast variety of crops as a result of diverse microclimates. Indigenous farmers' physical dispersion, as well as their ancient natural farming techniques, has become a source of competitive advantage for Irupana's market segment of choice –European and American consumers who are concerned about their health, environmental sustainability and native culture preservation.

By connecting Bolivia's indigenous communities to market segments demanding broad lines of organic products, Irupana has effectively improved farmers' living conditions while preserving their cultural heritage and their traditional crops, while at the same time, avoiding negative environmental impacts. Thus, it has transformed many poor Bolivian farmers, formerly dependent on charity from governments and development agencies, into micro-entrepreneurs. In each of these cases, LIS involvement made possible the preferred access to resources that gave competitive advantage to the commercial enterprise. Moreover, this competitive advantage may be sustainable over time, because competitors are held back by an investment asymmetry: they would incur higher costs if they tried to imitate the leader since those same resources cannot be so easily accessed once the network has been established (Ghemawat 1986).

Execution Capacity: Overcoming Barriers to Social Inclusion

The three case studies describe formidable barriers to LIS inclusion, among them logistical barriers that are especially severe in the field link, lack of organization among small producers, scant technical knowledge required for growing quality farm products, and cultural distance that hindered the formation of relationships with commercial enterprises. These barriers were overcome by targeted investments in infrastructure, alliances for technical training, initiatives for building trust, and premium pricing.

Targeted investments. Effective resource allocation is a powerful key to execution (Ickis, 1997). The Tierra Fértil and Irupana cases demonstrates that even in the face of immovable physical barriers or infrastructure deficiencies that cannot be remedied with available resources, logistics can be enhanced and transaction costs reduced with modest investments in storage and technology centers. It is worth noting that Nestlé, the world's largest dairy product manufacturer, has developed a targeted investment strategy to overcome logistical barriers by building "dairy

districts," where the company invests in milk collection and refrigeration centers for small dairy farmers' production, which is later shipped to processing plants (Goldberg and Herman, 2007). Even for CRES, in a small country with an extensive road network, the installation of pick-up points for butterfly pupae on the outskirts of the capital greatly facilitated delivery for breeders.

Alliances for technical training. To overcome capability and qualification barriers, all three companies developed support programs intended to improve farmers' technical readiness and education, often through formal or informal alliances with other actors. The provision of technical training was the original purpose why CSU initiated the Tierra Fértil program. It was a major feature of Tierra Fértil, beginning with instruction on packing for delivery and gradually broadening to include the proper use of agrochemicals and environmentally safe practices. Rather than creating its own program, Irupana formed a partnership with an NGO, Prorural, to overcome poorly educated and technically unprepared suppliers through the provision of technical assistance, production process supervision and harvest planning. CRES benefitted from the efforts of InBio, another NGO, to encourage and train underemployed agricultural workers and their families in butterfly breeding.

Initiatives for building trust. Overcoming cultural distance starts with a dialog between producers and companies, sometimes aided by an NGO –as the Prorural did with Irupana. In the Tierra Fértil program, cultural differences with potential suppliers were overcome by hiring a new type of buyer, who had the market and agricultural knowledge to advise LIS producers throughout the farming process and who also possessed the ability to relate to small farmers and a disposition to go out into the field. Irupana´s partner, Prorural, facilitated dialog sessions with the organic farmers, and CRES founder Joris Brinckerhoff held regular workshops with his butterfly breeders.

Premium pricing. The cultural differences between company managers and LIS were generally addressed with greater contact and dialog among individuals. It is harder to deal with issues of distrust, often compounded by different values associated with notions such as time, manual work, interpersonal relationships, laws and loyalties (Sathe, 1985). A practice employed to build trust and proximity with LIS farmers was the introduction of pricing policies that reward growers for quality. Tierra Fértil paid premium prices for quality. CRES promoted a policy known as "fair pricing" among its suppliers and overseas customers, a policy that it sought to sustain even as world prices for butterfly pupae were falling. To offset this unfavorable market trend, the company changed its sales policy, offering customers 30% more pupae at the same price, increasing purchase volumes and maintaining overall revenues for butterfly breeders. Additionally, CRES tried to differentiate its supply with an optimum mix in an effort to safeguard higher market prices. Irupana's business model also featured a premium pricing practice. The company paid providers a 20% premium to reward product quality and on-time delivery. This enabled farmers to increase their income while enjoying recognition for their efforts.

Integration of LIS and Social Change

The practices used to overcome barriers to LIS involvement described in the previous section have often produced changes in the structure of the agribusiness chains, introducing support

organizations and other new actors through social program ventures as shown in Figure 1. Intermediaries and other actors that hindered integration of the LIS in agribusiness chains were eliminated. These changes go beyond alterations in the structure of the commercial system. In all three cases, they have resulted in the formation of networks of extended business value chains and their supporting actors, and changes in the relationships among those actors, as informal markets are replaced by contracts. Relationships built on these ecosystems are hard to replicate by competitors, creating competitive advantages for the firm and social value for the LIS. Such changes do not occur without resistance; they must be managed.

An example of social change management may be seen in the Tierra Fértil program. At the time of its inception, the Costa Rican fruit and vegetable industry featured the presence of intermediaries, known as "coyotes," who bought and resold products in traditional markets or fairs. The company initially participated in this agribusiness chain, purchasing products for supermarket distribution through these traditional channels. The structure of the agribusiness chain was altered by the arrival of new actors – NGOs that provided support, training, pricing information, and technical assistance to LIS farmers. At the same time, Tierra Fértil reached out to producers, buying directly from them and eliminating two links in the chain –coyotes and wholesalers.

The agribusiness chain for fruits and vegetables in the Bolivian altiplano, in which Irupana participated, underwent a similar structural change. The original chain was characterized by many dispersed, isolated LIS farmers at risk of exploitation by intermediaries. The structure changed with the arrival of Prorural, which, in addition to training and technical support, offered financial and organizational assistance. As a result, Irupana was able to access the producers directly, achieving greater efficiency with benefits for both the company and the LIS.

Whereas Tierra Fértil and Irupana changed the structure of existing agribusiness chains, CRES created a new chain for the breeding and export of butterfly pupae. Many of the current breeders used to be occasional farm laborers or worked in their homes. One woman, interviewed by Italian national television, described how she had begun breeding butterflies and how her husband sitting beside her in the interview, quit his job and joined her to make more money. With the exports of pupae to North American and European butterfly exhibitors, a new business emerged, bringing a new opportunity for LIS in rural Costa Rica. Many of these rural entrepreneurs have started new businesses as butterfly exhibitors or producers of framed butterflies for tourists.

In all these cases, there was a change in the structure or relationships among actors in the agribusiness chains that favored the LIS, moving them from geographical, economic, and cultural isolation to fuller participation. This has constituted social change.
These cases also illustrate the key role played by supporting agents –crucial elements in the Austin analytical framework that we have applied to the cases. These support agents include NGOs that work in areas such as technical assistance, training and credit in order to promote and facilitate LIS involvement in the agribusiness chain.

Conclusions

We can now return to the questions posed in the introduction to this study. How do these market-based initiatives incorporate LIS in their value chains? First, they have developed business models that are consistent with the roles played by LIS in the agribusiness value chain, but required the LIS to further integrate into the value chain through actively building closer relationships, rather than further marginalizing them through middlemen. Transforming LIS from "indirect suppliers" into "direct vendors" with no intermediaries in agribusiness chains is a departure from traditional agribusiness operations.

Second, what factors were relevant in explaining the success of each venture? Each commercial enterprise designed a business model that was consistent with LIS incorporation, each agribusiness chain built one or more sources of competitive advantage, and each company in partnership with other actors in the agribusiness chain developed a collective capacity that was effective in overcoming barriers to execution.

Third, these same factors were common to all three ventures: a well-designed business model, a competitive agribusiness chain in which commercial enterprise and LIS both added and captured economic value, and the creation of execution capacity that helped ensure the sustained success of the effort. Non-economic value was created through the emergence of social networks. Integration of the LIS, then, is accompanied by changes in ecosystems though the growth of complex social networks, ranging from the involvement of new actors, such as Prorural or InBio, to the elimination of supply chain links. If these changes are not purposeful, competitive advantages will unlikely arise. The cases suggest that the integration of LIS in agribusiness chains is precisely an ecosystem shift towards greater physical and social proximity as well as a new opportunity to capture shared value.

We believe that LIS inclusion in agribusiness value chains may contribute to building competitive advantage and economic value for the firm and the LIS, and non-economic value that will benefit society. This is both the most meaningful and boldest conclusion drawn from our study. We do, however, offer one caveat: greater LIS inclusion in agribusiness value chains must be well conceived, given the unique context in which they live and the firm operates.

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University Press has published SEKN's books, and Harvard Business School Publishing distributes SEKN case studies.

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Assessing the Comparative Advantage of Albanian Olive Oil Production

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Abstract

The main objective of this study is to evaluate the comparative advantage of olive oil production in Albania using Policy Analysis Matrix (PAM) method. The result indicates that olive oil production in Albania is profitable for the producers. Whereas the DRC ratio equals to 2.2, meaning that olive oil production in Albania does not have a comparative advantage for the given situation of production, prices and technology. This means that while it is profitable for private producers to manufacture olive oil for the domestic market, it does not have a comparative advantage with other EU countries.

In order for Albania to develop an olive oil industry comparable to neighboring countries with similar climatic and soil conditions, the country will need to achieve higher productivity similar to those countries.

Keywords: olive oil production, PAM, comparative advantage, Albania

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Problem Statement

The Albanian economy's transition from a centrally planned to a market economy is associated with a considerable number of structural and institutional reforms necessary for a sustainable market economy. At the beginning of the economic reform period, Albanian authorities paid special attention to strengthening the macroeconomic environment by implementing appropriate monetary and fiscal policies to decrease the budget deficit. In addition, trade liberalization policies were implemented with the goal of stabilizing Albania currency oscillations. Price controls were also eliminated as the economy was decentralized to balance the supply and demand of goods and services.

Since the 90s, Albania has gone through a series of political and socio-economic upheavals, which have adversely affected agricultural productivity and the agro-industry. This period had also impacted the balance of the foreign trade for agricultural products. Imports have increased substantially, followed by a considerable reduction of exports creating a 9:1 trade deficit for the period.

Despite the progress made, especially in terms of macroeconomic and financial stability, Albania continues to have one of the lowest levels of income per capita in Europe (Civici, 2003). In addition, there is a large income gap between rural and urban areas residents. Since the agricultural sector is about 59% of the total labor force and 25% of Albania's GDP, Albania's economic growth and political stability can be achieved though strengthening the agricultural sector. The country's current political stability along with its climatic, geographic, and cultural advantages provides the opportunity for fast and sustainable growth in the agricultural sector.

Like many of the other agricultural products, the major supply of oil (vegetable and olive) in Albania comes from imports, due to the inconsistent and unreliable local supply of raw materials needed by the oil processing industry. Furthermore, many oil processing plants were destroyed after the 1990s, and the distribution infrastructure linking to markets is poor. With current prices and expected yield, the low economic returns do not provide farmers with the incentives needed to grow oil-bearing plants.

Albania is one of the few countries in Europe, and the only country in Central East Europe, that has favorable climatic and geographical conditions for olive cultivation, and its history here is as old as other Mediterranean countries. In the process of transitioning the Albanian agriculture sector to more market oriented, olive and olive oil production will remain one of the mainstays of the agro-food industry. The main reason the olive sector will be sustained as the country develops its economy is because Albania is one of the few countries in Europe where olives can be widely cultivated due to its favorable climatic and soil conditions. Albania farmers are familiar with the cultivation of olives, and ancestors have passed on successful practices to the current generation. The olive culture is a national treasure. The demand for olive oil and table olives in the domestic market is very high. Furthermore, with technological improvement in the olive processing industry, this product could be traded in the international market. Olive farming is seasonal, with most of the labor concentrated in the winter months of the year. During this same period other agricultural activities requires little labor, making it advantageous to produce other products during the olive off-season generating more farm household income.

Objectives

The purpose of this study is to identify the comparative advantages of olive oil production in Albania relative to other major EU olive oil production countries under various price and productivity changes.

To accomplish this study's objective within the Policy Analysis Matrix (PAM) framework, the analytical methods of the Private Cost Ratio (PCR) and Domestic Resource Costs (DRC) ratio were used.

Data Collection

The central and south-western parts of Albania were selected for the study area as most olive trees are cultivated there. According to Annual Statistical Report (2006) of the Ministry of Agriculture, Food and Consumer Protection, 90% of the olive cultivation is in these areas. The primary data used in this study came from questionnaires administered to 145 olive oil processing plants and from olive producers that supply to the olive oil processing factories. Only 126 Albanian processing plants completed the questionnaires resulting in a response rate of 86.8 %. Face-to-face interviews were conducted at the processing site, as e-mailing the questionnaires for responses are difficult in Albania due to the lack of adequate electronic networks and computer-based communication skills. The survey was carried out from April to June 2006 and they were collected for the production year 2005-2006.

The questionnaires were developed based on literature review and discussions with olive oil industry experts. There were two questionnaires. The first questionnaire was developed for the olive producers and the second questionnaire for the olive oil processors. We divided the survey in this manner in order to develop a budget for the olive oil processing industry. Issues like olive production, olive prices, cost of labor, cost of water, cost of land, revenues received, and income of the processing plant were the main foci of the questionnaire. There were also questions for marketing related issues and quality of the olive oil. 60% of the questionnaires were conducted by the researchers. The remaining 40% were administered by third-year undergraduate students who were trained in the survey protocol.

Secondary data such as import and export taxes were obtained from the Ministry of Food and Agriculture (MFA), the Institute of Statistics (INSTAT) and International Fertilizer Development Centre (IFDC) in Tirana.

Methods and Procedures

In order to fulfill the main objective of the study we used the Policy Analysis Matrix - PAM framework developed by Monke and Pearson (1989), augmented by a recent development that dealt with price distortion analysis by Masters and Winter-Nelson (1995), which accounts for the valuation of nontraded inputs. The PAM has been applied to several countries (see, Agraja 2006; Khachatryan 2002, Barichello et al. 1998; Yao and Tinprapha 1995; Nelson and Panggabean 1991). The crux of the PAM has to do with the profit and loss identities that are familiar to any business (Nelson and Panggabean, 1991). The primary strength of the PAM is that it allows

varying levels of disaggregations and makes the analysis of policy-induced transfer straightforward. Along with this strength, PAM also has weaknesses, one of which is the assumption of fixed input-output coefficients. However for the case of Albania the technologies have been quite traditional and are still the same.

PAM is the conceptual approach used to analyze data and is a stylized general equilibrium and policy-oriented simulation model (Khachatryan, 2002). The model used here is of a static nature. The greatest advantage of PAM is that it allows for the disaggregation of any production activities and thus their costs. The cost components are straightforward and can be gathered at a much disaggregated level depending on the data source. In a sense, the PAM model at the plant level is quite close to a partial equilibrium analysis. In the PAM framework the indicators for policy scenarios and economic efficiency are estimated and introduced exogenously in the model resulting in relatively reliable outcomes.

The PAM however inherits some limitations and it does not examine explicitly the economic relations between sectors of the economy and dynamic effects of the policy to be studied. The PAM assumes fixed levels of certain macroeconomic variables as well. In order to minimize the weakness of the PAM, sensitivity analysis is conducted in this study allowing for variations in the world input and output prices, and macroeconomic variables such as exchange rate and agricultural policies.

The PAM method distinguishes between private and social profitability. Private profitability (shown in the first row of Table 1) is determined using the actual input and output prices prevailing in the domestic market. Private value refers to actual, observed values for revenues and costs in this study. These values reflect the prices paid or received by the farmer or paid by the processors in the agricultural system. The private prices incorporate the economic costs or values plus the effects of all distorting policies and market failures.

Social profitability, shown in the second row of the Table 1, provides a measure for the comparative advantage. Social value measures the comparative advantage or efficiency of an agricultural commodity. These values are efficient measures because the inputs and outputs involved in the system are valued at their social opportunity costs. When we talk about the private value, we also have to deal with the effect of the distorting policies which the social value eliminates.

The PAM method distinguishes between tradable and non-tradable factors, inputs and outputs. The tradable factors are commodities or services, which are imported or exported. Fertilizers, seeds and seedlings, pesticides, machinery and various containers, packaging materials and fuel are tradable inputs. Factors, which do not enter the international market, such as labor, land, capital and water are non-tradable or so called domestic factors.

Such distinction is necessary for the social value estimations also known in literature as shadow, efficiency, accounting, economic, opportunity cost/prices or value of marginal physical product. Social prices are intended to reflect the true economic value of outputs and inputs in the absence of taxes, subsidies, tariffs and quotas, price control and other effects due to government policies or market failures. The social price for an agricultural commodity is the border price – the price

at which foreign suppliers would deliver the commodity to the domestic market or the price that foreign consumers would pay domestic suppliers to deliver the commodity to their markets (Monke and Pearson 1989). In this study the Italian market is the reference market, where Albania exports most of its outputs and from where it imports fertilizers, fuel, containers, labels and other tradable production inputs. The appropriate social values of tradable outputs and inputs are given by world prices – c.i.f. import (c.i.f. Italy, adjusted for transportation and insurance costs to Albania) prices for importable goods and services and f.o.b. prices (or c.i.f. Italy minus transportation and insurance costs from Albania) for exportable goods.

The social value of the non-tradable factors is estimated by the net income is forgone because the factor is not employed in its best alternative use, or opportunity costs.

Labor costs are set by the legislated minimum wage in Albania, but the labor market generally ignores this and it is unregulated. Regional labor markets are competitive, and there is surplus of labor relative to available opportunities. The opportunity cost of labor is assumed to be reflected in the private wage.

The opportunity cost of capital utilized in this study is the Albania Central Bank's interest rate. The shadow price of water is calculated using the actual purchase price plus the subsidy. The general framework of the PAM is given in Table 1.

Table 1. General Framework of Policy Analysis Matrix

	Revenues	**Costs**		**Profits**
			Domestic	
		Tradable inputs		
			Non tradable factors	
Private prices	A	B	C	D=A-B-C
Social prices	E	F	G	H=E-F-G
Effects of divergences and inefficient policy	I=A-E	J=B-F	K=C-G	L=I-J-K
p^p_i, p^s_i	private and social prices per unit of the i^{th} output;			
p^p_j, p^s_j	private und social prices per unit of k^{th} domestic factor;			
a_{ji}, a_{ki}	input-output coefficients			
π^p_i, π^s_i	private und social profits per unit i^{th} output;			
D-Private profits		J-Input Transfers		
H-Social Profits		K-Factor Transfers		
I-Output Transfer		L-Net Transfers		

Source: Monke and Pearson (1989)

From the PAM results, there are different indicators of profitability and comparative advantage that can be measured like, Private Cost Ratio (PCR), Domestic Resource Cost (DRC), Nominal Protection Coefficient (NPC), Effective Protection Coefficient (EPC), and Profitability Coefficient (PC). Only two of the indicators in the PAM structural model are the focus of this study - Private Cost Ratio (PCR) and Domestic Resource Cost (DRC). The estimation of these two indicators will help us determine if olive oil production in Albania is profitable and also whether the country has a comparative advantage over neighboring countries.

The empirical application of the Policy Analysis Matrix (PAM) begins with an assessment of revenues, costs, and profits using private (actual market) prices. Data on private revenues and costs are entered in the top row of the PAM, often termed the "private row." The private cost ratio (PCR) explains the ratio of domestic factor cost (C) to the value added in private prices (A-B). This ratio demonstrates the ability of the production system to cover the cost of the domestic factors and continue to be competitive. This ratio is important for investors because they can optimize their profits by minimizing the costs of tradable inputs and factors. If the PCR ratio is between 0-1 this means that producing the agricultural goods is profitable for the farmer, where as if the ratio is greater or less than this range the farmer makes no profit.

(1) PCR = Cost of non tradable inputs / (Revenues - Cost of tradable inputs) = C / (A-B)

or

(2) $PCR = \Sigma_k a_{ki} p^p_k / (p^p_i - \Sigma_j a_{ij} p^p_j)$

The second step in the empirical application of the Policy Analysis Matrix (PAM) is an assessment of revenues, costs, and profits in social (efficiency) prices. Data on social revenues and costs are entered in the middle row of the PAM, commonly called the "social row." To estimate the comparative advantage of a commodity, in this case the production of olive oil, this study utilizes the DRC estimation described by Monke and Pearson (1989) as a ratio of the opportunity cost of domestic factors of production per unit of value added in world prices. The DRC ratio is calculated using the formula:

(3) DRC = Cost of non tradable inputs / (Revenues - Cost of tradable inputs) = G / (E-F)

or

(4) $DRC = \Sigma_k a_{ki} p^s_k / (p^s_i - \Sigma_j a_{ij} p^s_j)$

The value of the DRC ratio indicates whether the production of a commodity has a comparative advantage for a given country. It estimates the efficiency of the use of domestic resources to save (or earn) one unit of foreign exchange. The interpretation of the different DRC value is given in Table 2 below:

Table 2. Interpretation of DRC Ratios

DRC Ratios	Interpretation	Conclusion
DRC = 1	The economy neither gains nor saves foreign exchange through domestic production	Economy in balance
0 < DRC < 1	Value of domestic resources used in production is less than value of the foreign exchange earned or saved	Comparative advantage
DRC > 1	Value of domestic resources used in production is greater than value of foreign exchange earned or saved	No comparative advantage
DRC < 0	More foreign exchange is used in production of a commodity than the commodity is worth	No comparative advantage

Source: Khachatryan, 2002.

Because productivity and price change due to technological advances and supply and demand balance, sensitivity analysis varying price and yield was carried out. Sensitivity analysis is a good tool for revealing the changes in the comparative advantage when specific parameter changes. It can be used to assess the effects of possible changes or errors in the evaluation of technical coefficients of the production budgets, or errors and fluctuations in the market prices. The sensitivity analysis parameters for this study are yield and production and world reference prices of olives. The DRC ratio was calculated by changing the values of the basic model parameters (prices and production) by ±5, ±10, ±15 and ±20% to assess the impact of possible changes due to fluctuation in these parameters.

