International Food and Agribusiness Management Review

Official Journal of the International Food and Agribusiness Management Association

Volume 11: Issue 4
2008

International Food and Agribusiness Management Review
Volume 11, Issue 4, 2008

Editorial Staff

The IFAMR (ISSN #: 1559-2448) is published quarterly and is available at http://www.ifama.org
For copyright and publishing information, please contact: Jessica Smith, Project Manager
IAMA Business Office • P.O. Box 14145 • College Station, TX 77841-4145, USA
Tel: 1-979-845-2118 • Fax: 1-979-862-1487 • E-mail: iama@tamu.edu • Web: http://www.ifama.org

International Food and Agribusiness Management Review
Volume 11, Issue 4, 2008

Table of Contents

RESEARCH

Applying a Sectoral System of Innovation (SSI) Approach to the Australian Red Meat Industry with Implications for Improving Innovation and Entrepreneurship in the Australian Agrifood Industry
Christine Pitt and Susan Nelle..... p. 1
Special Merit, Best Paper Award, XVIII IAMA Symposium, Monterey, June 2008

India's Agrarian Crisis and Corporate-Led Contract Farming: Socio-economic Implications for Smallholder Producers
Vijay Paul Sharma..... p. 25
Best Paper Award Finalist, XVIII IAMA Symposium, Monterey, June 2008

Economic Value Added versus Traditional Performance Metrics in the Czech Food-Processing Sector
Gabriela Chmelíková..... p. 49

Virtual Investment Concepts and the Ethanol Industry
John W. Siebert, Amy D. Hagerman and John L. Park..... p. 67

Consumer Preferences and Trade-Offs for Locally Grown and Genetically Modified Apples: A Conjoint Analysis Approach
Nadezhda K. Novotorova and Michael A. Mazzocco..... p. 81

CASE STUDIES

Competing in a Mature Market: The Case of Super AM Food Markets
Kenneth Harling..... p. 105

The Clustering of Organizational Innovation: Developing Governance Models for Vertical Integration
Molly J. Burress, Michael L. Cook and Peter G. Klein..... p. 127

Farming Fish in a Transitional Economy: A Case for East Timor
Toby Ryan Wood a and Catherine Chan-Halbrendt.....p. 155

INDUSTRY SPEAKS

Reflections on the Irrational
José Gobbée.....p. 175
Spanish version.....p. 179

INDUSTRY INTERVIEWS

Trends and Opportunities in Agriculture
Lowell Catlett.....p. 183

International Food and Agribusiness Management Review
Volume 11, Issue 4, 2008

Executive Summaries

RESEARCH

Applying a Sectoral System of Innovation (SSI) Approach to the Australian Red Meat Industry with Implications for Improving Innovation and Entrepreneurship in the Australian Agrifood Industry

Christine Pitt and Susan Nelle

The paper describes the results of an action research study conducted over four years (2002-2006) in the Australian red meat industry. Increasingly, industry leaders and government policy makers in the agri-food sector understand that the continued competitiveness of the food industry will depend on the extent and rate of innovation within the sector. Innovation studies have provided substantial empirical evidence of a high correlation between innovation performance and economic growth. The systems approach to understanding innovation presents a new economic paradigm which acknowledges that firms do not innovate alone and that innovation (at the firm, value chain and sector level) requires effective functioning both within and across the system. However, there is, as yet, very little practical information to inform either policy development or the design of improvement strategies in this area. The key research question addressed by this study was therefore to determine how best to integrate the various views of innovation systems thinking and to develop and test a new Systems Innovation Intervention Framework that would build innovation capabilities within firms and facilitate the emergence of a much stronger culture of innovation and entrepreneurship across the red meat industry.

A conceptual framework was developed from a review of the literature with further testing of the components for relevance based on industry input via a series of 28 in-depth interviews with a cross-sectional sample of the key stakeholder groups. An iterative triangulation methodology was used that involved systematic engagement with the literature, analysis of emerging data from the interviews with industry stakeholders, and critical reflection by the research team. Based on the conceptual framework, the red meat industry's innovation system was analysed to identify stresses and failures. Priorities were identified