Results

From the PAM analysis we have first developed the budget for the olive oil production. (Appendix 1) The budget is presented in two main columns, representing the private and the social price. All revenues and costs of production are measured in private and social prices, reflecting the main components of PAM matrix. Also an important point of the budget construction is the disaggregation of the cost in tradable and non tradable. Tradable inputs are goods traded internationally. Domestic factors refer to land, labor and capital.
From PAM construction we have the following results:

Table 3. Results from PAM Analysis for Olive Oil Processing Industry, in Albanian Lek

	Revenues	**Costs**		**Profits**
		Tradable inputs	Domestic factors	
Private prices	8,575,000	5,314,416	2,292,596	967,988
Social prices	4,645,526	2,890,997	3,897,996	-2,143,467
Effects of divergences and inefficient policy	3,929,474	2,423,419	-1,605,400	3,111,455
DRC = 2.2				
PCR = 0.703				

Private Cost Ratio

From the calculation of the collected data, the following results were obtained:

PCR = 2,292,596 / (8,575,000 – 5,314,416) (in Albanian Lek)
PCR = 0.703

The result indicates that olive oil production in Albania is profitable because the ratio is between the intervals {0-1}. This indicate that producers have positive financial incentives to continue or to expand production

Domestic Resource Cost

From the calculations using the survey data, the DRC ratios are:

DRC = 3,897,996 / (4,645,526 – 2,890,997) (in Albanian Lek) = 2.2

The DRC ratio equals to 2.2 which shows that Albania currently has no comparative advantage in the olive oil production. The estimated DRC ratio indicates that the value of domestic resources used in the production of olive oil is more than the value of foreign currency earned.

Sensitivity Analysis

As the PAM is a static model which cannot capture the potential changes in prices and productivity, these results are subject to change with market conditions. For example, changes in either international prices or parity prices of tradable inputs can change the values of DRC. The sensitivity analysis illustrates how the PCR and DRC ratios for olive oil production react to various parameter changes and how olive production and olive oil prices can alter the PCR and DRC ratios. Based on the results above and assuming that is the real situation of these parameters in Albania, we change the parameters by ±5, ±10, ±15 and ±20%. Table 4 shows what the changes in the PCR and DRC ratios are when the productivity parameters were changed by the above percentages.

Table 4. Sensitive analysis by changing the olive oil yield

	DRC ratio for olive oil	**PCR ratio for olive oil**
Base scenario	*2.2*	*0.703*
-20%	4.7	1.48
-15%	3.97	1.3
-10%	3.1	1.25
-5%	2.7	0.91
+5%	2.15	0.62
+10%	1.98	0.59
+15%	1.7	0.5
+20%	**1.45**	**0.46**

Source: Adapted from Nguyen 2004, computed data

We have an improvement in the scenario (+20%) as expected, where the PCR ratio is still in the interval {0-1} so the product is still profitable if production increased by 20%. While the DRC ratio has decreased considerably, from 2.2 in 1.45, it is still not in the range of {0-1}, where it has a comparative advantage. When changing the production by -20%, Albania olive production is not profitable to farmers and of course does not have a comparative advantage.

The results of a second scenario of changing the olive oil price by ±5, ±10, ±15 and ±20% can be seen in Table 5. In this case, the DRC ratio is 1.0 suggesting that when olive prices increased by 20% Albania's olive oil industry has a comparative advantage. Furthermore, even when price decreases between 5-9%, the product is still profitable.

Table 5. Sensitivity analysis by changing the olive oil price

	DRC ratio for olive oil	PCR ratio for olive oil
Base scenario	*2.2*	*0.703*
-20%	3.2	1.52
-15%	2.9	1.31
-10%	2.71	1.07
-5%	2.4	0.89
+5%	1.97	0.61
+10%	1.5	0.49
+15%	1.33	0.41
+20%	**1.0**	**0.39**

Source: Adapted from Nguyen, 2004, computed data

Conclusions

Currently Albania is importing the majority of its food fats, even though it has considerable potential to be self-sufficient. In 2006-2007, 42 thousand hectares were planted with olives, with a total of 3.6 million olive trees. Because of suboptimal care and management of the trees, Albanian olive production has grown very slowly and exhibited very high yield fluctuations, when compared to neighboring countries. The insufficient olive supply affects the oil processing industry, resulting in low output and low quality of olive oil.

Using the data taken from the 126 olive oil processing plants, PAM analysis indicates that olive oil production is profitable. The Private Cost Ratio was estimated at 0.703, meaning that production is profitable for the country's private enterprises.

However, the results of Domestic Resource Cost analysis indicate that Albania does not have a comparative advantage in the olive oil producing industry, at least for the 2006-2006 production years. The calculations resulted in a DRC = 2.2. This means that it is not socially desirable for the country to produce and expand olive oil production in Albania, as the use of domestic factors is not efficient in economic terms. Comparing the two values of the above ratios, in the given situation olive oil production seems to be profitable within the country with actual market prices, but not with social prices. In other words olive oil production is profitable for the farmer/producers but it is not profitable for the country to produce it, under given local and international prices.

According to the sensitivity analysis, parameters like olive oil quantity and olive and olive oil price are very important in the final analysis of private and social profitability of the olive oil production in Albania.

Changing parameters in the sensitivity analysis shows that increasing the olive oil production and olive oil price in the industry, the domestic resource cost ratio enters in the interval values in which we can say that olive oil production is competitive in Albania. In order to make the olive

oil industry globally profitable, there is a need for state policy intervention. The government should invests in more research to increase productivity, marketing and decrease input costs subsidies to producers.

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Implementation of a Traceability and Certification System for Non-genetically Modified Soybeans: The Experience of Imcopa Co. in Brazil

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Abstract

This paper analyses a productive opportunity taken by a family-owned Brazilian soybean crusher (Imcopa) as it adapted its production system to sell certified non-GM soybeans products. Imcopa was Brazil's first soybean crusher to implement a non-GM soybean traceability and certification system, in 1998. It is now held to be the world's largest non-GM lecithin exporter. The analysis adopted here is based on a microeconomic perspective of productive opportunities identified by the firm, which goes beyond a simple balance-sheet approach. Four fundamental elements were used to guide the analysis: benefit-cost ratio; information asymmetry; bounded rationality; and company's growth. The possibility of selling non-GM soy and soybean products on the international market has provided Imcopa with access to an even broader commercial network of feed and food products. This has given the company a better outlook on why it should diversify its activities and intensify its pace of growth.

Keywords: non-GM soy, cost, benefit, traceability, certification

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Introduction

Imcopa – Importação, Exportação e Indústria de Óleos Ltda. was Brazil's first soybean crusher to implement a soybean traceability and certification system for non genetically-modified (non-GM) soybeans and products in 1998. As a pioneer, the company has expanded rapidly over the past decade, with invoicing up from $70 million USD in 1998 to nearly $1.3 billion in 2008. Growth came not only from the emergence of a profitable non-GM food market niche, but also from the identification and exploitation of new production opportunities related to that niche.

This article analyses Imcopa's experience in implementing a traceability and certification system for non-GM soybeans and products. Our analysis goes beyond a neoclassical approach based on an economic-financial diagnosis for a company seeking to optimize its resources in a substantive rational manner. We set out to shed light on a medium-size, family-owned company's decision-making process in a market dominated by major transnational's and how investments could create a novel market niche for both domestic and export markets. While this market niche was being created there was a lot of incertitude concerning non-GM labeled products and the viability of investments, despite the fact the social resistance against genetically modified organisms in Europe became a central issue in the international trade between the United States and the European Union. In such context, this study follows the company's decision making logic in the context of uncertainty by which the agents looked for new productive opportunities.

We use an analytical framework that examines the costs and benefits of a given investment in which the parameters for decision making evolve with short-term and structural changes in supply and demand. These changes are caused mainly by the dynamic nature of technology; a company's learning process, the discovery of new opportunities for production and institutional changes regarding the regulation of technology. Our analysis discusses four major aspects, by following an historical approach of the company: the bounded rationality of players in decision making; the asymmetry of information related to an uncertain environment; the business benefit-cost ratio; and the production opportunities identified by the firm based on the entrepreneur's own image of the environment in which he operates.

The data collected for this study came from interviews with Imcopa's Director of Operations in three different periods: first in 2006, as part of a survey done by the Co-Extra Consortium[1]; and then in 2008 and 2009, in order to update and expand the company's experience in a new situation as the non-GM soybean market has consolidated both domestically and internationally.

Section 1 presents a brief theoretical review relating to a firm's investment decisions under conditions of uncertainty and asymmetry of information, in the specific context of the food market. Section 2 describes Imcopa's profile as a producer before and after the implementation of its system for tracing and certifying non-GM soybeans and soybean products. Section 3 briefly characterizes the tracing and certification system and then identifies major cost and benefit factors associated with its implementation. Section 4 presents some closing considerations.

[1] Co-Extra (GM and non-GM supply chains: their Co-Existence and Traceability). European FP6 Research Program.

Information Uncertainty and Asymmetry in the Food Market

The commercial release of GM soybeans in the US and the EU in the late 1990s gave rise to a period of intense controversy on risks inherent to the production and consumption of genetically modified organisms (GMOs). That controversy was enhanced by the spread of Bovine Spongiform Encephalopathy (BSE) in several European countries, which revealed the questionable and unaccountable criteria used by expert committees responsible for analyzing, managing and communicating food-related risks (Miller 1999; Millstone and van Zwanenberg 2001).

The rejection of regulatory agencies' risk analyses by consumer and environmental organizations in several European countries led governments to withhold the approval of GMOs. EU-wide harmonization policies adopted from 1992 to 1995 were destabilized by de facto moratoria declared by certain governments against the adoption of GMOs in their countries (Morris and Adley 2000) [2]. Likewise, in Brazil, an attempt by the National Technical Biosafety Commission (CTNBio) to rush through the release of Monsanto's GM soybeans in 1998 was held back by court injunctions obtained by the Brazilian Consumer Defense Institute (IDEC) and Greenpeace Brazil. During the next seven years, as ensuing litigation proceeded through courts, Brazil experienced large-scale debates over the risks and benefits to farmers and consumers of adopting GM soybeans[3].

Resistance against the release of GMOs in several European countries and the 2000 approval of labeling rules for food containing GMOs in the EU were decisive factors in the decision by major supermarket chains and food-industry groups to keep GMOs out of their product lines. Actually, uncertainties arising from controversy over the risks and benefits of producing and consuming GM food reflect a contemporary quandary, most prevalent in developed countries, that goes beyond quantitative food security, to qualitative safety aspects of the food supply. Meanwhile, with the expansion of global trade, particularly within new economic blocs, the harmonization of plant-health controls has become an enduring and complex problem.

In the context of expanding international trade it is important to note that food products are no longer produced and consumed in the same country, thus compromising the enforceability of national food safety regulations, which have no cross-border efficacy. Responsibility for enforcement has actually been shifting from the public to the private sphere. The World Trade Organization (WTO), supermarket chains and some food corporations have begun to set and implement food quality standards nationally and internationally[4]. Increasingly, concentrated retail markets entail supermarket chains covering multi-country regions in which the same products are provided by a single supplier. On the other hand, this geographic reach can also increase the diversity of products offered by chain stores. Consequently the impact of any food

[2] In 2000, the EU required labels for food with over 1% of its content consisting of GMOs (Regulation 49/2000). That limit was lowered to 0.9% by the Regulation 1829/2003.
[3] The legal deadlock was removed with the new 2005 Biosafety Law in, which permanently legalized illegal GM soybean crops, which were widespread mainly in Rio Grande do Sul. The illegal spread of GM soybeans in that State was facilitated by its common border with Argentina, where they were widely used and from where many growers smuggled seeds into Brazil. On this process, see Pelaez and Silva (2009) and Pelaez (2009).
[4] On this matter see also Braithwaite and Drahos (2001).

safety problem is no longer a concern just for the small geographic area served by a supermarket, but for the entire area covered by the company's chain stores. This fact increases the exposure of retail chains to liability for harm and also the risk of harm to its own reputation. Major retail chains thus tend to be leading players in the implementation of traceability systems, in order to identify failures in quality control throughout their supply chain as well as identifying responsibilities for any harm caused by shortcomings in their food quality-control systems (Hatanaka, Bain and Bush, 2005).

Consequently, "third-party certification" (TPC) has emerged as an important institution to certify the quality of products offered for sale. According to Deaton (2004), third-party certifiers provide market signals concerning food quality claims. The strategic role of such signals is to reduce information asymmetry, the importance of which is growing in the perception of societies whose political agenda includes debating the inherent risks of adopting new technologies.

According to Loader and Hobbs (1999), the asymmetric distribution of information in the food market gives more information on product quality to sellers than to buyers. This is because food is no longer a commodity whose features can be observed simply by visual inspection. Food products have become a specialty commodity whose quality-related features often can only be perceived when they are consumed. For these authors, impacts of information asymmetry in the food market can be handled in three, non-mutually-exclusive ways. The first solution is to introduce certification and labeling systems to assure product quality and safety firm-by-firm. The second solution is to implement a legal framework to assure labeling and an adequate level of quality control for food. The third solution is to have laws that hold companies accountable for food-safety failures, allowing them to be targeted by civil suits to establish liability and redress. Such measures tend to make companies more concerned about assuring the safety of the food products they market.

Similarly, Tanner (2000) observes that companies with certified food products can enjoy several advantages: less risk of food-safety liability suits; a stronger defense through detailed assessments and inspections of the company (due diligence); a greater ability to comply with legislation; achievement of competitive advantages; ease of access to markets; national and international acceptance; lower costs and higher profits; lower insurance costs and more effective management.

These advantages go beyond the distribution and manufacture links in the production chain to include farmers, final consumers and society at large. Advantages here include: lower production costs and prices for final consumers; higher-quality products and more value added; less chance for fraud by buyers who often make misleading claims about low-quality products; access to new markets; good labor practices including safer working conditions and better wages; enforcement of environmental recovery and preservation standards.

Another important advantage of traceability and certification systems is that it gives agents a chance to identify new production opportunities. The recombination of productive resources required to implement these systems involves the creation of new services, which can allow new market segments or niches to emerge. Consequently, new opportunities identified by agents will provoke a reworking of their own productive resources. Quality decisions made by entrepreneurs

thus depends upon identifying production opportunities a firm can seize, based on their ability to reorganize existing resources. A firm's behavior regarding productive opportunities is guided not only by objective facts, but ultimately by expectations created by entrepreneurs regarding possibilities for growth (Penrose 2006). Diversification or differentiation of products through traceability and certification system expanded this firm's potential for growth, while opening up new social and economic networks. In this new relational environment, agents' decisions tend to vary depending on new elements that influence their own image of the environment and the decision-making process itself (Boulding 1961; Loasby 1976; Callon 1998). To the extent that rationality, or the agents' decision-making process, depends on the environment in which they operate, their positioning along the chain (or multiple chains) of production also tends, in turn, to generate information asymmetries.

Overview of Imcopa's Production

Founded in 1967, Imcopa is a medium-sized, family-owned company with approximately 450 employees, located in the State of Paraná, in southern Brazil. The company's soybean crushing capacity is around 2 million tons/year, or 5.5 tons/day, and 98% of its output is exported. It owns three soybean processing facilities, two of them located in soybean production areas and the third about 70 km from the country's main soybean export port (Paranaguá).

The crushing of 2 million tons/year yields approximately 1.5 million tons of soybean meal, with 44-53% protein content. Twenty-four percent of that output (360,000 tons) is high-protein meal (60-70%). It also produces around 240,000 tons of refined oil, 20,000 tons of lecithin[5] (emulsifier), 230 tons of tocopherol (a precursor to vitamin E), 28,000 tons of molasses extracted from soybean meal and 7,000 tons of ethanol, obtained through fermentation of the molasses (Table 1).

Table 1. Soybean Products, Imcopa, 2008

Products	Total Annual Production
Processed soybeans	2.0 million tons
Meal	1.5 million tons
High-protein meal	360,000 tons
Refined oil	240,000 tons
Lecithin	20,000 tons
Fatty acid (tocopherol)	230 tons
Molasses	28,000 tons
Alcohol	7,000 tons

Source: Traver (2008)

Imcopa estimates the total world demand for lecithin is at around 50,000 tons/year, meaning its 20,000 tons produced in 2008 accounted for 40% of global consumption. Only 20-22% of the lecithin is sold on the domestic market. Imcopa meets a major share of Nestlé's demand for lecithin, and 100% of Kraft's demand, in addition to sales to other major food companies. The decision to initiate the non-GM certification program by Imcopa was mainly motivated by

[5] Obtained from oil seeds, lecithin has an emulsifier property valuable as a food ingredient by providing stable and smooth mixtures of oil and water in processed foods such as chocolate bars, candy bars, biscuits, snacks and baby food.

Nestle's demand for non-GM lecithin which is an important ingredient added to several industrialized food products. This demand is a preventive strategy adopted by several big food companies in Europe who consider this kind of food content a commercial risk because of the consumer's resistance to accepting GM food products. Imcopa was the first company in Brazil to launch non-GM certified soybean oil. Approximately 99% of the oil and 97% of the meal is exported. Thus, Imcopa exports non-GM soybean and products to more than 250 clients[6] in over 30 countries[7] (Traver 2006).

Imcopa works with about eleven co-operatives who supply 80% of the soybeans bought by the company. Six co-operatives provide about 70% of the volume used by the company. Imcopa partners with individual farmers and wholesalers who do the segregation of non-GM soybeans. The company is located in Paraná, Brazil which is the largest soybean producing State with around 20 million tons/year. Imcopa has several logistical advantages which include proximity to production, the presence of adequate infrastructure to move raw material to the processing facilities and easy access to the main export outlet, at the Port of Paranaguá.

In addition, during the period of most heated debate on advantages and disadvantages of adopting GMOs in Brazil (1998-2005), the State of Paraná strongly resisted the approval of GM crops. This involved the State government's control and enforcement activities to prevent the illegal planting of GM varieties, as well as commercial strategies by several co-operatives seeking to create a market differential by implementing their own systems for non-GM soybean identity preservation and certification[8]. When the decision was make to implement the traceability system in 1998, Imcopa was well positioned geographically near large supplies of non-GM soybeans, available for virtually no premium to local farmers. This gave Imcopa large profits during the initial phase of implementation of the non-GM soybean certification system.

The Traceability and Certification System

Imcopa's traceability and certification system was set up in 1999 by Genetic ID, an American company specializing in GM analysis and detection. That same year, Genetic ID and Law Laboratories, a company specializing in quality control and the legal compliance of food products, formed a partnership which created, Cert ID Ltd. Company. They began certifying Imcopa's non-GM products.

Imcopa's traceability and certification system is made up of four stages related to the successive activities of soybean production and marketing:

i) production and multiplication of seeds
ii) production of grain
iii) industrial processing
iv) delivery for export

[6] The main client companies are Nestlé, Kraft, Unilever, Porters, Grampian, Amadori, Martini, Danone, Carrefour, Tesco, Asda, Agravis, Ewos, Mitsubishi, Nutreco, Solae, Cargill, Bunge, Barry Callebaut, Fenaco and Degussa.
[7] The main countries are France, Germany, Belgium, Holland, Denmark, Norway, Finland, Sweden, Switzerland, Austria, UK, Scotland, Ireland, Italy, Greece, Japan, Korea, New Zealand, Australia, Argentina, Chile, Uruguay, USA and Canada.
[8] On this process see Pelaez and Albergoni (2004), Brehm and Pelaez (2008) and Nascimento and Pelaez (2008).

Production and Multiplication of Seeds

In this stage, Imcopa inspects and validates the entire process of seed production and multiplication for its suppliers, through the following activities:

- Seed production: The original seeds are produced by companies accredited by the Ministry of Agriculture. The purchase, testing and distribution of these seeds to co-operatives are monitored by Imcopa. All original seeds are tested by the co-operatives or purchased with non-GM certificates.

- Seed distribution for multiplication: Imcopa monitors the distribution of original seeds that are multiplied by co-operatives for later distribution to farmers.

- Seed planting: Seed planting is supervised by the co-operatives' own agronomists and is validated by Imcopa.

- Seed harvest: The harvesting process and seed-storage in silos are monitored by the co-operative and validated by Imcopa.

- Distribution of seeds for soybean production: After storage, the seeds are classified and packed for distribution. The documentation is validated by Imcopa and delivered to the farmers for planting.

Grain Production

During grain production, in addition to inspection and validation of the process, Imcopa carries out tests to assure the soybeans' non-GM identity, as follows:

- Planting: Seeds are delivered to the farmers by their cooperatives, to be planted. The process is monitored by the cooperatives and validated by Imcopa.

- Harvest: The harvest is monitored through strip tests[9] done by Imcopa.

- Transportation to silos at the cooperatives: Chronologically-numbered samples are collected from each truckload. One composite sample for each five trucks is homogenized and strip-tested. If the test is negative for GMOs, the trucks are unloaded. If the test is positive, all the samples are tested individually to identify the specific truck with GM material, which is rejected. Another composite sample, for an entire day of grain deliveries, is tested by the co-operative.

- Transportation from the silos to Imcopa facilities: During this stage, chronologically-numbered samples are also collected from each truckload. To avoid contamination, all

[9] "Strip tests" or immunochemical tests are used, among other purposes, to identify GMOs. The method uses antibodies to find a GMO molecule. If found, it reacts with the antibody and changes the color of the strip thus indicating the presence of GM material. It is a quantitative method that provides a quick result (in about 5 minutes) at low cost (around US$ 6 per strip) (Grainnet, 1999).

trucks are cleaned with air spray guns before they are loaded. A composite sample from five truckloads is homogenized and strip-tested. If the test is negative for GMOs, the trucks are unloaded. If the test is positive, all the samples are tested individually to identify the specific truck with GM material, which is rejected. The samples are kept for 360 days. Another composite sample, for each seven days of grain deliveries, is sent to be PCR-tested[10] at an accredited laboratory.

Industrial Processing

During this stage, samples are collected every two hours, as soybeans are unloaded into the processing plant. Twice weekly, composite samples are PCR-tested at an accredited laboratory. Samples are also collected every two hours from the meal, oil (crude and refined) and lecithin units of production. For meal and refined oil, the composite sample of the day is tested for GMOs, in addition to physical-chemical tests. For crude oil and lecithin, the composite sample of the day only undergoes physical-chemical tests. These composite samples are stored for one year.

For meal and crude oil, the composite sample is PCR-tested fortnightly at an accredited laboratory. This procedure is applied to refined oil and lecithin every seven days, and the lecithin also undergoes microbiological tests. This stage thus requires only that the company have the trained personnel and the kits needed to carry out the tests for GM material.

Dispatch for Export

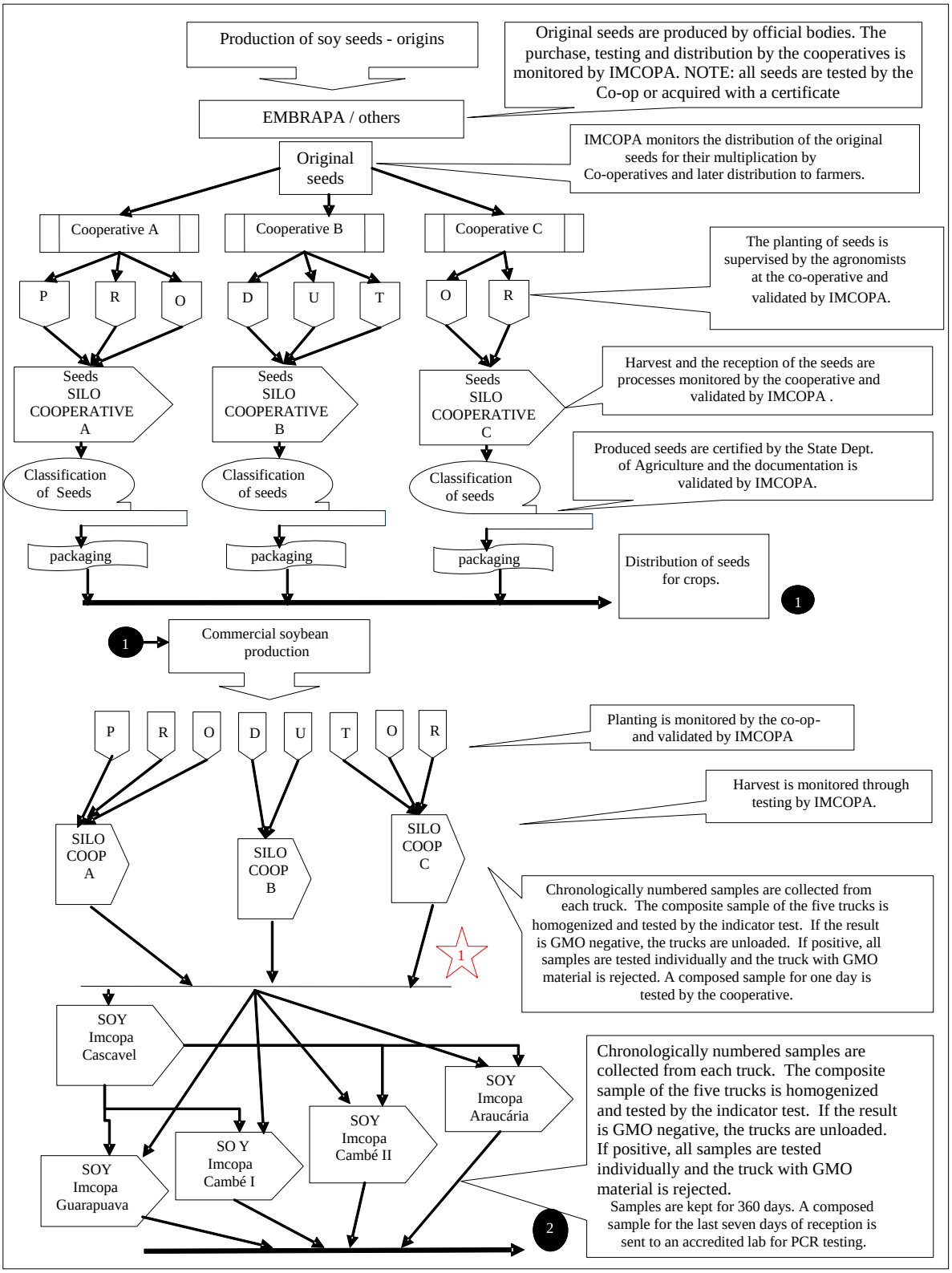
Company care is intensified, because products risk being contaminated by other companies' loads, mainly at port terminals. Procedures include:

- Dispatch of degummed oil: Samples are collected as oil is loaded into trucks and wagons, and undergo physio-chemical and microbiological tests. For each shipload a Transaction Certificate of Compliance (TCC) is issued, identifying the company traceability and assuring the product is non-GM. If required by the client, a PCR test for the lot can be provided.

- Dispatch of meal: Samples are collected as the meal is loaded into trucks and wagons. Before Imcopa delivers each load to the ships, all conveyor belts and empty ship loaders are activated for at least 15 minutes, to assure that no trace of previous loads can come into contact with the merchandise. Physicochemical tests are done on daily composite samples, which are stored for one year. A TCC is also issued for each shipload. Another sample is collected from every hold in the ship, for PCR testing.

Below is a flowchart of Imcopa's traceability and certification system for non-GM soybeans and products.

[10] PCR (Polymerase Chain Reaction) is a method to analyze DNA (deoxyribonucleic acid) directly in order, among other uses, to detect the presence of specific GMO molecules in grain or food products. This method is more sensitive than immunochemical methods but also takes longer (two or three days) and costs more (about US$ 200 to US$300 per sample) (Grainnet 1999).



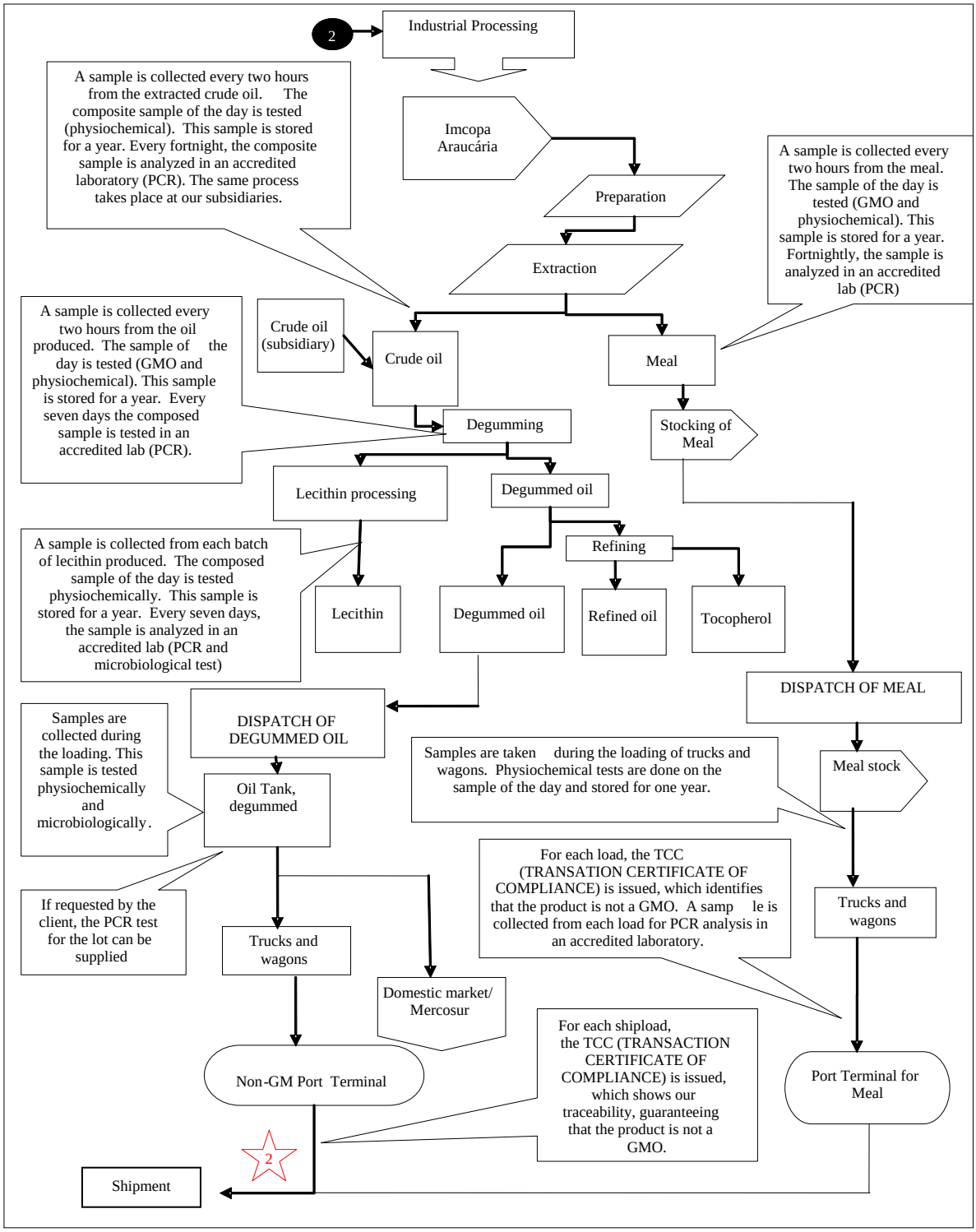


Figure 1. Flowchart of Imcopa's Traceability and Certification System for Non-Gm Soybeans and Products

Source: Traver (2005)

Note: ☆ = Critical point in the system.

Critical Points in the Control System

There are two critical control points to assure the identity preservation of conventional soybeans and products from the purchase of grain to loading at port. The first, and most critical is the reception of grain at the collection and storage facilities in the State's interior region. Significant risks exist because farmers began planting part of their land with GM soybeans after they were legalized in 2005, thus increasing the probability of blending with non-GM grain. Farmers who grow non-GM soybeans, face widespread risk from neighboring farmers who often share columbines, which become a vector for contamination of non-GM grain.

Once the grain has been purchased from farmers, the port terminal is the second critical point. Despite policy control over GM soybean shipments adopted by the Paraná State government in the Paranaguá Port, Imcopa does not assume that the port authorities' procedures are reliable enough, due to the huge flows of raw material from various regions of the country. To minimize risks of contamination, Imcopa has an officer of its own at each of the two terminals (Center-South and Cotriguaçu) it uses to store shipments before loading. Company employees are hired exclusively to monitor the movement of conveyor belts and the appropriate cleaning of the silos.

Traceability and Certification Costs

Implementing and maintaining traceability costs break down into four categories: infrastructure investment; personnel training expenses; spending on analyses (GMO tests); and the payment of premiums to farmers for growing non-GM soybeans.

Infrastructure investments were minor for Imcopa due to the company's choice to work exclusively with non-GM products. They did not need to invest in new silos or manufacturing facilities. Investments were limited to a laboratory equipped with a grain processor to carry out GM identity tests, which cost little and are accounted for as part of the company's general expenses. The second category, for training of personnel, was done by the certifying company. The third category involves operating costs and the purchase of test kits to control identity preservation through the stages of cultivation, transportation, processing and storage. The fourth category has to do with the expansion of the area planted to GMOs in Brazil, particularly in the State of Paraná, following December 2005, when the federal government finally managed to push through a law to impose the commercial release of GM soybeans. Moreover, the Paraná State government's policy of banning the dispatch of GM soybeans through the Port of Paranaguá was overturned by a September 2006 court order, signifying that all the port's berths could now load GM soybeans.

Imcopa occasionally paid premium prices to rural co-operatives for non-GM soybeans for several years, due to an abundance of raw material available in the State of Paraná[11]. Not until 2006 did premiums paid to farmers become standard clauses in supply contracts. This also has to do with the fact that soybean crushers constitute an oligopsony.

[11] From 2004 to 2006, the three rural co-operatives in Paraná that had implemented their own non-GM soybean traceability and certification systems reported paying an average of US$ 4 to US$ 5/ton (Pelaez et al., 2006).

In 2005, ten major crushers purchased 70% of Brazil's soybean harvest. Specifically in Paraná, where 23% of the country's soybean crushing facilities are concentrated, Imcopa is the leader in crushing capacity, with 35% of the State's installed capacity (Abiove 2005). Processing companies – which are more than just crushers are often global soybean traders[12] and gain significant bargaining power over co-operatives and individual farmers. This oligopsonic power had allowed those companies to retain the bulk or even the entirety of premiums paid by importers for non-GM products, until the mid-2000s.

In 1999, the total cost of implementing the Imcopa system was around $ 900,000USD. Of that, some $650,000 (72% of the total) went to traceability activities. Imcopa paid the equivalent of $250,000 for certification. In that year, Imcopa processed about 250,000 tons of soybeans, which means a cost of $3.60/ton (Traver 2006).

In 2006, the company crushed about 2.8 million tons of soybeans, and paid $2 million in traceability and certification costs, an average of $0.70/ton of soybeans. Of that, 75% ($1.5 million) went to running the traceability system, while the other 25% covered certification costs. Thus from 1999 to 2006, there was a significant 80% reduction in the unit cost of the company's traceability and certification system. According to Imcopa's director, this cost reduction was mainly due to gains in scale and with the company's learning curve in running the system. Inclusion of $7/ton in premiums paid to farmers in 2006, however, raised the total unit costs for the system to around $7.70/ton of processed soybeans (Traver 2008).

In 2008, total costs for maintaining the system rose to $22/ton, due to two factors: higher costs with traceability and certification (from $ 0.70/ton to US$ 2/ton) caused by the expansion of GM soybean plantations in the proximities of non-GM areas and by the need for more quality control to dispatch shipments through Paranaguá Port; and, most particularly, the tripling of premiums paid to farmers, from $7/ton to $20/ton as shown in Table 2.

Table 2. Imcopa's Traceability and Certification Costs: 1999, 2006 and 2008

Cost item	**Implementation (1999)**		**Maintenance (2006)**		**Maintenance (2008)**	
	TOTAL in $USD					
	$	$/ton	$	$/ton	$	$/ton
Traceability	650,000	2.60	1,500,000	0.50	NA	1.70
Certification	250,000	1.00	500,000	0.20	NA	0.30
TOTAL	900,000	3.60	2,000,000	0.70	4,000,000	2.00
Premium[1]	NA	5.00	20,000,00	7.00	40,000,000	20.00
TOTAL + PREMIUM	NA	8.60	22,000,00	7.70	44,000,000	22.00

Source: Traver (2006, 2008).

Note: [1] The value of premiums paid to farmers by Imcopa in 1999 varied depending on the contract negotiated with each co-operative; therefore not everyone received US$ 5/ton. NA = Not Available.

Benefits of the System

Three benefits from the traceability and certification system are examined: (i) higher turnover for

[12] Most notably the multinational traders: Cargill, Dreyfuss and Bunge.

the company, (ii) the benefit-cost ratio accrued from premiums paid by international buyers for the sale of non-GM soybean products and (iii) the diversification of the company's activities as a result of newly identified production opportunities.

Financial Benefits

Premiums paid for non-GM soybean products depend on each year's market conditions. Non-GM lecithin brings in the highest premium, at $1,000/ton in 2006. After falling more than 50% in 2007 and 2008, this premium returned to its 2006 values in 2009. Fatty acid is the product with the most unstable demand. In 2006, it sold with premiums up to $4,500/ton, about 10 times more than the market value of the non-certified product. At other times, this market nearly dries up with almost no consumers, as was the case in 2008 (Traver 2009). The production of crude and refined soybean oil, meanwhile, provides no benefits from the non-GM traceability and certification system, since it is sold at no additional premium (Table 3).

Table 3. Average premiums paid and received by Imcopa on the sale of non-GM soybean products, 2006/2009.

Products	**Premiums $/Ton**			
	2006	2007	2008	2009**
Raw soybeans*	7	12	20	NA
Meal	8	14	25	35 - 40
Crude and refined oil	0	0	0	0
Lecithin	1,000	400 - 500	500 - 600	1,000
Fatty acid (tocopherol)	0 – 4,500	NA	NA	NA

Source: Traver (2006 and 2008), Oliveira (2006) and Campos (2006)
* Premiums paid by Imcopa to farmers.
** Forecast.

The company's benefit-cost ratio can be estimated specifically related to its traceability and certification system in 2006 and 2008 in terms of the premiums paid on the sale of meal and lecithin. In 2006, Imcopa sold around 2 million tons of meal, with an average premium of $14 per ton. It sold 25,000 tons of lecithin, with a premium of $1,000 per ton. This brought in a total annual added value of $67 million for the company, while total costs for certification and traceability were around $2.5 million. In this sense, the company's benefit-cost ratio concerning the adoption of non-GM controls was around 26.8. Even so, additional costs to pay farmers' premiums hiked the system's total operating expenses to $27.8 million, reducing the ratio to the order of 2.4. In 2008, increased premiums paid to farmers substantially reduced the company's benefit-cost ratio from 2.4 to 1.1 (Table 4).

The largest benefit obtained by Imcopa with its certification program came in its growth, with the company's productive capacity expanding eight times, from 250,000 tons per year in 1998 to 2 million tons per year in 2008. Meanwhile, turnover grew by a factor of 18, from $70 million in 1998 to approximately $1.3 billion in 2008. The most intense period of growth was from 1998 to 2003, when turnover grew 328%. In the following years, turnover continued to grow but at lower rates. From 2003-2005, the company grew 116%, from 2005-2006 another 53% and from 2006-2008 by 30% (Table 4). That rapid rate of growth led Imcopa to become the fifth largest soybean processer in the country, and number one in Paraná.

Table 4. Imcopa's yearly turnover and benefit-cost ratio: 1998/2008

Year	Turnover	Total Value of Premium Received (Meal + Lecithin)	Total System Cost (Traceability + Certification)		Benefit-Cost Ratio	
			Without Premium	*With Premium*	*Without Premium*	*With Premium*
1998	$70 million	NA	NA	NA	NA	NA
2003	$300 million	NA	NA	NA	NA	NA
2005	$650 million	NA	NA	NA	NA	NA
2006	$1 billion	$67.0 million∗	$2.5 million∗	$27.8 million∗	26.8	2.4
2008	$1.3 billion	$47.5 million	$4 million	$44 million	11.9	1.1

∗Present value estimated to 2008 at a 12.45 annual interest rate.
Source: Gazeta Mercantil (2005), Gazeta do Povo (2006) and Traver (2006 and 2008).

Additionally, sales of non-GM certified products allowed Imcopa to expand in an economic climate in which many soybean processers had to shut down due to hard competition from multinationals, especially those with plants located in Argentina. Several factors make the cost of producing soybean products in Argentina up to 25% lower than in Brazil:

- The concentration of plants in a single region (80% located in Santa Fé Province)[13] facilitates logistics, particularly for exports.

- The valuation of the Brazilian currency since January 2002 lowered the price competitiveness of soybeans and products compared to Argentine output. From January 2002 to May 2009, the average rate of exchange between the two countries was 0.476 Real = 1.0 Peso (Banco Central 2009).

- In Brazil, many processing plants are not in soybean-producing regions. This implies the payment of a 12% tax (the Tax on Circulation of Merchandise and Services/ICMS) for the interstate purchase of raw soybeans. Since the accounting entry of credits to be compensated by the processing of meal and oil does not entirely pay the costs of crushers, it is advantageous to export soybeans *in natura* and crush them in Argentina. There the taxes are the other way around: grain is more heavily taxed (3.5%), thus favoring the export of oil and meal (Valor Econômico 2006).

- Fuel oil and natural gas cost three times more in Brazil than in Argentina, due to Argentine government subsidies. Since fuel consumption is 80% of the cost of crushing soybeans, soybeans processed in Argentina are much more competitive than those crushed in Brazil (Traver 2006).

The competitive advantages of Argentina's micro- and macro-economic environment has led many transnationals to shift part of their soybean crushing units from Brazil to Argentina. Companies like Bunge and Cargill decided to forego investments in Brazilian plants, in order to prioritize the construction and expansion of plants in Argentina[14].

[13] On this point, see Ghezan, G. et al. (2006).
[14] In 2006, Bunge began crushing in a plant expansion in Buenos Aires, able to produce 19,000 tons/day, while Cargill also invested in Argentina, in a plant whose crushing capacity is 12,000 tons/day (Valor Econômico, 2006).

Productive Opportunities

Imcopa's main motivation for implementing the identity preservation system for non-GM soybean products was demand from major food corporations such as Nestlé and Kraft Foods, eager to avoid having their products labeled "GM" in Europe. This situation allowed Imcopa to negotiate a premium price for certified lecithin from non-GM soybeans that was five times the going market price. Imcopa was thus assured not only a rapid return on its investments, but also a high rate of profit as it operated the system we have just described.

Since lecithin is a byproduct of oil production, all stages in the process had to be traced in order to certify each of the products. The company therefore started seeking clients abroad for its non-GM meal and oil. Although there was significant demand for non-GM products by the late 1990's, particularly in Europe, it was hard for Imcopa to find consumers willing to pay premiums for certified non-GM products. This market segment grew slowly. Imcopa earned virtually no premiums on its soybean meal sales from certifying this product during the first year the traceability system was in operation. In the second year, the company managed to differentiate prices on the export of 60% of the meal it processed. It was only in the third year of operations that Imcopa earned premiums on 100% of its meal production, ranging from $3 to $4 per ton.

As it sought market segments for higher value-added products, however, the company began to identify new production opportunities based on differentiating the protein content of its meal for more specific markets, such as fish food. Soybean meal with 40-50% protein has such a high sugar content that, in water, it tends to ferment and create a toxic environment for fish. Extracting the sugar reduces this effect, in addition to raising the meal's protein content, thus adding value to the product. At the same time, the molasses byproduct obtained by extracting the sugar is a good substrate for producing ethanol. Soybean ethanol obtained from this molasses can be used in pharmaceuticals, beverages and to produce biofuel. The company also uses its soybean molasses as an energy source for its own production lines, thus reducing costs significantly, since energy is the most important cost item in soybean processing (Traver 2006).

Imcopa's strategy to add value to it's product line through non-GM certification gave rise to new opportunities to differentiate production by increasing the protein content of its soybean meal. As a result, these more high-quality market segments moved the company to implement complementary quality-control programs that in turn demanded new certifications and new adaptations of its production structure. Imcopa has now earned another ten quality certificates[15], which complement a product-quality differentiation strategy in a market traditionally known for the sale of bulk agricultural and industrial commodities.

Conclusion

Imcopa adopted quality-control in order to implement its non-GM soybean traceability system, based on a recombination of existing productive resources, and in so doing lowered the costs of

[15] ISO 9000; ISO 14000; Hazard Analysis and Critical Control Points (HACCP); Good Manufacturing Practices (GMP); GMP-Animal Feed; Kosher Certificate; Halal Certificate; Salmonella-free Program; Special Granulometric Control Program; Agricultural Sustainable Production Certificate (Pro-Terra).

both implementing and operating the system. Together with the high premiums it initially earned on non-GM lecithin sales and later on its non-GM soybean meal, with no need to pass part of the profits on to farmers, in the system's early years Imcopa maintained quite a high level benefit-cost ratio.

That benefit-cost ratio began to decline when the sale of GM soybeans was legalized in Brazil in December 2005 and the dissemination of GM plantations increased the risks for preserving the identity of the company's product, along with the costs of its traceability system. Also as a result of this, Imcopa was obliged to adopt a more effective strategy to promote the planting of non-GM soybeans, through the payment of higher premiums to farmers. That strategy was the key to reducing information asymmetries between the opportunities the company had identified on overseas markets for non-GM soybean products and the opportunities perceived by farmers, who live in a farm-supply market controlled by seed and pesticide companies.

Considering this drive for short-term returns on investment, the economic feasibility of maintaining non-GM soybean traceability and certification systems capable of sustaining the coexistence of GM and non-GM crops depends above all on the presence of markets willing to offer a price differential attractive to all players involved in the production chain. Though, the logic of this market niche depends on a set of factors involving the balance between social acceptance and resistance of GM food in which the premium paid by the existence of a segregation system seems to be the less important one.

In addition to the extraordinary earnings from its certification of non-GM products, the product differentiation based on a recombination of the company's own resources revealed new productive opportunities and created previously non-existent market niches for soybean meal. Actually, productive opportunities arising from the sale of non-GM soybeans are mainly concentrated in the grain processing stage, as a function of the company's own operational environment. In Imcopa's case, the expansion of its involvement in global food and feed markets allowed it to become part of a more complex network of commercial and production relations. In this new environment, market niches that emerge for products with higher value added allow a medium-sized, family-owned company like Imcopa to expand its share in a market traditionally known for the sale of commodities and controlled by major transnational corporations.

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Competitiveness of Zacatecas (Mexico) Protected Agriculture: The Fresh Tomato Industry

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Abstract

The industry of fresh tomato production under protective structures in Zacatecas has undergone accelerated growth in recent years. Free trade, market globalization, new trends in the agro-food sector, as well as the food and financial crises, are impacting its competitiveness. In this study competitiveness of the industry of fresh tomato production under protective structures in Zacatecas was evaluated to provide elements that contribute to the design of policies aimed toward development of sustainable competitiveness. A systemic competitiveness model was applied, and a SWOT analysis was performed. The information was obtained through interviews with technicians and/or owners of the production units and complemented with interviews with researchers and government authorities. It was shown that a high level of technology is a necessary, but not sufficient, condition for achieving sustainable competitiveness.

Keywords: development, technology, greenhouses, systemic competitiveness

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Introduction

Protected agriculture is a broad category of production methods in which there is some degree of control over one or more environmental factors. The structures under which protected agriculture takes place can vary from the simplest, least expensive shade house to the most costly, high-tech greenhouse with automated climate control. In the state of Zacatecas, as in other regions of Mexico, protected agriculture production systems have seen accelerated growth in recent years. The mean annual growth rate of the cultivated area from 2001 to 2007 was 30.5%. Currently, this area is estimated to be 184.2 hectares, 95% of which was cultivated under tomato (Padilla-Bernal, Rumayor-Rodriguez, and Pérez-Veyna 2008), accounting for around 10% of the total area of Mexican covered horticultural production (Cook 2007; Padilla-Bernal, Rumayor-Rodriguez, and Pérez-Veyna 2007b).

The rapid expansion of protected agriculture in the state of Zacatecas is attributed to several factors. First and probably the most compelling is the potential return on investment; these production systems can be highly profitable because of the favorable climate in production regions. In those such as the Zacatecas high plateau, where climate is temperate, dry and with good conditions of sunlight, it is possible to lengthen the growing period or to produce year-round, meaning extraordinary profits for the growers. A second factor is proximity to the US border; the US is the largest export market for Mexican tomatoes. A third is support from government organisms; government programs provide support for protected agriculture installations. The state government, during its last two development plans (1999-2004 and 2005-2010), has promoted protected agriculture as part of the strategies aimed to reactivate the rural sector. Government authorities at the local and federal level have encouraged protected agriculture projects as a way to offer employment opportunities and improve the welfare to rural producers (Sagarpa 2006; 2008; Sedagro 2008).

As in Mexico, in the US and Canada the greenhouse tomato industry has shown high growth rates. Expansion began in the 90s (Cook and Calvin 2005), but recently growth has become stable[1]. Even though Mexico was the last of the three competitors to enter the industry, it now has a larger area, which continues to expand rapidly (Cook and Calvin 2005; Padilla-Bernal, Rumayor-Rodriguez, and Pérez-Veyna 2007a). In terms of technology and yields, however, Mexico has lagged behind. In 2006, average greenhouse tomato yield in Mexico was estimated at 130 tons per hectare, while in the US and Canada yields are more than 450 tons (Cook 2007). The low average yields in Mexico are attributed largely to the wide range of technologies used by growers, from shade houses and macrotunnels to permanent greenhouse structures with limited or passive environmental control and high-tech greenhouses with both fully active environmental control and hydroponics.

One of the characteristics of the fresh tomato industry under protected agriculture in Mexico is its high concentration. Like that of field production, a few companies control a large part of the production (Wilson and Thompson 2004; Padilla-Bernal, Thilmany and Loureiro 2003). The US is the largest consumer of this type of tomato and imports more than it produces (Cook and Calvin 2005). In recent years, imports have increased faster than production. Canada exports

[1] The mean annual growth rate during the period 1994-2006 was 16.5% in the US and 11.5% in Canada, while from 2003 to 2006 it was 3.5% and 1.2%, respectively.

60% of its production to the US, and almost all of the greenhouse tomatoes produced in Mexico are sold in the US or Canada (Cook and Calvin, 2005; USDA-AMS, 2005; Cook, 2007). At present, the demand for greenhouse tomatoes in Mexico is limited, but will probably grow in the near future. It is estimated that only 15% of Mexican greenhouse tomatoes are sold on the domestic market; this is attributed to the possibility of selling lower quality rather than to strategic marketing decisions.

A consequence of rapid growth of the tomato industry under protected agriculture is lower prices on the US market, especially during the summer when the three countries offer their produce (USDA-AMS 2005) and the retail demand for greenhouse tomatoes in the US market is saturated (Cook 2007). Simultaneous placement on the market has led to legal disputes among groups of growers of the three countries (Cook 2002; Cook and Calvin 2005). Once all of the duties on vegetable imports in North America are eliminated, market protection will take on the form of non-tariff barriers.

Although tomatoes can be produced anywhere in any season, especially in greenhouses, aspects of profits still impose seasonal limits on production, in particular in the US and Canada, where greenhouse production is impacted by climate. Because of the low winter temperatures in the US and Canada, costs soar and production is limited. One of the weaknesses of the Canadian greenhouse tomato industry is the lull in production during the winter, while the principal US greenhouse tomato growers produce year round, though it is difficult to find a region where production is as profitable in the winter as it is in the summer (Cook and Calvin, 2005). The four largest enterprises are located in Arizona, Texas, Colorado, and coastal southern California and account for 67% of domestic production. High prices during the winter help the year-round US producers withstand the very low prices during the summer season. However, expanding winter production in Mexico will likely decrease prices and put competitive pressure on year-round growers in the US. The largest exporter of greenhouse tomatoes in Mexico, Desert Glory, a US firm operating in Jalisco and Colima, ships tomatoes year-round (Cook and Calvin 2005), thanks to the region's mild climate. Sinaloa, the main fresh field tomato exporting region in Mexico and a leader in greenhouse-tomato export, because of the hot, humid summers, produces only during the winter (Padilla-Bernal, Thilmany and Loureiro, 2003). But large field-grower exporters in Sinaloa and the Baja California peninsula are also experimenting with protected agriculture, either shade houses or greenhouses, near their field operations. In sum, in Mexico, increasing attention is being given to the location and structure of the production units in order to minimize the costs of creating the ideal conditions for vegetable production for a specific market niche. The main strength of the protected vegetable growing industry is Mexico's climate, which allows production during winter in some regions, such as the high altitude temperate regions of central and northern Mexico: Zacatecas, Chihuahua and northern Sonora, near the US border. Year-round production is a factor that can encourage growers to invest in advanced technology. On the other hand, the main obstacles for this industry are: the high cost of capital, high energy costs, inexperienced management, lack of infrastructure and input suppliers, as well as the inconsistent quality of the produce, implying lower prices for Mexican growers (Cook and Calvin 2005; Padilla Bernal et al. 2007a). These critical points require special attention since they limit the industry's competitiveness.

Globalizations, aperture of the economy, and market liberalization have totally changed the economic and entrepreneurial context. Also forming part of the new context of agribusiness are the financial and food crises and the changes that directly impact the agro-food sector, such as reduction or elimination of government support, rapid technological advances (informatics, microelectronics, biotechnology, genetic engineering, nanotechnology, and telecommunications), and greater concern for environmental protection. In addition to this is the demand from consumers oriented by criteria of quality, food safety, convenience and nutrition (Brambila 2006; Kinsey 2005; Suárez and Bejarano 2001), which is exerting pressure toward better, more highly differentiated products on both the international and domestic markets. The demand for different foods forms part of the new civilization and the new agriculture considered in the new economy (Brambila 2006). This situation is not foreign to the tomato market; differentiation is demanded for both field grown and greenhouse tomatoes (Kaufman et al. 2000; Calvin and Cook 2001). Today, the economy, as a whole and, in particular, the enterprises of the agricultural sector, is competing not only in international markets but also in the domestic market. They are facing the phenomenon of global hyper-competition on the local market (Altenburg, Hellebrand, and Meyer-Stamer 1998; Villarreal 2007). To survive, the enterprises must have international quality and standards of efficiency as their production goal, as well as the attributes of speed, global perspective, and permanence (Brambila 2006). This is a difficult challenge, and to be able to meet it depends both on an organization's internal decision-making and on decisions made on the outside.

Presently, an enterprise's competitiveness is in function not only of its productivity, level of organizational learning, technological development, market prices and customer satisfaction, but also on regional incentive policies, links with sectorial and entrepreneurial cooperation, macroeconomic and international context, as well as the security and trust of society (Esser et al. 1996; Villarreal 2007). That is, competitiveness is a systemic phenomenon; being competitive is required at the enterprise, sector, national economy, government and institutional levels.
In this context, an isolated enterprise cannot be competitive since competition is not between enterprises; it is present in the enterprise-chain-cluster-regional pole-country scheme, which requires efficient integration of the global value chain and efficient operation at each link (Esser et al. 1996; Meyer-Stamer 2005; Villarreal 2007). In this scheme, enterprises of all of the productive sectors should seek a sustainable competitive advantage based on the capacity to learn and innovate, as well as on technological, productive and organizational changes.
The objective of this study was to evaluate the competitiveness of the industry of fresh tomato production under protective structures in Zacatecas to provide elements that contribute to the design of policies aimed toward development of sustainable competitiveness. The analysis parted from the classification of production units by technological level and destination market for the tomatoes. Two research questions were answered by this study: Are the export-oriented production units more competitive than those that sell their produce only on the domestic market? Do the production units with a higher level of technology have more developed competitive capital?

Methodology

To evaluate the competitiveness of the industry of fresh tomato production under protective structures in the state of Zacatecas, a model of systemic competitiveness was applied following

Esser et al. (1994; 1996) and Villarreal and Villarreal (2002; 2003). Under this approach, the competitive position of this industry is determined in an integral form within a globalized setting. The starting point is the principle that competitiveness is not an isolated effort, but rather it involves changes and interrelationships at different levels within the economic system. The analysis was conducted under an integral approach that includes the microeconomic level as well as the mesoeconomic, macroeconomic, international, institutional and sociopolitical levels. The research presents how each of these levels contributes to the ten class of capital formation of the industry's systemic capital was determined within the industry. These ten sources of capital frame the level of the industry's competitiveness and This is integrated with the ten capitals of competitiveness (Table 1), which are the pillars of sustainable growth in an open economy (Villarreal 2007).

Table 1. Levels of economics and competitive capitals for the formation of systemic capital

Economic level	Competitive capital
Microeconomic	Entrepreneurial
	Labor
Mesoeconomic	Organizational
	Intellectual
	Logistic
Macroeconomic	Macroeconomic
International	Commercial
Governmental and institutional	Governmental Institutional
Political-social	Social

Source: Villarreal 2007.

The information required was obtained using a questionnaire, which was applied during interviews with 45 technicians of the production units from March to May 2008. This information was complemented with ten interviews with owners or managers. In addition, from May to August of the same year, two researchers of INIFAP (National Institute for Research in Forestry, Agriculture and Fishing) and one from the Universidad Autónoma de Zacatecas (UAZ) were interviewed, as well as five functionaries of state government institutions related to programs of protected agriculture. The criteria used in the selection of the production units for the study were the following: a) size, ≥2,500 m^2, b) production of vegetables, excluding production of seedlings and flowers, and c) willingness of the people to answer questions. With the information obtained from the interviews, competitiveness indexes were obtained by capital and at each economic level studied. Furthermore, a SWOT analysis for the development of systemic competitiveness was conducted. The interviewees evaluated themselves by responding to groups of statements referring to the indicators related to the formation of the different competitive capitals. The interviewees responded by expressing their agreement with the statements on a scale of 3 to 0: 3=totally agree, 2=partially agree, 1=disagree, and 0=does not exist. The information was processed for each of the indicators, capitals and economic levels analyzed, calculating the maximum number of points per level. A similar scale was used by Giuliani, Pietrobelli and Rabellotti (2005), who also determined the indexes in a like manner, to explore how small-and medium-sized Latin American enterprises (SMEs) may participate in global markets in a way that provides for sustainable growth. They analyzed the degree of collective efficiency and levels of upgrading the clusters in Latin America. The index by level represents the relationship between the points of the level studied with respect to the highest

possible number of points. To enable us to make comparisons, the maximum number of points was considered to be 10. Thus, an average response of 3 would be equivalent to 10. Finally, the systemic competitiveness index of the protected tomato production industry in Zacatecas was obtained by averaging the indexes of the capitals considered.

Table 2. Destination markets by size of the production units of the industry of fresh tomato production under protective structures in Zacatecas

Type of market	**Size of production unit**			
	Small	*Medium*	*Large*	*Total*
Local	6	4		10
National[1]		8	11	19
Local and national[1]		3	1	4
Local, national[1] and international			1	1
National and international		2	8	10
International			1	1
Total	6	17	22	45

Note: [1]Tomatoes are sold in other states of the Mexican Republic.
Source: Constructed by authors with data obtained during field work.

Table 3. Definition of variables and clusters of protected fresh tomato production units

		Low technology		**Transition technology**		**Intermediate technology**		**Advanced technology**	
Variable	**Description**	*Mean*	*S. D.*	*Mean*	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*
Structure	Type of structure covering the largest area of the production unit 1 = Almeria type 2 = Multitunnel	1.0	0.0	2.0	0.0	2.0	0.0	2.0	0.0
Climate control	Type of climate control 1 = Automated 2 = Mechanical 3 = Manual	2.9	0.3	2.3	0.8	2.3	1.2	1.2	0.3
Cultivation technique	Type of cultivation 1 = Hydroponics 2 = Soil 3 = Soil and hydroponics	2.0	0.0	2.0	0.0	3.0	0.0	1.0	0.0
Size	Size of the production unit 1 $\leq$ 2,500 m^2 2 2,501-15,000 m^2 3 > 15,000 m^2	2.3	0.8	2.2	0.6	2.7	0.6	2.8	0.4

Note: A unit of production with a macrotunnel structure was not included. For the analysis it was included with the low-tech production units.
S.D. = Standard deviation.
Source: Constructed by authors with data obtained during field work.

Competitiveness indexes were also obtained by grouping the enterprises by the market where they sell their tomatoes, domestic or international (Table 2), and by level of technology, for

which the cluster analysis technique was applied. Clusters were determined by the hierarchical analysis procedure with the group linking method using SPSS v16 software. The following variables were considered for clustering: a) structure, b) climate control, c) cultivation technique, and 4) size[2]. Using the clustering report and tree graph, four groups of production units were defined: low technology, transition technology, intermediate technology, and advanced technology (Table 3).

Results

With the field work, we found that 174.1 ha cultivated under tomatoes in 2007 were distributed among 45 production units. The survey represents about 94.5% of the total cultivated area. It is very likely that to date (2009) the total area has changed since, according to government records, 40.5 ha of protected agriculture were granted support (SEDAGRO, 2008) in 2007. Regarding structure type, 54.4% of the total area has Almeria-type structures, 28.6% multitunnels, and a smaller proportion was found with shade house-type structures (7.5%) and macrotunnels (9.5%).

Some growers, to reduce investment or to identify more suitable technology, have decided to experiment with different types of structures or with cultivation techniques. Within the same production unit, there are areas with Almeria-type structures and others with shade houses, or some other combination[3]. They also experiment with cultivation techniques: hydroponics, soil, soil and hydroponics. Regarding climate control (automated, mechanical, or manual), it was most common to find production systems with limited environmental control; in only eight production units climate control is automated.

Competitiveness at the Enterprise or Microeconomic Level

Competitiveness at the enterprise level is the starting point for an analysis of systemic competitiveness. At this level, we analyzed the elements that contribute to the formation of the entrepreneurial and labor capitals. Competitive enterprises are those that satisfy the criteria of efficiency, quality, flexibility, and speed (Esser et al. 1996; Brambila 2006). For the evaluation of entrepreneurial capital, we took into account the effort the production units are making to enrich their organizational intelligence, their productive flexibility, and their commercial agility. In the case of labor, their performance and training were evaluated considering the requirements of the new economy (Kinsey 2005; Brambila 2006) in which the generation and transmission of knowledge and new technologies in the development of the entire value chain are necessary to achieve sustainable competitiveness. In the evaluation, considering 10 as the maximum score for competitiveness, entrepreneurial and labor capitals had indexes of 5.5 and 5.7, respectively (Tables 4 and 5). Only 20 of the agro-enterprises had an index of 6 or more. An index value of six, considering 6 the index that indicates that production units have the minimum capacity to deal with challenges of globalization (Centro del Capital Intelectual y Competitividad [CECIC], 2002). Of the remainder, eight are within the range of 5.25 a 5.75 and are considered to be in transit to levels of minimum competitive capacity at the microeconomic scale. The remaining 17

[2] Production units were classified by size following the criteria of the Zacatecas SEDAGRO-SAGARPA Technical Commission of the Greenhouse Program: a) small, up to 2,500 m^2; b) medium, 2,500 m^2 to 1.5 ha, and c) large, more than 1.5 ha.

[3] In some production units, we found several types of structures under construction. For the purposes of this study, we considered the structure that covered the largest area.

production units all sell in the domestic market. They have areas of opportunity that need attention to strengthen their entrepreneurial and labor capitals.

Competitiveness at the Mesoeconomic or Sectorial level

Mesoeconomic competitiveness is substantiated in organizational, intellectual, and logistic capitals, on which the competitiveness of entrepreneurial groups and regional poles of development is founded (Esser et al. 1996; Villarreal 2007). The increasing requirements of the enterprises are augmented by the growing external requirements. This has implicated that they compete not in isolation, but by forming entrepreneurial groups in networks of collaboration.

Organizational capital is based on productive articulation among enterprises, productive sectors, and industries, as well as among regions. This articulation is efficient when it generates clustered economies that contribute to the collective efficiency of the group of enterprises (Villarreal 2002; 2007). Externalities do not totally explain the success of industrial districts; rather, it is necessary to consider the joint deliberated action of the agents. This cooperation implies the gradual development of trust, which forms part of an integrated process in which the enterprises develop long-term cooperative relationships and establish principles to guide their response in the face of uncertainty. This translates into organizational learning to generate collective efficiency (Esser et al. 1996; CECIC 2002).

To evaluate organizational capital, we considered indicators that determine the modality and intensity of cooperation between suppliers and customers (vertical), as well as among growers (horizontal), aspects that can reveal the level of productive articulation of the value chain. The index of organizational capital obtained by the 45 enterprises was 5.3 (Table 4). The indicators with the highest values were those that referred to collaboration between growers and clients (8.9) and between growers and suppliers (8.5). The lowest values were those regarding collaboration and communication among growers: organization for export (1.3), communication to solve marketing problems (2.5), communication for collective buying (3.0), and communication on the use of technology (3.3). The notably weak cooperation among growers limits the production units' ability to remain in the market since competition in today's world takes place among groups of enterprises, regions and countries.

Differentiating among enterprises, the highest organizational capital index was obtained by those with more advanced technology and by export-oriented enterprises (Tables 4 and 5). For the latter, the advantages of productive articulation are clearer. Some of them have already made strategic alliances with growers and shippers located in the US, while others have constituted integrative enterprises to lend support in buying inputs and in marketing their produce.

Intellectual capital was analyzed as a factor of generation of productive knowledge, which contributes to developing sustainable competitive enterprises. In the evaluation of this factor, the following indicators were considered: links with institutes, research centers or universities; ability to develop technology; and type of relationship with suppliers of technology. The value of the intellectual capital index for the enterprises studied was 3.8 (Table 4). Within this index, the indicator with the highest value was their relationship to the supplier of technology (7.7), while the lowest was the ability to develop their own technology (1.6).

It was found that although centers of research and technological development in the state are willing to collaborate, there is little communication with the production units. Most of the enterprises receive technological support from their suppliers, and they are highly dependent on foreign technology. The fact that production units maintain communication with suppliers of technology is not sufficient to develop the capacity to generate knowledge and innovate. They require more solid links with research and development centers, which could help them find possibilities for improvement.

Logistics capital refers to the infrastructure necessary for efficient mobilization of produce and inputs. For this aspect we determined the degree of development of physical, transportation, and technological infrastructure for international competitiveness. For the evaluation of this capital the following indicators were considered: type and efficiency of transport used to move tomatoes, electricity, irrigation water supply, regional telecommunications, ease of access to suppliers, road conditions, and relationship with customs. The value of the logistics capital index was 6.3 (Tables 4 and 5).

Even though water is scarce in the state of Zacatecas, the irrigation water service obtained the highest value (9.0), followed by electricity (7.8). Telecommunications (4.9) and the customs service (1.7) received the lowest values. Thus, as a group, the enterprises require greater attention to the use of information technology. Those with a higher level of technology and those oriented toward export are more capable of delivering their produce to international markets concordant with the requirements of the demand.

Competitiveness at the Macroeconomic Level

Macroeconomic stability is a necessary, but not sufficient, condition for achieving macroeconomic competitiveness (Esser et al. 1994; Villarreal 2007). Also required is overall, sustained growth, as well as efficiency in key variables for enterprise competitiveness, and implementation of mesoeconomic policies. According to Villarreal (2007), macroeconomic competitiveness is expressed in two aspects: macroeconomic dynamics and efficiency. The variables of macroeconomic dynamics were growth and volatility of aggregated demand. For macroeconomic efficiency, besides economic stability, the variables were real exchange rate[4] and competitive financing and fiscal systems.

For evaluation of the macroeconomic level relating to the protected tomato production industry in the state of Zacatecas, we considered the following variables: demand behavior, access to credit, interest rates, and system of taxation. The macroeconomic capital index was 4.7 (Table 4). The indicator that most contributed to the formation of macroeconomic capital was demand behavior. Although most of the growers reported a stable demand, they expect it to increase. A growth trend in production was observed; some growers seek to take advantage of the winter-spring demand by making use of the climate conditions of their location.

The indicator that least contributed to the formation of macroeconomic capital was access to credit, which limits investment in new technology. The results suggest that reforms need to be

[4] The effect of real exchange rate on competitiveness will be discussed in the section on commercial capital because of its importance in international trade.

made in fiscal and monetary policies that would encourage productive investment in the agricultural sector.

Competitiveness at the International Level

Competitiveness at the international level refers to the ability of the industry to become integrated into international trade, efficiently maintaining trade relationships. This implies implementation of government policies oriented toward the formation of commercial capital. These policies would include trade agreements and programs for the prevention of disloyal competition and contraband, which affect growth of domestic industry (Villarreal and Villarreal 2002). For the evaluation of commercial capital, the following indicators were considered: real exchange rate, imported produce and agricultural inputs, contraband of agricultural products, governmental support for exporting and export documentation of tomatoes. The commercial capital index was 4.4 (Tables 4 and 5).

Real exchange rate is one of the most important variables in the formation of commercial capital, affecting relative prices of the economy. The real exchange rate must be permanently competitive. In recent years in Mexico, the exchange rate has been used as an inflationary anchor, an instrument to stabilize prices. This inflationary anchor was achieved at the expense of increasing overvaluation of the peso, which was reported to be 15% by August 2008, although Calva (2007) stated that by November 2007 Mexico had accumulated an overvaluation of 31.2%. Indeed, in the last few months, because of the financial crisis, the exchange rate has been highly volatile.

In the case of our evaluation of protected agriculture in Zacatecas, the real exchange rate indicator was 4.9. This suggests that the exchange rate has affected exports, a situation that could change in virtue of the world financial crisis. In terms of the impact of imports of produce and agricultural inputs, growers did not express feeling threatened by tomato imports. However, they recognize that fresh produce imports constitute serious competition on the domestic market. Export growers also expressed concern for non-tariff barriers to marketing tomatoes in the US, especially during periods of excess supply. Acquiring imported inputs is costly despite the subsidized exchange rate. Regarding contraband of agricultural products, the growers believe that it does not affect their permanence on the market. Export-oriented enterprises declared that documenting their produce for export is not problematic. Those that sell only on the domestic market, however, expressed a lack of knowledge on this matter.

Competitiveness at the Governmental or Institutional Level

At this level, the formation of government and institutional capital was evaluated, analyzing the model of governmental administration and rule of law. The role of the government is considered to be provider of public services and fomenter of economic and social growth through public policies that are effective and efficient, non-bureaucratic, and transparent and that operate with administrative simplification. The rule of law is substantiated by the formation and development of the society's institutional capital (Villarreal 2007).

For the evaluation of government capital, the impact on the production units of the most

important government programs aimed to support agriculture and rural entrepreneurial development were analyzed. To this end, a list was made of the principal government programs for which the production units were eligible. Growers were asked whether they knew of the program. If the answer was yes, they were asked if they had received support from it and at what level of satisfaction. The government capital index obtained was 2.4.
Of the production units studied, 96% received some support for their establishment from Alliance for the Countryside (Alianza para el Campo), most within the program of Support for Agriculture (Fomento Agrícola). The small production units were those most supported by the Rural Development Program (Programa de Desarrollo Rural). Some of these production units are managed by women, who see protected agriculture as an option for increasing family incomes. They do, however, recognize their limitations in the spheres of organization and marketing because they are not able to relate with other growers and they do not have sufficient capacity to take their produce to market efficiently. As for other government programs, it was found that only a few enterprises have received their support; many enterprises have no knowledge of the programs for which they are eligible and so do not take advantage of the government capital available. These results reflect the need for more promotion and information about the different government programs, informing growers about what is needed to be eligible for support.
Institutional capital is related to aspects that contribute to creating a favorable environment for business, such as the legal state and public safety. Institutions are a reflection of the rules of the game in a society and encourage desirable behavior (Visser 2006). Their function is to create the spaces in which individuals can trust, learn, innovate, and achieve their objectives.

The indicators used for the evaluation of institutional capital were documentation and requirements for access to government programs, access to other institutional support, and compliance with food safety norms as set out in the official manuals. The institutional capital index was 6.6 (Tables 4 and 5). Of the production units studied, 77.8% (35) believed that they could work satisfactorily with the institutions; that is, they have an institutional capital index of at least six. Of the group of enterprises satisfied with the institutions, eight sell their tomatoes on the international market. The results show that most of the growers are confident in the work of the institutions.

Competitiveness at the Political-social Level

Competitiveness at the political-social level is founded on the formation of social capital. This is based on the trust the productive sector has in its institutions and is exercised through norms of reciprocity or networks of mutual commitment (Nooteboom 2003; CECIC 2002). There is a close relationship between institutionalism and development of creativity and innovation, which is based on trust, especially in the organizational aspects of innovation. In a market context or in cooperation networks, the information the different actors have about the market is incomplete or asymmetric. There is, moreover, much uncertainty about the characteristics of the products and the reliability of partners or allies in the networks where they participate. Within this context, institutions must create spaces in which the actors can trust and be able to achieve their objectives (Visser 2006).

For the evaluation of social capital the following indicators were considered: membership and collaboration in growers' associations, willingness to serve on the part of state growers'

associations, collaboration with other protected agriculture growers, and quality of service of state and of federal agricultural institutions. The social capital index was 5.2 (Tables 4 and 5). The indicator that most contributes to the formation of social capital is the quality of service of federal institutions (7.3), followed by that of state institutions (5.7). The lowest indexes corresponded to indicators related to collaboration among growers and the service vocation of the growers' associations (2.4). The results show the need to clarify and strengthen the role of growers' associations in the state of Zacatecas and to encourage their creation in the understanding of the role that institutions play in the development of the industry's systemic competitiveness.

Table 4. Indexes of systemic competitiveness of the industry of fresh tomato production under protective structures in Zacatecas by level of technology

Economic level and capital	Low technology	Intermediate technology	Transition technology	Advanced technology	Index
Entrepreneurial capital	5.3	5.1	5.0	7.1	5.5
Labor capital	5.2	5.5	6.3	7.5	5.7
Microeconomic level	5.3	5.3	5.6	7.3	5.6
Organizational capital	5.2	5.6	4.3	5.9	5.3
Intellectual capital	3.4	4.4	3.7	4.3	3.8
Logistic capital	6.2	6.0	6.3	7.2	6.3
Mesoeconomic level	4.9	5.3	4.8	5.8	5.1
Macroeconomic capital	4.2	5.1	4.4	5.7	4.7
Macroeconomic level	4.2	5.1	4.4	5.7	4.7
Commercial capital	4.2	3.8	4.0	6.9	4.4
International level	4.2	3.8	4.0	6.9	4.4
Governmental capital	2.5	2.4	2.7	2.0	2.4
Institutional capital	6.5	7.1	5.6	6.3	6.6
Government and Institutional level	4.5	4.8	4.2	4.2	4.5
Social Capital	5.1	5.2	3.6	6.2	5.2
Political-social level	5.1	5.2	3.6	6.2	5.2
Index of systemic competitiveness	4.8	5.0	4.6	5.9	5.0

Source: Constructed by the authors with data obtained in field work.

Systemic Competitiveness of the Industry of Fresh Tomato Production under Protective Structures

The Index of Systemic Competitiveness (ISC) of the protected fresh tomato production industry of Zacatecas was 5.0 points over ten, 50% lower than that of maximum competitiveness. This index is lower than the 5.5 points obtained by CECIC (2002) in a survey of 160 enterprises of different industrial sectors of the state of Coahuila, Mexico. These results denote a wide gap that the fresh tomato industry must bridge in order to achieve sustainable competitiveness. According to CECIC, the enterprises or sectors commanding the minimum capacity to confront globalization have an ISC of at least 6.0 (CECIC 2002).

Intellectual and governmental capitals are two important areas of opportunity. The investment in technological innovation and development is a key factor for production units to be able to sustain their competitive permanence in the market. Furthermore, greater administrative simplification and transparency are required in the allocation of resources from public programs. The high technology production units are those that are apparently in a better position competitively (Table 4). However, using the Kruskal-Wallis non-parametric statistic[5] test at a 5% (α=0.05) level of significance, no differences were found among the ISC of the four technological groups (p-value=0.137). Also, with the Kruskal-Wallis test applied to the capitals that integrate systemic capital, it was shown that the specified technological groups differed only in the formation of the commercial capital index (p-value=0.01). The other nine indexes showed no statistically significant differences. This means that high technology enterprises, contrasting with the other technological groups, have more highly developed competitive capacity for marketing their tomatoes. To complement our results, according to Padilla-Bernal et al. (2007a), considering a basic scheme of competitiveness, cultivating slicing tomatoes in a high-tech greenhouse is the best option for orienting the greenhouse tomato industry toward sustainable competitiveness.

Table 5. Indexes of systemic competitiveness of the industry of fresh tomato production under protective structures in Zacatecas, market orientation

Economic level and capital	Export oriented	Domestic market	Index
Entrepreneurial capital	7.3	4.8	5.5
Labor capital	6.9	5.2	5.7
Microeconomic level	7.2	5.0	5.6
Organizational capital	6.3	5.0	5.3
Intellectual capital	4.5	3.5	3.8
Logistic capital	7.3	5.9	6.3
Mesoeconomic level	6.1	4.8	5.2
Macroeconomic capital	6.0	4.2	4.7
Macroeconomic level	6.0	4.2	4.7
Commercial capital	6.7	3.6	4.4
International level	6.7	3.6	4.4
Governmental capital	2.9	2.2	2.4
Institutional capital	6.0	6.8	6.6
Governmental and institutional level	4.5	4.5	4.5
Social capital	6.3	4.8	5.2
Political-social level	6.3	4.8	5.2
Index of systemic competitiveness	6.0	4.6	5.0

Source: Constructed by the authors with data obtained in field work.

Unlike the ISC by technological group, the ISC of the group of production units that export is significantly different from those that do not, according to the Kolmogorov-Smirnov Z non-parametric statistic test. However, when this same test was applied to each of the distributions of the ten capitals, the distribution of intellectual (p-value=0.884), governmental (p-value=0.789)

[5] Application of non-parametric methods depends on simple size and the absence of normality in the data; this conditions the use of parametric tests.

and institutional (p-value=0.789) capitals was not significantly different. This reflects the need for better communication between the production units and research and development centers that can help to strengthen their technological capacity by achieving competitive advantage through innovation. Moreover, it is important to promote government programs that can contribute to scaling up the productive units and to inform growers about them. Government should also promote administrative simplification and actions aimed to instill trust in government organisms.

In the SWOT matrix of the industry, the principal problems and obstacles to the formation of each of the capitals studied are synthesized, as are its strengths and opportunities (Table 6). The main strength of the industry in Zacatecas is the climate of the high plateau, which allows lengthening the growing season, and when the temperatures are not too low, it is possible to produce during the winter with little or no fuel, which, in the face of the financial crisis, opens up an opportunity to increase the number of production units that export. To do so requires greater consistency in production, better yields and the adoption of good agricultural and management practices. The main weaknesses are insufficient productive articulation, lack of training for workers and administrative personnel, as well as an extreme dependence on foreign technology and inputs and little relationship with research and development centers. The main threat is an increase in prices of imported inputs, implicating higher production costs and lower competitiveness, which could lead to exclusion from the market for some of the production units.

Conclusions

Within the context of market globalization and the financial and food crisis, the enterprises of the agro-food sector are facing strong competition in both the international and domestic markets, where their permanence depends not only on the development of competitive capacity of the enterprise, but also on an environment that is propitious for competitive performance. In other words, it is necessary to work with a systemic competitiveness approach, which implicates being competitive at the levels of the enterprise, sector, national economy, government and institutions. The systemic competitiveness index of the protected fresh tomato production industry of Zacatecas was 50% lower than the highest possible competitiveness index. This situation suggests the need to improve variables at the production unit level, such as productivity, organizational learning, technological development, and degree of customer satisfaction, besides improvements required in those external to the production unit. In a globalized context, the export-oriented production units are more capable of remaining competitive, although they need to be strengthened mainly in the aspect of forming intellectual and governmental capitals. This could by achieved through stronger links with research centers and institutes that contribute to developing technology and innovation and through greater promotion and transparency of government programs that protected agriculture growers can have access to.

The enterprises that sell their tomatoes on the domestic market are seriously lagging in the formation of all of the capitals involved in systemic competitiveness, especially intellectual, commercial, macroeconomic and governmental capitals. Therefore, besides the enterprises' strengthening their innovative capacity and links with the government, it also is necessary to strengthen macroeconomic variables. It should be highlighted that although in recent years inflation has been under control, this situation could change on the short term because of the

impact on the agricultural sector by the food and financial crisis. Competitive interest rates and real exchange rates, as well as better access to credit, are needed.

A high level of technology is a necessary, but not sufficient, condition for sustainable competitiveness in the protected fresh tomato industry in Zacatecas. To increase competitiveness, networks of collaboration among growers, customers and suppliers are also needed, considering that a source of competitive advantage is innovation and learning through intellectual capital, better coordination between government action and the productive sector to seek better conditions in the macroeconomic and international setting, and the society's assurance and trust.

Implications for the Mexican Fresh Tomato Industry

For the newly born protected agriculture industry in Zacatecas to attain sustained competitiveness within the global hyper-competition of the domestic market, greater attention and care must be given to the critical points we detected, on the part of both the growers and government. To achieve this will require modifications in the organizational profile of the agro-enterprises. Especially those that sell on the domestic market must increase yields, lower production costs, and improve the quality of their produce. Likewise, in order to decrease dependence on foreign technology, the productive chain requires tighter integration with strong links to research centers that support innovation and product differentiation and diversification.

It is recommended that government programs aiming to create an atmosphere that favors competitive development should promote innovation and environmental protection in order to simultaneously assist economic development and better living conditions for rural areas.

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Appendix 1.

Table 6. SWOT matrix of systemic capital of the industry of fresh tomato production under protective structures in Zacatecas

Category	Strengths	Weaknesses	Opportunities	Threats
Entrepreneurial	Organizational intelligence. The tomato varieties grown are demanded in the local and international markets.	Administration of production units is not adequate for current needs.	Promotion of training courses in agribusiness management with an entrepreneurial approach, considering the formation of value networks.	Risk of being forced out of the market due to a management system inadequate for marketing needs.
	Productive flexibility. Climate of high plateau allows prolongation of growing season, and sometimes winter production with low fuel consumption. Good crop management in export-oriented enterprises.	Learning curve in greenhouse management takes 3 to 5 years. More than 60% of the production units use imported seed and other inputs. High fuel costs.	Publicity of the importance of timely, accurate information about the produce and input market. Development of information systems for production units.	Entry into the local market of larger variety of tomatoes from other regions or imported at a price lower than production cost of production units. Rise in costs of inputs.
	Marketing agility. There is willingness to produce conforming to market requirements.	High cost of intermediaries; 71% of the growers sell their produce to domestic market intermediaries. Inconsistency of tomato quality. Lack of information on norms and standards for selling tomatoes on the international market. Low level of good agricultural practices and management in non-export-oriented enterprises.	Promotion of training in tomato marketing requirements for both domestic and international markets. Promotion of good agricultural and management practices, especially in units of production for the domestic market.	Non-tariff barriers to trade that impede or make difficult international marketing of tomatoes.
Labor	Willingness to learn on the part of workers.	High turnover of trained workers. Lack of training for workers and inexperience of managers.	Improve qualification of workers and administrative personnel through training programs and courses. Establish performance evaluation programs for workers in which economic incentives are included.	Delay in adoption of practices and programs of hygiene, quality, and food safety.

Intellectual	Good relationship with suppliers of technology.	Strong dependence on foreign technology. More than 50% of the production units have foreign technology suppliers. Little relationship with research institutes and centers and universities.	Development of programs to link institutions of higher education and research with the productive sector to adopt technology that would improve productivity and reduce costs. Creation of a program for development of technology for protected agriculture.	Better positioning on the market of enterprises with more developed technology, management capacity and lower costs.
Logistic	Adequate irrigation and electricity service.	Deficient or scarce telecommunications services. High cost of fuel. Only 51% of the units use refrigerated transport.	Promotion of strategic alliances between growers and shippers to guarantee good handling of tomatoes.	Loss of competitiveness due to bad handling during shipping.
Macro economic	Stable conditions of the principal macroeconomic variables, although this has been modified by the financial crisis that began to show its effects in September 2008. 96% of the production units received government support for their establishment.	Lack of Access to credit. Overvaluation of the peso with respect to the dollar in recent years. High cost of capital. Little information on the tax system.	Development of a program of fiscal support for protected agriculture growers. Facilitate access to credit for growers.	Better positioning of enterprises of other regions with greater possibilities for investment and access to credit.
Commercial	Climate of producer regions that allows prolongation of growing season and winter production. Proximity of producer regions to US border.	Overvaluation of peso relative to dollar during recent years, although since early October 2008 the exchange rate has been highly volatile. Domestic market does not pay price premium for tomatoes grown in protected agriculture systems. Low price on the market because standards established by buyers are not met.	Promotion of vegetables grown in protected agriculture systems for the domestic market. Implementation of a program for training in norms and documentation for exporting. Increase the number of export production units.	Access to local tomato market by protected agriculture from other regions of the country or imports. Devaluation of the peso relative to the dollar implies higher costs of imported inputs and thus higher production costs. Drop in tomato prices due to excess supply.
Governmental	96% of the production units received support from the government for establishment of their production units.	Serious lack of information about government programs, other than *Alianza para el Campo*, for which growers are eligible.	Promote public information about government programs for which protected agriculture growers are eligible.	Lower level of investment and technological development in protected agriculture.

Institutional	Good opinion of growers toward government institutions, especially of those related to the agricultural sector.	42% of the growers believe that it is not easy to meet the requirements for Access to a government program. Delays in allocation of government support.	Simplify administrative process of documentation for access to government programs.	Reduction of budget for support of growers.
Social	Good level of service of federal institutions related to the agricultural sector.	Lack of trust in other growers restricts their association or relationship.	Promote collaboration among enterprises and its importance for competitive permanence in the market.	Lack of definition of public policies in support of protected agriculture.

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Measuring Demand Factors Influencing Market Penetration and Buying Frequency for Flowers in the U.S.

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Abstract

The floriculture industry faces many challenges including increasing energy and input prices, seasonality of its products and international competition. To analyze floriculture demand, we estimate and use simulation analysis to decompose it into market penetration and buying frequency. Understanding what are the factors that influence non-buyers of floral products to become buyers, and the factors that influence current buyers to increase their expenditures on floral products is vital information that the industry can use to design specific programs targeting different demographic groups according to their specific preferences for flowers.

Keywords: floriculture, consumer preferences, ornamentals, horticulture, environmental

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Introduction

Consumption behavior has always been of great importance and a topic of focus for researchers. The consumption of goods takes place because of the satisfaction that the goods or services provide (Johnson et al., 1984). The consumption of traditional agricultural food products depends on the characteristics of the product or attributes which can be measured or quantified. In contrast to traditional food products, many nonfood items are consumed because of their aesthetic value. Flowers are purchased for various reasons such as expression of love or friendship, a way to express thankfulness or appreciation, beautification purposes for self use or gifts. Most flowers attributes cannot be quantified directly; therefore the satisfaction gained from the consumption of these goods is closely related to the purpose of the purchase. This also implies that the demand for these products can be influenced by the characteristics or preferences of buyers and the reasons for buying the products. This situation becomes evident during special seasonal calendar occasions (i.e., Mother's Day, Valentine's Day, etc), where the consumption of floral products is substantially higher compared to non-calendar occasions.
Demand for all products depends on the characteristics or attributes of the products. For most food products the prevailing characteristic is to satisfy nutritional needs and/or taste. Even though flowers do not satisfy any nutritional needs, they possess other important characteristics that influence the buying decision; and because flowers are not essential for survival a substantial portion of the population are non-buyers or infrequent buyers. Therefore there is a considerable gap for the decision of buying or not, and this decision is based upon the demographics and the buying occasions and periods. Understanding how consumers make choices whether to buy or not and the perceptions of the characteristics of the products are essential to understanding flower demand (Girapunthong, 2002).

Compared to the other food products such as milk, meat, citrus, etc., floriculture and nursery crops lack an extensive marketing literature. There are only a few studies in the literature with information on the demand side and consumer preferences for flowers. Miller (1983) performed an extensive sub-sector analysis for the fresh cut-flower industry in the U.S. by analyzing the structure, conduct and performance of the existing conditions of the industry to try to predict future trends. Miller observed that there were special calendar occasions when the demand for flowers was substantially higher and other non-calendar occasions where the demand was substantially lower. He also determined that the demand for flower arrangements was inelastic, meaning that consumers are not highly responsive to changes in price of floral products. Tillburg (1984) analyzed a panel of cut flower and potted plant consumers in the Netherlands to relate aspects of consumer behavior to marketing variables and demographic characteristics of households. He identified three market segments: the first segment consisted of 44 percent of the households and was sensitive to prices but insensitive to national advertisements; the second segment consisted of 40 percent of the households, and was insensitive to both prices and advertisements; and the third segment, with 13 percent, was sensitive to both prices and advertising.

Behe (1989) analyzed the consumer purchasing behavior of Pennsylvanians at the retail level. She recommended three ways to segment retail flower markets: by product, volume of purchase, and by location of the purchase. Behe et al. (1992a) carried out an analysis of consumer purchases of floral products in Ohio supermarkets using principal components analysis. Behe et

al. (1992b) followed up on her previous study and applied cluster analysis to identify the most important factors affecting floral buying decisions. Becker (1993) studied differences in service quality between supermarkets and florists in Texas. He found that the differences on the types of retail outlets were based on the types of products sold, custom design and other in-store services, delivery options and convenience. Rimal (1998) analyzed the effects of generic and brand promotions on sales of fresh cut-flowers at the retail level in the U.S.

Girapunthong (2002) analyzed the demand drivers for fresh cut-flowers and their substitutes in the U.S. Girapunthong found that all direct price effect coefficients with the seasonal and actual variables were statistically significant and changes in the relative prices had a significant impact on flower market shares among fresh cut-flowers, potted flowering plants, and dry/artificial flowers. Ward (2004) evaluated the impacts of the Flower Promotion Organization (FPO) advertising campaign on cut-flower sales, concluding that the promotions have impacted the demand for flowers through increasing buyer frequency and through attracting new buyers. He found that about 87 percent of the increase in demand for the promotional programs is from the increased number of transactions per buyer. Ward found that the demographic group that responded the most to the promotional program were female buyers that purchase flowers for self-use. This was consistent with the target of the FPO promotion program.

Yue and Behe (2008) analyzed consumer preferences for different floral retail outlets. They used a consumer panel data collected by the American Floral Endowment from 1992 to 2005 to evaluate consumers' choice of different floral retail outlets among box stores, traditional freestanding floral outlets, general retailer, other stores, and direct-to-consumer channels. When studying the aforementioned literature regarding the demand for floral products, it is apparent that there are many factors that affect their demand. These factors can be grouped into three main categories: external, controlled, and seasonal factors. External factors of demand include inflation, wages, prices, unemployment rate, demographic factors and other economic variables. Controlled factors of demand may be used to change perceptions and awareness with the use of promotions, product development and innovations. Seasonal factors also affect the demand for flowers. There are certain special calendar occasions when the demand for flowers is substantially higher. The most common special calendar occasion dates are Mother's Day and Valentine's Day (Ward, 1997).

The main objective of this paper is to analyze the demand for flowers by decomposing the demand into two types of analysis for cut-flowers, potted flowering plants, dry/artificial and outdoor flowers. First, market penetration models were developed and then buying frequency was analyzed. This decomposition is one of the main contributions of this paper to the literature, and it will also aid managers in designing marketing programs to address either the entry of new buyers or to increase the number of transactions of current buyers. Because flowers are non-essential for survival, in a typical month the percentage of the population that buys flowers is less than five percent. From this fact arises the need to understand how consumers make the choice to purchase flowers or not and what are the factors that influence their purchasing decisions. After determining the factors that affect their purchase behavior, simulation analysis was used to develop specific programs to increase the entry of new consumers (market penetration). Once a person becomes a consumer of flowers, the remaining question is what motivates a buyer to increase their expenditures (the frequency of buying). Together these two

models provide a basic understanding of the factors that influence the demand for flowers, and can help the industry make marketing decisions in an attempt to increase total flower consumption.

Even though fresh cut flowers, potted flowering plants, and dry-artificial flowers are fundamentally different and substitutable to some degree, there are certain similarities in their attributes if analyzed in terms of the purpose of use. They can be used to express love, thanks, reflect emotions, project beauty, and show environmental concerns. Consumer expenditure patterns may change among these products even though they are physically different. These consumer patterns are affected by many factors, including income, purpose of use, occasions, information, perceptions and sources of purchases. The level of consumer expenditures depends on three basic components: market penetration, frequency of transactions among buyers and prices. Demand analyses for floral products differ among other agricultural commodities because the quantity consumed is used directly in the analysis. In the case of floriculture products, a consumer purchase quantity is ambiguous and closely tied to the type of flower; for example, a quantity of one may refer to one single stem rose, or an arrangement of a dozen roses and several other plants. Hence, this study replaces quantity (number of units) observed by the number of transactions given on a defined period of time. In doing so, all properties (or restrictions) of the demand function are still satisfied.

Methods

Consumer aggregate data for flower purchases from July 1992 to July 2004 was obtained from the American Floral Endowment (AFE) and Ipsos-NPD group. Data were based in a consumer panel of 15,300 households who reported their purchases of floral products in the US. Data include consumers in 48 states and Washington D.C. with 612,000 aggregate transactions. The data set is organized by total number of households, expenditures, transactions and buyers. Market penetration and buyer frequency models are developed in order to separate the total demand effect for flowers in the U.S. into market penetration effect and buyer frequency effect. Because both models, market penetration and buyer frequency, have a cluster of observations on the lower limit, a model was selected that takes into account its asymptotic distribution. The market penetration model has a lower limit at zero, while the buyer frequency has a lower limit of one, since in order to be defined as a buyer a household must have made by definition at least one transaction per month or more. The model that deals with this type of clustering of the data is the Tobit model (Greene 2000).

The dependent variables for each model were penetration and frequency respectively. Market penetration was defined as the number of buyers divided by the number of households (equation 1). This would result in a market penetration index between the values of zero and one, where zero means that there are no buyers at all, while a value above zero means that some households with a defined group were buyers.

$$(1) \qquad P_i = \frac{B_i}{HH_i}, 1 \quad 0 \le P_i \le \ ,$$

where P_i , B_i , and HH_i are penetration, households making purchases (buyers) and total number of households for the *ith* product form.

Frequency is derived by dividing transactions by buyers (equation 2).

$$(2) \qquad F_i = \left(\frac{T_i}{B_i} \right),$$

where F_i , T_i , and B_i are frequency, total transactions and households with purchases (buyers) for the *ith* product form. By definition a person who is a buyer had at least one transaction or more in a given period, or else that person would not be defined as a buyer. Since F_i is censored at 1, an often-used option for an estimation purpose is to adjust the censored variable so that the lower limit is zero. That adjustment simply entails subtracting the lower level from the original censored value of one.
In order to account for this tr uncation on the data set, Tobin developed a m odel specified as follows:

$$(3) \qquad y_i^* = x_i'\beta + \varepsilon_i ,$$

where x_i' is a (1 × K) vector of explanatory variables and $\varepsilon_i \sim N(0, \sigma^2)$ and it is independent of other errors. The problem arises because in order for a hous ehold to be a buyer, it has to have at least one transaction during a gi ven period. Adjusting the subtr acted one from the frequency variable to have the lo wer lim it equal zero. I n the penetr ation m odel a large nu mber of the observations take the value of the lower lim it, zero. Thus for any household the penetration and frequency models would take the form:

$$(4) \qquad \begin{aligned} y_i &= y_i^* \text{ if } && y_i^* > 0 \\ y_i &= 0 && \text{if } y_i^* \le 0 . \end{aligned}$$

From the total number of observations T in the sample, the number of observations can be divided into two groups; one for which $y_i = 0$, T_0 ; and another for the number of observations for which $y_i > 0$, T_1 (Greene 2000).

The independent variables for both penetration and frequency models were discrete variables created for income, gender, purpose, age, seasonal monthly, and region dummies. If the common method of creating dummy variables described by Greene (2000) is used, then the base level for all the coefficients of the dummy variables will be the category left out of the equations in order the avoid the dummy variable trap. A different approach consists of restricting the sum of the coefficient of the dummy variables to zero. In this case, the base of the dummies would be the mean of all the categories, and any parameter estimate would be compared relative to the average variable.

The price per transaction is calculated from the data set by dividing total expenditures by the number of transactions (equation 3).

$$(5) \qquad P_i = \frac{E_i}{T_i} ,$$

where P_i , E_i , and T_i are price per transaction, total expenditures and total transactions for the ith product form.

The penetration model is defined as:

$$P_i^* = \delta_{0(i)} + \sum_{k=2}^{4}\delta_{k(i)}\left(I_{k(i)} - I_{1(i)}\right) + \delta_{6(i)}\left(G_{2(i)} - G_{1(i)}\right) +$$
$$\delta_{8(i)}\left(PP_{2(i)} - PP_{1(i)}\right) + \sum_{k=2}^{4}\delta_{8+k(i)}\left(A_{k(i)} - A_{1(i)}\right) +$$
$$\sum_{k=2}^{12}\delta_{12+k(i)}\left(M_{k(i)} - M_{1(i)}\right) + \sum_{k=2}^{9}\delta_{25+k(i)}\left(R_{k(i)} - R_{1(i)}\right) +$$
$$u_i$$

And the frequency model is defined as:

$$F_i^* = \delta_{0(i)} + \sum_{k=2}^{4}\delta_{k(i)}\left(I_{k(i)} - I_{1(i)}\right) + \delta_{6(i)}\left(G_{2(i)} - G_{1(i)}\right) +$$
$$\delta_{8(i)}\left(PP_{2(i)} - PP_{1(i)}\right) + \sum_{k=2}^{4}\delta_{8+k(i)}\left(A_{k(i)} - A_{1(i)}\right) +$$
$$\sum_{k=2}^{12}\delta_{12+k(i)}\left(M_{k(i)} - M_{1(i)}\right) + \sum_{k=2}^{9}\delta_{25+k(i)}\left(R_{k(i)} - R_{1(i)}\right) +$$
$$\beta_{1(i)}P + \beta_{2(i)}IMR + \beta_{3(i)}GXP + \beta_{4(i)}PPXP + u_i$$

The variables and their summary statistics are defined in the Appendix as Tables 1 and 2.

Results and Discussion

The parameters were estimated using TSP version 4.5 (Hall 1992). The results for both dem and models yielded similar results. If the common method of creating dummy variables is used, then the base level for all the coefficients of the dummy variables will be the category left out of the equations in order the escape the dummy variable trap. A different approach consists of restricting the sum of the coefficient of the dummy variables to zero. In this case, the base of the dummies would be the mean of all the categories (Wirth 2007; Suits 1984; Greene and Seaks 1991). For example, let β_{ki} be the parameter estimate for income, then if the restriction $\sum_{k=1}^{4}\beta_{ki} = 0$ is imposed, then $\beta_{1i} = -\sum_{k=2}^{4}\beta_{ki}$ is obtained and then the dummy variable $di_k = i_k - i_1$ will be created, where $k \neq 1$. More generally we would impose the restriction as follows:

(6) $\sum_{k=1}^{K}\beta_{ki} = 0$, to obtain $\beta_{1i} = -\sum_{k=2}^{K}\beta_{ki}$,

In order to create the dummy variables the following operation follows:

$$(7) \qquad dummy_k = category_k - category_1 \text{ , where } k \neq 1 .$$

The results for flower types and regions differed considerably. Their interpretation is quite simple, as all of the variables except price are dummy variables and hence represent deviations from its means. For example, if the parameter estimate for the month of February is positive and significant, it means that the month of February is statistically higher than the average of the twelve-month cycle. Alternatively if income group 2 was negative, it means that income group is lower that the average of all income groups. Most of the parameter estimates in both models were significant at the 95 % confidence level.

In general it was found that the demand for flowers, both market penetration and buyer frequency, depends on demographic characteristics, purpose of the purchase and seasonality factors. The results vary depending on the flower types and regions. For example, for most cut-flowers, it was found that market penetration and buyer frequency increased with females purchases for the purpose of self-use and with the higher age categories. In general, for seasonality effects, each month was compared to an average over the twelve-month period. The results were in agreement with the findings of Miller (1983) and indicated that household demand, in our case, decisions to purchase flowers (market penetration) and the number of transactions on a given period (buyer frequency) was highly impacted by calendar occasions. The only continuous variable was price on the buyer frequency model and it was negative. This is in accordance with economic theory for normal goods (Nicholson 1998). The rest of the parameter estimates were obtained from dummy variables and can be interpreted easily as deviations from its means. The complete set of results can be found in the Appendix (Tables 3 and 4).

Simulation Analysis

The simulation analysis is an essential part of this research project. Each simulation procedure measured demand changes by adjusting one or more variables relative to the mean value of the rest of the variables in the demand model. The first step in the simulation analysis was to calculate the market penetration and buyer frequency values for the average household consumer. Then, both market penetration and buyer frequency were calculated with changes in one variable only with the rest of the variables kept constant at the average consumer level. After obtaining the values for market penetration and buyer frequency, the proportion of the total number of transactions attributed to frequency of buying versus the increment in the number of buyers (market penetration) was calculated. This was accomplished by multiplying the market penetration value by the total number of households to obtain the total number of buyers (B); Then, the total number of buyers and the frequency of transaction (F) were obtained for the average household and for changes within a specific variable, and the proportion of the variable attributed to buyer frequency versus market penetration was calculated. For example, for age, the highest and lowest number of transactions were selected, in order to capture the whole variation effect from the age variable. This would be referred to as the range of transactions. The range represents total variation in transactions from the variable means, and it could have a negative or a positive impact. The range would differ from variable to variable, depending on the relative

negative or positive impact of that variable in the total number of transactions. Some variables may have a large negative range, while other may only have a small negative range. In general the larger the negative impact, then the highest potential to reduce it and increase the number of transactions. Managers should concentrate on marketing programs that address the negative component of each variable. For example, if the younger age group had a large negative range, it means that young age group should be targeted in promotional and advertising campaigns. The proportion of the variable changes in total number of transactions corresponding to frequency of buying for cut-flowers, plants, dry/artificial, and outdoor are low, varying from one flower type to the other. In other words, the increase in the number of transactions is due in a larger proportion to an increase in the number of buyers (market penetration). The number of transactions for all flower types was most affected by attracting new buyers into the market. Even though these results seem to differ from the findings of Ward (2004), who found that 87 percent of the increase in the number of transactions were due to increase in the frequency of purchase, this is because Ward was evaluating the impact of the FPO promotional campaign; and the main objective of that campaign was to increase the number of transactions of females in the older age groups and higher income levels.

The results clearly show that the demand for flowers is driven in part by demographics, seasonal occasions, purpose, price and geographical differences based on regions in the U.S. Furthermore, the demand response is from both changes in the level of market penetration and frequency of buying with penetration being the major component in the demand equation. Important differences in the demand drivers were observed across the four flower types, (i.e., cut-flowers, flowering plants and greens, dry/artificial flowers, and outdoor flowers). Also, the drivers influenced both market penetration and frequency of buying with the level of importance quite different across the drivers within each flower type.

Demand for flowers in all forms is a direct reflection of consumer preferences and differences in preferences across the population. Measuring demand's two components, as proposed in this study, is essential to understanding and influencing the longer-term growth and opportunities for marketing flowers in the U.S. Unlike many other countries, the percentage of U.S. households buying flowers within a month is quite low and differs by flower type. The results provide clear insights into these differences across flower types and the demand drivers. For each sector, the obvious goal would be to move the average number of total transactions to higher levels. Much of that could probably be accomplished by addressing the factors to generate transaction levels below the means, or a negative impact in the range of transactions (Figure 1). For fresh cut-flowers age and seasonality are the two demand drivers having the greatest potential negative impacts with the values below the average level of transactions being nearly equal between these two variables. Then purpose, regional differences and gender produce similar relative effects on the number of total transactions. Furthermore, for each of these variables most of the changes above or below the average level are attributed to buyer penetration. These results point to marketing programs to address the age effect and seasonality negative effects to have probably the most potential to move the average transaction levels even higher. Some of these programs may include some sort of promotion or advertising targeting these specific demographic group interests with particular advertising and promotion efforts that seek to attract younger age groups to become buyers of flowers and also to promote consumption of floral products during non-calendar occasions (seasonality). While the regions, purpose (i.e., gift versus self) and gender

have slightly lower negative impacts, these three are likely easy to target. Recent programs developed by the Flower Promotion Organization, a relative new generic promotion program, currently target females to buy flowers for self-use and promotions are targeted to specific regions (Ward 2004). The regional differences shown in the Tobit models provide guidance to better regional targeting to the extent that there is flexibility in the regional selection. Finally, targeting income groups appears to have considerably less potential relative to the other demand drivers for fresh cut-flowers.

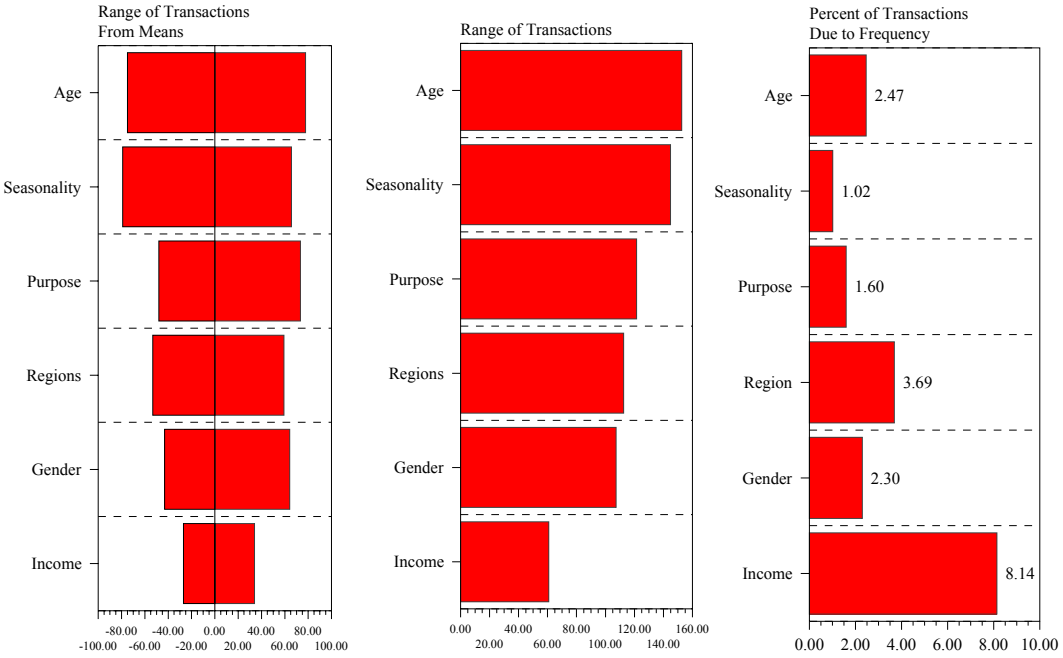

Figure 1. Ranges and percentages of variable changes affecting transactions due to frequency of buying for cut-flowers.

For flowering plants and greens, age and gender have the largest negative effects (Figure 2). Hence, programs designed to target age and gender have considerable potential whereas efforts to address seasonal and regional differences, as well as income and purpose, have far less potential to moving the transaction levels for flowering plants. Interestingly, the role of purpose is extremely small, causing very little variation in transactions below the mean. Clearly, targeting those age groups and gender that contribute to the negative side of the transaction equation is suggested with the estimates.

For dry and artificial flowers, age and gender are the two most important targets since some age groups and gender create most of the transactions below the mean levels (Figure 3). Among all four-flower types, gender is most important in relative terms for the dry/artificial flower group. Negative effects from regional differences, seasonality, income and purpose are very small and most likely have limited payoff in producing larger gains in the number of transactions for the dry and artificial flower group.

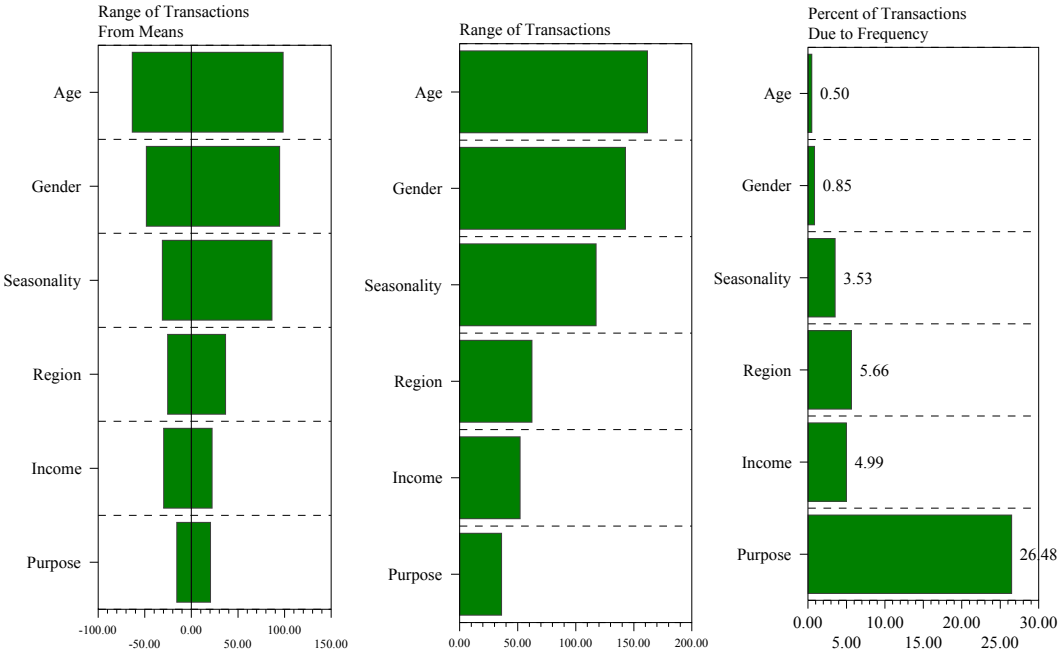

Figure 2. Ranges and percentages of variable changes affecting transactions due to frequency of buying for plants.

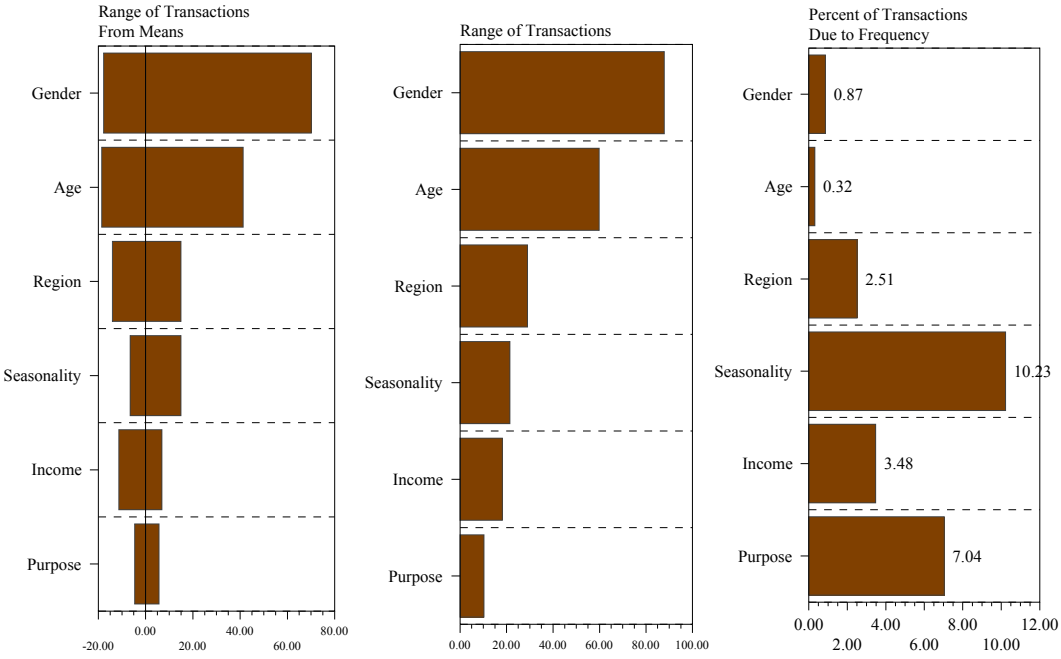

Figure 3. Ranges and percentages of variable changes affecting transactions due to frequency of buying for dry/artificial.

Finally, the outdoor flowers show a profoundly different response level with most of the variation in the transactions being attributed to seasonality. This obviously reflects much of the spring planting season with outdoor flowers. Beyond seasonal differences, age, gender and purpose on the negative side of the equation (i.e., producing values below the average) were reasonably small in relative terms (Figure 4). Addressing seasonal patterns is likely the most difficult thing to change since the season demand is closely tied to weather, fixed holidays and seasonal celebrations. Also, the importance of frequency of buying is slightly greater for the outdoor market than for the other flower types. There is probably more substitutability among cut-flowers, plants and dry/artificial flowers compared with the outdoor flowers.

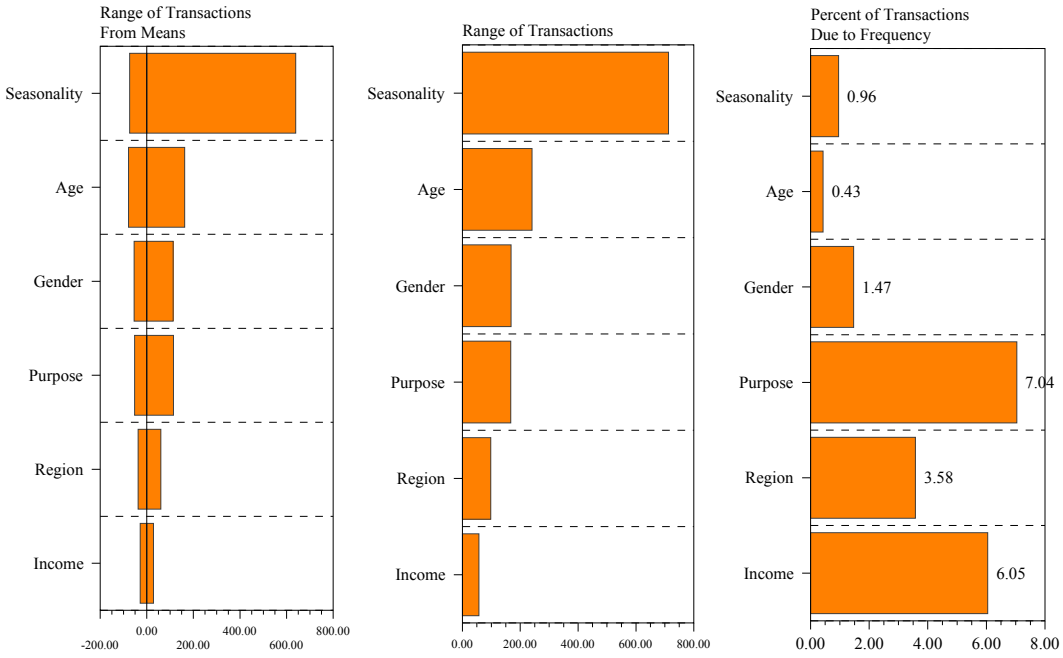

Figure 4. Ranges and percentages of variable changes affecting transactions due to frequency of buying for outdoor.

Summary and Conclusions

One of the most important overall objectives of this research project was to separate the demand drivers for flowers into the market penetration component from that of the frequency of buying. Most transactions for all flowers took place because of the entry of new buyers rather than repeat buying customers (frequency); however, when analyzing each variable individually, this percentage differed across flower types. Figure 5 presents a summary of the percentage of the number of transactions that is due to frequency of buying for all flower types. The extreme importance of market penetration versus frequency of buying has considerable implications. New buyers may need additional information and are potentially influenced by the first impression, whether the facilities or quality of the flowers. Buying habits may not be as well established in terms of the types of flowers and what is communicated with different types. Hence, having in-store information to guide potential buyers is more important than with products where the consumer is a frequent repeat buyer. For outdoor flowers, informational needs are even more

challenging for the new buyer. Store layout, resource materials, and personal assistance are likely more important with the demand gains coming mostly from market penetration versus the frequency of buying.

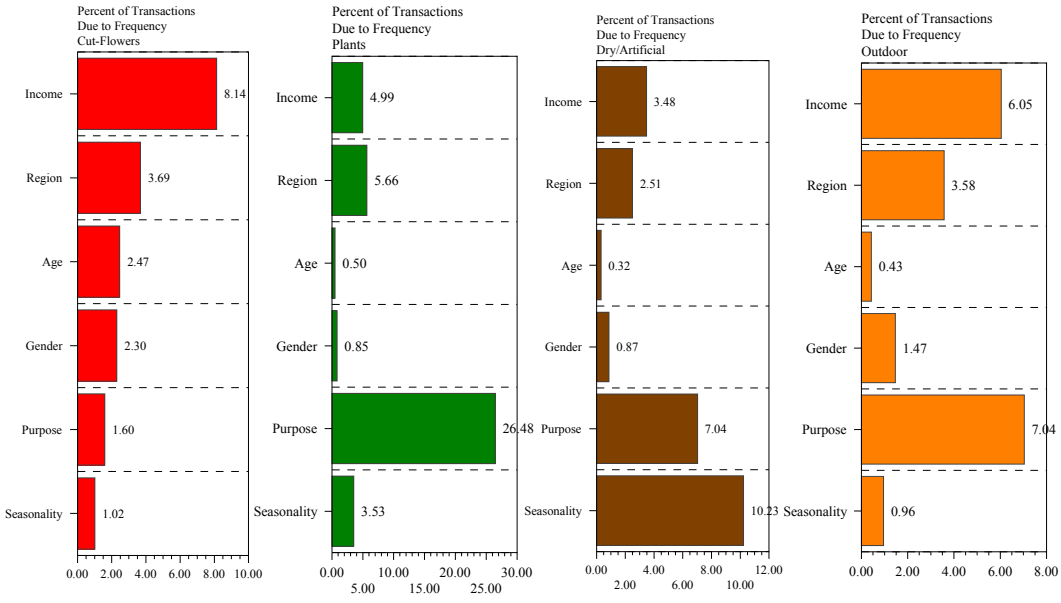

Figure 5. Percentage of transactions due to frequency of buying for all flower types.

While the goals likely differ among the four flower types, there are several generalities that have potential for all four. The demand for each flower type was closely tied to the age of the buyer with the transactions increasing with the age of the buyer. Hence, promotional efforts to target the younger market in all flower types should have potential positive benefits in all four groups. For the other classifications, programs targeting specific household attributes should more likely be tailored to the type of flowers (e.g., cut, plant, dry or outdoor) being marketed as described previously.

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Appendix 1

Table 1. Variables for the market penetration and buying frequency models

Purpose	PP = (self = 0) and (gift = 1)
Gender	G = (male = 0) and (female = 1)
Income	I2 = ($25,000 - $49,999 = 1) or (otherwise = 0) I3 = ($50,000 - $74,999 = 1) or (otherwise = 0) I4 = ($75,000 or more = 1) or (otherwise = 0)
Age	A2 = (25 - 39 = 1) or (otherwise = 0) A3 = (40 - 54 = 1) or (otherwise = 0) A4 = (55 or more = 1) or (otherwise = 0)
Seasonability	M2 = (February = 1) or (otherwise = 0) M3 = (March = 1) or (otherwise = 0) M4 = (April = 1) or (otherwise = 0) M5 = (May = 1) or (otherwise = 0) M6 = (June = 1) or (otherwise = 0) M7 = (July = 1) or (otherwise = 0) M8 = (August = 1) or (otherwise = 0) M9 = (September = 1) or (otherwise = 0) M10 = (October = 1) or (otherwise = 0) M11 = (November = 1) or (otherwise = 0) M12 = (December = 1) or (otherwise = 0)
Region	R2 = (Middle Atlantic = 1) or (otherwise = 0) R3 = (East North Central = 1) or (otherwise = 0) R4 = (West North Central = 1) or (otherwise = 0) R5 = (South Atlantic = 1) or (otherwise = 0) R6 = (East South Central = 1) or (otherwise = 0) R7 = (West South Central = 1) or (otherwise = 0) R8 = (Mountain = 1) or (otherwise = 0) R9 = (Pacific = 1) or (otherwise = 0)
Price	P
Mills	IMR – Inverse Mills Ratio of the Probability of Becoming a Buyer, calculated using a Probit Model
Gender x PRT	GXP – Interaction Variable Gender X Price

Appendix 2

Table 2. Summary statistics for all variables and all flower types combined

Category	Variable Name	Description	Mean	Std Dev
Purpose	PP	Gift	0.4593	0.4983
Gender G		Female	0.5407	0.4983
Income	I1	< $25,000	0.2619	0.4397
I	2	$25,000-$49,999	0.2830	0.4505
	I3	$50,000-$74,999	0.2315	0.4218
I	4	$75,000 +	0.2235	0.4166
Age	A1	<25	0.1293	0.3355
A	2	25-39	0.2688	0.4434
	A3	40-54	0.2989	0.4578
A	4	55 +	0.3030	0.4595
Month	M1	January	0.0733	0.2606
M2		February	0.0866	0.2813
	M3	March	0.0868	0.2815
M4		April	0.0958	0.2943
	M5	May	0.1013	0.3017
M6		June	0.0865	0.2810
	M7	July	0.0790	0.2697
M8		August	0.0761	0.2651
	M9	September	0.0784	0.2689
M1	0	October	0.0810	0.2729
	M11	November	0.0762	0.2654
M12		December	0.0790	0.2697
Region	R1	New England	0.1405	0.3475
R2		Mid Atlantic	0.0824	0.2750
	R3	East North Central	0.1123	0.3158
R4		West North Central	0.1103	0.3133
	R5	South Atlantic	0.0820	0.2744
	R6	East South Central	0.1128	0.3163
	R7	West South Central	0.0751	0.2636
R8		Mountain	0.0950	0.2932
	R9	Pacific	0.0785	0.2689
Price P		Price	13.5013	14.0586

Appendix 3

Table 3. Market penetration model results

Category	Variable Name	Description	Cut-flowers		Plants		Dry		Outdoor	
			Beta	*T-value*	*Beta*	*T-value*	*Beta*	*T-value*	*Beta*	*T-value*
	C		-0.0007	-52.3112	-0.0011	-76.8696	-0.0022	-115.6828	-0.0038	-120.9518
Purpose	PP	Gift	0.0011	102.9237	-0.0003	-25.1376	-0.0002	-20.4351	-0.0019	-84.9935
Gender G	2	Female	0.0009	86.0835	0.0014	125.2033	0.0015	114.4173	0.0022	99.2070
Income	I2	$25,000-$49,999	0.0003	18.6526	0.0004	19.5252	0.0003	15.8162	0.0007	18.6633
I	3	$50,000-$74,999	-0.0005	-29.6864	-0.0008	-38.8804	-0.0007	-36.6055	-0.0010	-25.9222
	I4	$75,000 +	0.0005	28.0709	0.0004	21.6003	0.0001	6.0903	0.0007	18.3733
Age A	2	25-39	0.0002	13.7908	0.0001	7.9370	0.0001	4.3646	0.0002	6.0113
	A3	40-54	0.0008	45.9536	0.0007	37.9315	0.0005	28.6399	0.0015	42.8205
A	4	55 +	0.0010	56.0033	0.0015	84.6699	0.0012	70.0850	0.0030	84.8853
Month	M2	February	0.0009	29.3479	0.0000	-0.0506	0.0001	3.3859	-0.0014	-18.8813
M	3	March	0.0004	10.7160	0.0002	6.3438	0.0003	8.1818	0.0007	10.9955
	M4	April	0.0004	10.7361	0.0010	30.6956	0.0002	5.6269	0.0036	58.8141
M	5	May	0.0008	24.8736	0.0012	36.1014	0.0005	14.8107	0.0062	104.3894
	M6	June	-0.0002	-6.5393	-0.0002	-6.6311	-0.0003	-8.2608	0.0026	41.3037
M	7	July	-0.0003	-9.2678	-0.0006	-17.3406	-0.0003	-9.9504	-0.0001	-1.1828
	M8	August	-0.0003	-8.3059	-0.0008	-20.5723	-0.0003	-8.2480	-0.0012	-16.3510
M	9	September -0	.0003	-9.8279	-0.0007	-18.0200	-0.0001	-3.3137	-0.0003	-3.5717
	M10	October	-0.0002	-5.2949	-0.0006	-15.6467	0.0000	-0.5259	-0.0006	-8.2480
	M11 N	ovember	-0.0003	-7.6487	-0.0003	-7.8065 0	.0001	2.8372	-0.0027	-32.8293
	M12	December	-0.0005	-14.6275	0.0013	40.2844	0.0001	3.2050	-0.0036	-41.2331
Region R2		Mid Atlantic	0.0005	15.2437	-0.0002	-6.0979	-0.0012	-31.2740	-0.0006	-9.4757
	R3	East North Central	0.0007	25.6229	0.0002	7.4795	-0.0001	-3.0994	0.0002	3.9665
R4		West North Central	0.0004	12.3367	0.0003	9.4144	0.0003	10.0981	0.0003	4.3330
	R5	South Atlantic	-0.0006	-17.5750	-0.0005	-15.4916	0.0000	-0.4940	-0.0009	-13.3050
	R6	East South Central	0.0002	7.7168	0.0003	10.7089	0.0004	12.9990	0.0011	18.1417
	R7	West South Central	-0.0013	-37.0119	-0.0007	-20.6050	0.0001	4.7204	-0.0011	-16.2393
R8		Mountain -0	.0004	-13.4968	-0.0002	-6.4145	0.0000	1.5941	-0.0004	-5.8071
	R9	Pacific	-0.0006	-19.2774	-0.0006	-17.3769	-0.0008	-23.3985	-0.0016	-22.1806
S	igma		0.0026	269.3091	0.0026	258.0288	0.0021	188.0584	0.0048	249.8967

Appendix 4

Table 4. Frequency of buying results

Category	Variable Name	Description	Cut-flowers		Plants		Dry		Outdoor	
			Beta	*T-value*	*Beta*	*T-value*	*Beta*	*T-value*	*Beta*	*T-value*
	C		-0.4969	-10.3032	-0.8461	-14.5258	-1.5248	-6.1599	-0.1197	-1.6551
Purpose	PP	Gift	-0.0674	-4.0430	-0.3138	-27.6656	-0.0621	-2.7835	-0.5539	-30.8803
Gender G	2	Female	0.1335	9.1006	0.2632	12.8957	1.0034	11.3425	0.2686	13.6566
Income	I2	$25,000-$49,999	-0.0049	-0.3982	0.0628	4.3289	0.1497	4.4845	0.0034	0.1926
I3		$50,000-$74,999	-0.0441	-3.6628	-0.1251	-8.4163	-0.3005	-7.2216	-0.0166	-0.9369
	I4	$75,000 +	0.1253	11.3766	0.0822	5.9498	0.0266	0.8880	0.1014	5.8005
Age A	2	25-39	-0.0429	-3.5423	0.0843	5.8475	0.2203	7.2472	0.1772	9.6118
	A3	40-54	0.2247	14.7371	0.2235	12.4431	0.2961	6.6943	0.2052	9.1415
A	4	55 +	0.3276	21.9142	0.2144	10.4883	0.3233	5.3088	0.1290	4.9904
Month	M2	February	0.0980	4.7494	-0.0140	-0.5638	0.0811	1.6419	-0.2101	-5.4304
M	3	March	0.0411	2.0070	0.1206	5.0352	0.2589	5.3248	0.2377	7.5798
	M4	April	0.0533	2.6056	0.2582	10.6746	0.1893	3.8931	0.6245	17.3198
M	5	May	0.1664	8.1822	0.3360	13.6652	0.4232	8.6589	0.9306	21.8288
	M6	June	0.0216	1.0069	-0.0419	-1.6323	-0.2716	-4.9119	0.5625	17.2824
M	7	July	-0.0390	-1.7880	-0.1456	-5.1976	-0.1643	-2.9610	0.0208	0.6413
	M8	August	0.0059	0.2732	-0.1648	-5.7083	0.0387	0.7106	-0.1646	-4.5228
M	9	September	-0.0421	-1.9114	-0.1657	-5.9417	-0.0871	-1.6874	-0.1292	-3.9033
	M10	October	-0.0822	-3.8307	-0.1113	-4.0932	-0.0524	-1.0457	-0.1133	-3.3277
M	11	November	-0.1021	-4.6436	-0.1651	-6.2678	-0.0842	-1.6859	-0.4327	-9.1418
	M12	December	-0.0225	-0.9716	0.2452	10.1382	-0.1910	-3.7843	-0.8675	-14.5413
Region R2		Mid Atlantic	-0.0145	-0.6413	-0.2358	-7.6445	-0.6873	-6.0833	-0.0659	-1.7498
	R3	East North Central	0.1604	7.6671	0.1077	4.7708	-0.0320	-0.6788	-0.1473	-5.0375
	R4	West North Central	0.0739	3.6175	0.1384	6.0367	0.1462	2.8940	-0.0268	-0.9184
	R5	South Atlantic	-0.3027	-11.7934	-0.3052	-10.1533	-0.2860	-5.2314	0.0267	0.7247
	R6	East South Central	0.1266	6.3317	0.1142	4.9973	0.1610	3.0354	0.0631	2.1514
	R7	West South Central	-0.3272	-9.1399	-0.2122	-6.2438	0.1189	2.1508	-0.1429	-3.6855
R8		Mountain	-0.0050	-0.2340	-0.0243	-0.9889	0.0318	0.6729	-0.0306	-0.9868
	R9	Pacific	-0.3078	-10.1270	-0.2702	-8.2696	-0.4877	-5.5829	-0.1000	-2.5368
Price P		Price	-0.0121	-13.5142	-0.0139	-17.7185	-0.0391	-22.8771	-0.0221	-22.4493
IMR	IMR	Inverse Mills Ratio	0.2579	5.0657	0.3592	6.4711	0.7329	4.7177	0.1049	1.7253
Interaction	GXP	Gender x Price	0.0013	2.8169	-0.0014	-1.9389	-0.0057	-3.3711	-0.0075	-7.9813
	PPXP	Purpose x Price	0.0059	6.6979	0.0015	1.9570	-0.0072	-5.2307	-0.0003	-0.2661
Si	gma 1		.1256	172.4753	1.2359	158.6380	1.9869	135.5962	1.5970	186.0218

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Industry Speaks

Defining an Agribusiness Strategic Agenda for 2010-2020

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Editor's Note: *The Brazilian research, projects and consulting company Markestrat, presents a food and agribusiness research agenda which suggests areas for researchers to focus their attention over the next 10 years. Beyond the broad areas of sustainability and globalization what specifically will challenge businesses the most? Readers, please feel free to challenge the Markestrat proposal and submit your thoughts on a research agenda. We publish an "Industry Speaks" every issue, and would love to hear from you.*

Abstract

This article addresses the importance of having a research agenda that is useful to industries, government and organizations in the future. The authors propose and share 10 topics with the research community. It builds upon the sustainability of business operations critical in the next era, 2010-2020, and the importance of considering the company as a network of relationships and contracts. These topics include: empowerment, simplicity, technology, emerging consumers and markets, integration of economy, climate and environment, risk management and network value reengineering. A research agenda is outlined for each topic.

Keywords: networks, sustainability, supply chains, marketing, agribusiness, agenda

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Introduction and Objectives

Markestrat is a think tank created in 2004 in Brazil for projects and research in the field of agribusiness and food chains. It has three major pillars; scientific research, education and training, and consultancy. This mix of activities within one organization provides a rich environment for knowledge creation which supports public and private institutions. At its core Markestrat facilitates day-to-day interaction between industry and academics. More than 25 researchers work at Markestrat.

The major task of Markestrat is to supply managerial methods to the private and public sector. Several methods have been created and used over the years. Most have been published by international journals and consolidated into a book recently published by Routledge (Marketing Methods to Improve Company Strategy, 2010, 127 pag). One of the most important activities of Markestrat is in food chain quantification and strategic planning. The methods have been applied in the sugar cane, orange, milk, meat, fruits and wheat sectors in Brazil, Argentina, Uruguay, Mexico and Venezuela.

Being in touch with both public and private sectors, and linked to the University in the scientific area, provide an opportunity to discuss and conduct workshops on the 2010-2020 research agenda. It is important to share views and exchange experiences about the fast changing agribusiness environment with industry colleagues, policymakers, and researchers.

The objective of this article is to present a list of research topics, considered by the authors to be hot topics in the future. These strategies are important to consider if we wish to be come and remain competitive as we enter a period called the "network era" where food companies will be more intimately involved in their supply chains.

Method

This list is in part based on the previous experience of the authors, acquired in several international lectures, projects, and consultancies over the last 10 years. It was also developed from a review of relevant literature, case studies done by the first author for the Harvard Business School, and several in-depth interviews with executives on international investments.

The Big Picture: An Era of Sustainability, 2010-2020

Sustainability defined as the "responsible use of exhaustible energy resources and raw materials" is increasingly gaining attention throughout the world. Several factors have contributed to this heightened sensitivity— rising consumer awareness and expectations, the emergence of a new generation concerned with planetary welfare, the scarcity of natural resources in light of an increasing population; floods, hunger and lost agricultural areas due to global warming; and the impact of mass communication, which allows the immediate transfer of news concerning disasters, and bad behaviors by individual firms and farm businesses.

At a company level there is a growing concern that firms have to reduce impacts on the

environment and increase transparency, promote greater inclusion and less social imbalance, and finally, increase the efficiency of the company's use of natural and renewable resources/energy.

Sustainability has three traditional major pillars; the economic dimension (profit), the environment dimension (planet), and the social dimension (people). We've added a fourth "P", pro-activeness.

Without economic sustainability, any other request is impossible, since companies cannot operate without positive margins. This is the first and most important component. A company must be economically sustainable.

On the environment side *(planet)*, major factors to consider are the impact of the company on the environment. These include: those of suppliers, transportation (food miles), packaging (trying always to recycle and reuse), waste management (generating less waste; separating and recycling; generating energy/fertilizers from waste), energy usage, emission reductions, water management, low impact building and facility construction. Consumers also have an incredible task as well to change their habits and become more responsible.

On the social *(people)* side, major factors include employee working conditions as well as the conditions in the company's suppliers and distributors, health and safety, use of child labor, safety equipment, promoting actions for local community, incentives for cooperation, small holder initiatives, technology transfer to smallholders, improving local companies capacity and ensuring that product lines provide consumers real benefits, especially where nutrition and health are concerned.

Finally, a company must be *proactive*. They should not only espousing sustainability, but demonstrating change through action. This involves building a code of conduct, following codes of industry associations and governments, budgeting for sustainability, initiating steps to reduce environmental impacts, monitoring and documenting activities, and assuring internal information is exchanged and communicated among various committees and boards.

Sustainability is the starting point for the next 10 years. The next session provides important topics where more research is needed, and where the interaction between academics and industry, the hallmark of the last 20 years of IAMA, will be valuable for addressing the challenges facing agribusiness.

Ten Topics for Industry Research

- What is industry going to do?
- What do they need from researchers?
- What linkages will make industry more effective in what they do?
- What knowledge needs to be developed?
- What are important research topics for the major agribusiness strategy think-tanks?

Empowerment

Companies, networks and productive chains may become more valued by consumers if they operate by becoming more inclusive and finding a place for small shareholders at the base of the pyramid—small land holders, suppliers, distributors, and service providers. Over the next ten years consumers will expect companies to be socially responsible. For example, fair trade networks will gain more importance. Inclusion will be a topic of growing demand to promote job growth, and more equitable income distribution across the globe.

Integration of Economy

Greater value chain integration across the globe means that more research is needed on emerging countries' supply chains, as alternatives for developed world consumers, and emerging countries' markets as opportunities for market growth. More integrated chains mean knowledge about local institutions, organizations, customs, and practices will be in great demand.

Income Distribution

Rising incomes in many developing countries has generated a need for greater research on emerging market consumers. The growth of Islamic and Southern hemisphere consumers raises not only new questions about product- brand targeting and positioning, but also the sustainability impacts when these consumers adopt developed country tastes and preferences.

Climate and Environment (Preservation)

Low carbon networks (carbon management), networks adaptation to climate change, renewable energy networks, environmental certification, resource usage efficiency, network reversal (material reuse and recycling) and network integration for optimization of usage of byproducts will become key themes as firms and their networks attempt to reduce their adverse impacts on the environment. This is a major point for collaboration in future industry agendas as these issues often span multiple nodes in supply chains.

Technology

In this new era of hi-tech, consumers will value companies and networks that make "hi-touch" networks possible. Companies will be expected to be transparent and communicate directly with consumers on an individual basis through respect, engendering trust and problem solving.

Converging Industries

The next 10 years will be special in the convergence of industries, similar to what has occurred among telecommunications, cameras, watches, and the computer industries. The world will large growth in agri-ceutical networks (food and pharmaceutical), agri-cosmetics networks (food and cosmetics), agri-tourism networks (food and tourism business), and agri-fuel networks (food and biofuels). Research will be needed to understand the regulatory frameworks that will be associated with these converged industries.

Risk Management

Although this has been done for decades, new approaches will be needed to serve more integrated companies and the broader network of firms. Risks will now naturally span national boundaries as will the associated risk management mechanisms. Speed and high levels of integration will simultaneously time compress the geography of risk while expanding the causes and effects associated with risk and brand integrity.

Communication

This area will see major changes. New media network communication, proactive network communication with stakeholders, priorities on inclusion, traceability and other trends will place a premium on corporate reaction times.

Era of Simplicity

It is a new era where simplicity will be valued, in terms of the company network management, market segmentation, new product launching, brand management, services, customer focus, sales management, etc. Simplicity in dealing with consumers, clients, suppliers, distributors will be key.

Network value Engineering

Finally, firms will need to balance the power of integrated networks with the increasing need to provide customer intimacy. As a result research on supply chain redesign, contracting, and value capture along the chain will gain even more importance.

Table 1. Ten Major Topics for a Research Agenda for 2020.

10 Major Topics	Research issues for managerial methods and networks
1 – Empowerment	• Chains & networks inclusion of the base of pyramid (smallholders) • Chains & networks social responsibility (working conditions) • Fair trade networks • Margin allocation and distribution
2 - Integration of Economy	• Developing countries supply chains (trade barrier relief) • Developing countries marketing channels
3 - Income Distribution	• Emerging consumers and chains & networks positioning • Building incentives for coordination (associations and cooperatives) • Neo-consumption (volumes/grains to proteins)
4 - Climate and Environment Preservation	• Low carbon networks • Chains & networks adaptation to climate change • Renewable energy networks • Measurement and certification of chains & networks • Chains & networks resource usage efficiency / optimization of by-products • Network reversal (re-use of materials or recyclable inputs)

5 - Technology	• Chains & networks transparency and information exchange • Consumer "hi-touch" networks • Innovation driven networks
6 - Converging industries	• Agri-ceutical networks • Agri-cosmetic networks • Agri-tourism networks • Agri-fuel networks
7 – Risks	• Integrated chain & network risk management and mitigation • New market risks (carbon foot print)
8 – Communication	• New media chains & networks communication • Proactive chains & networks communication with stakeholders • Origin and processes (inclusion) • Traceability
9 - Era of simplicity	• Chain & network management • Market segmentation • New product launching • Customer focus
10 - Network Value Engineering	• Supply chain redesign • Marketing channels value capture • Collective actions in chains & networks

Conclusion and Managerial Implications

The next 10 years will present several challenges for companies and academics to address through research. Companies will need to: focus more, return to their core business, use capital and resources efficiently, and work even more on planning, collective actions and their cost structure. Companies will also need to carefully examine their risk monitoring processes. It will be an era of establishing global and more competitive supply chains and the development of strong value propositions in companies in order to attract and maintain critical human capital. Finally, it will be an era of more conservative leverage and finance, and taking advantage of opportunities for consolidation, acquisition, mergers and cheap assets.

To help the industry face the changes of the next decade academics will need to be more in touch with the real world and address topics that are useful to private companies, governments, and organizations. They will need to deliver more simple and direct messages with real impact on government policy and on strategies applicable to integrated and broad company networks.

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Rabobank's Success in Uncertain Times

An Executive Interview with Frans van Bijsterveld[1]

By Richard Hooper[Ⓘ]

Abstract

The end of 2008 ushered in a severe and sweeping economic change throughout the global economy. In an Executive Interview conducted during IAMA's 2009 World Forum and Symposium in Budapest, Hungary, Frans van Bijsterveld, Global Head of Food & Agribusiness Research at Rabobank explains why Robobank is one of the few financial institutions that has not been heavily affected. Rabobank continues to remain successful in these uncertain times because of it's careful selection of customers and sole focus on Food and Agribusiness (F&A) outside of the Netherlands, as F&A is typically far more resilient than other sectors.

Keywords: economic crisis, banking industry, food and agribusiness, Robobank.

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Introduction

Frans van Bijsterveld joined Rabobank Nederland at the conclusion of his studies at Tilburg University in 1978. Mr. van Bijsterveld began his career in the Economic Research Department and quickly advanced. In 1992, he was appointed General Manager of Rabobank Belgium, and then later appointed Global Head Food and Agribusiness Research in 1996. In 2001, Mr. van Bijsterveld managed the Food & Agribusiness Portfolio in Europe in his role as Food and Agribusiness Business Manager, Europe. Today, he is Head Food and Agribusiness Europe and manages the Food and Agribusiness Wholesale Business.

Rabobank began to internationalize gradually in the 1970's but more rapidly in the 1980's. Mr. van Bijsterveld has been heavily involved in this internationalization. Rabobank has maintained it's Food and Agriculture focus through all the cycles weathered by international economy. Today Rabobank's international's sole focus is on food and agriculture. Only in the Netherlands is Rabobank active in other sectors.

Rabobank Europe has recently undertaken a change in its overall approach to Europe. Rabobank has gone from a very local orientation, a country-by-country focus, to a global and regional focus. Instead of having each office focus solely on their geographic area, Rabobank instead focuses on key global and regional players and aims to satisfy their needs with available resources. Globally, Rabobank's key clients are those involved in grain and oilseed trade, large processed foods manufacturers, such as Nestle and Unilever, and large beverage companies. On the European scene, Rabobank has identified strategic clients who fit their customer profile. Each of the ten Rabobank offices work to become the key bank for strategic clients who are based in their geographic area.

To what extent has Rabobank been affected by the recent credit crisis? What are the qualities that Rabobank possess that have allowed it to continue being successful in such uncertain times?

van Bijsterveld: The credit crisis in itself has affected Rabobank through forcing the devaluation of certain assets, resulting in a loss of capital. However Rabobank has not been heavily affected and these losses could be easily absorbed. Rabobank, along with all other banks, was also affected by the liquidity crisis in 2008, which made it far more difficult to find funding on interbank markets. However, due largely to the strength of Rabobank's Dutch operations, Rabobank was able to remain profitable and maintain growth. The most serious problems are being encountered currently with the economic crisis. This crisis is affecting the markets where Rabobank is most active, predominantly the Dutch market.

Rabobank has continued to remain successful in these times because of it's careful selection of customers and sole focus on Food and Agribusiness (F&A) outside of the Netherlands, as F&A is typically far more resilient than other sectors.

What changes do you see occurring in the next ten years in the food and agricultural industry? How is Rabobank positioning itself to take advantage of these opportunities?

van Bijsterveld: I do not see dramatic changes. Demand and supply factors are the structural drivers and these are not really changing. Processing capacity remains in the Americas, demand in Asia caused by a growing population and increased purchasing power remains, and trade flows will continue to flow from West to East. This will not change, although these trends will be temporarily affected by the economic cycle.
What is changing is risk. Price and volatility will increase so players in the F&A market need to look at their risk management policies in a much better and broader manner than they have done in the past. Rabobank will have to develop the right risk management products. Rabobank will not only have to offer traditional risk management products for things such as foreign exchange risk, but also offer products for the price risk in commodities and risk stemming from the unavailability of productive land.

How would you define Rabobank's current positioning in the banking marketplace?

van Bijsterveld: Rabobank is very strongly positioned in the banking marketplace, being the only privately held bank with a AAA credit rating. In today's tough economic environment, such recognition aids Rabobank greatly with its funding side of its business. This rating is primarily achieved due to Rabobank being a major Dutch financial institution with very stable balance sheet and a cooperative ownership structure. Approximately two-thirds of Rabobank's business is conducted in the Netherlands, with the other third from International business. Rabobank is aiming to gradually increase the International business to 40 – 50 percent.

On the lending side of its business, Rabobank is the only bank worldwide truly focused on Food and Agribusiness (F&A). This does not mean that Rabobank is without competitors. For example, there is much competition from the many local banks active in agriculture, the cooperative banks in Europe, the farm credit system in the US and Government related banks in emerging markets. The further the potential customer is up the value chain, the greater the level of competition.

What are the key changes or events over the past 31 years that have determined Rabobank's positioning?

van Bijsterveld: The first key change was the steep consolidation in the local cooperative bank environment in the Netherlands. The number of local cooperative banks decreased from 1178 in 1978 to only 153 today. This allowed the banks to professionalize, get bigger and attract better educated people. This allowed the cooperative group of banks that make up Rabobank to become a major force in the Dutch financial system. Today in the Netherlands, Rabobank is the largest in agriculture, the largest mortgage provider, the largest small-medium sized business provider and the largest in the savings markets.

This increase in size allowed the second key event that has determined the positioning of Rabobank; the internationalization of Rabobank through Rabobank International. Rabobank International began in the late 1970's, which was very late in comparison to other large banks. Originally Rabobank International focused on F&A, but always was active elsewhere in such industries as healthcare, telecom, and energy. The biggest change recently, which has partly been

brought on by capital restraints due to Rabobank's cooperative structure, has been the decision to focus solely on F&A and to leave all other industries to other financial institutions.

What is the food and agribusiness strategy that Rabobank is presently pursuing?

van Bijsterveld: Rabobank's overriding strategy is to stick solely to global F&A and to be active in the entire value chain. Rabobank achieves this through three separate businesses: the Wholesale Business, the Retail Business and the Rabo Development Business.
When Rabobank first internationalized, it was forced to focus on large food and agribusiness players and not the farmer. This was because Rabobank was aware, due to experience in the Netherlands, that to finance a farmer the bank needs to be very close. Without good networks in place such a relationship was infeasible. Rabobank International instead focused on the remainder of the value chain, and today is known as the Wholesale Business. In this business, Rabobank's strategy is to finance the large key consolidators and niche players, such as input suppliers, those organizations involved in the first line of processing such as slaughtering businesses, those involved in secondary food processing who produce dried and packaged food and finally food retail and food service.

Rabobank International is now in a position to meet the requirements of farmers in some parts of the World through its Retail Business. This business is about developing local networks to finance local farmers. Rabobank is very selective in which markets it operates in, as it prefers to partner with larger, more industrial farmers. As a result Rabobank International has retail operations in New Zealand, Australia, California and Brazil where strong local networks are in place. Rabobank International's strategy is to stay and develop these markets to the highest level possible before attempting to enter further markets.

The third business that Rabobank International has is the Rabo Development program, which is not commercial business. Instead Rabobank partners with a bank in a developing country by providing equity and expertise on their board. The partnering bank remains local but benefits from foreign support. Rabobank International presently partners with banks in farmer communities in Africa, China and Paraguay. Rabobank International benefits by expanding the initial objective of Rabobank, to serve the underserved, and by expanding its international F&A network.

What is the customer profile that Rabobank is targeting?

van Bijsterveld: Rabobank is very selective when choosing who it wants to partner with in the wholesale sector. The customer must be a large F&A player and the bank has to generate an adequate RAROC (Risk Adjusted Return on Capital). The customer must be looking for a long-term relationship. Rabobank is not interested in those who are looking for one cheap product and then walk away after two or three years. Rabobank are also interested in customers who want to use many of Rabobank's products, not just one. A long standing relationship is also very important so Rabobank can discuss Corporate Social Responsibility (CSR) issues with the customer. Rabobank does not preach to its customers but does require engagement with such issues as water scarcity, biodiversity and child labor.

Rabobank targets its customers in its Retail Business by being selective in the areas in which it has a network. It is for this reason that Rabobank's Retail Business is active in areas where farmers are very industrious and farms are large in size.

The characteristics of the country of the potential banking partner determine whether or not Rabo Development will be interested in getting involved with that foreign bank. Eligible countries are those which have developing economies, economic, political and social stability, are open for retail investment and are safe for Rabobank staff.

Why has Rabobank Europe changed from a country-by-country approach to a global and regional approach? Is this change proving to be effective?

van Bijsterveld: Europe provides a very good example highlighting the problems that were encountered with a country-by-country approach. Throughout the 1980's offices were set up in ten countries throughout Europe. Each office was given a capital base and instructed to go to the new country, be entrepreneurial while focusing on local F&A, and develop a profitable bank within three years. The problem with this approach was that after 15 years of development, Rabobank had ten offices investing in a wide range of agribusinesses with no pattern and very little focus on any particular type of customer. In addition the offices were much segmented and there was a silo mentality, blocking cross border business development. To summarize there were too many customers in too diverse sectors, many of whom did not live up to the key customer profile.
Prompted by capital constraints and the consolidation of Europe, a Pan European approach was implemented in 2008, and the entire F&A scene in Europe was re-evaluated. Seven core sectors were determined, and those key consolidators and niche players who Rabobank wanted to be their customers were identified. Depending on where these key players were located determined which office would attempt to get their business. The country was no longer the starting point, but instead the end result of the strategic analysis of the major forces in European F&A. As a result the relative size of offices is currently changing as offices upsize and downsize depending on the number of potential customers in their area. This approach has meant that some existing customers now fall outside the key customer profile characteristics. Rabobank works with these customers to help them grow their business or encourage them to put more business through Rabobank to make it a sensible relationship for Rabobank.

This change has enabled Rabobank to be far more effective with its constrained capital by serving only those that meet the key customer profile.

Who are Rabobank's current key customers?

van Bijsterveld: Rabobank's key customers differ between regions. In the America's the biggest F&A sectors are animal protein and grains and oilseeds. The top five players in the animal protein industry presently have banking relationships with Rabobank, including Smithfield's and Cargill. The largest grains and oilseeds players are ADM, Bunge, Cargill and Glencore all of which are currently key customers of Rabobank.

Rabobank Europe aims to finance the top three or five players outside the listed companies in each Pan European sector depending on the size of the market. Rabobank will also deal with the larger listed companies if they can do sensible business with them. In Europe the biggest sector is beverages. The largest player is InBev while Heineken and Carlsberg are also big players. Rabobank Europe has banking relationships with all of these businesses.

There are presently around 280 customers who live up to Rabobank's key customer definition in Europe and Rabobank banks with 160 of them.

What are the key capabilities and qualities that these customers demand from Rabobank?

van Bijsterveld: The customers of Rabobank demand a good partnership and value a long standing relationship. They also demand the right products at the right price at the right time, so Rabobank must offer the financial services that their customers could get from elsewhere. As a result Rabobank constantly develops new products. However, the financial services demanded by the largest multinational listed companies, such as financial logistics and cash pooling, have not been within the scope of Rabobank.

Being the World's only dedicated F&A bank also results in many customers expecting products that other banks do not offer. Sometimes these demands can be met, but other times they cannot. For example Rabobank offers risk management for soft commodities but is presently not prepared to run physical positions, but instead tries to link suppliers and buyers.

How does an organization the size of Rabobank measure its performance? What are the key drivers that enable success?

van Bijsterveld: In the wholesale business the performance or Rabobank is measured on a per customer basis. Important are profitability, the level of revenue and cross-sell opportunities.

Furthermore performance is assessed by considering whether CSR targets are being met. Rabobank aims to be an institution that is recognized for being socially responsible. As a result, Rabobank tries to ensure that its clients are living up to certain CSR principles.

Thus the key drivers enabling success is choosing appropriate clients who meet the key client criteria and ensure that they meet the financial and CSR benchmarks.

Conclusion

Rabobank is recognized as being the safest financial institution in the world. This is primarily due to the strength of Rabobank's Dutch roots and cooperative structure, along with Rabobank International's focus on F&A. Rabobank is committed to growing its international business in a sustainable manner through its wholesale and retail businesses. In addition the Rabo Development program highlights Rabobank's commitment to serving the underserved. The F&A industry is fortunate to have a dedicated F&A bank such as Rabobank at its service.

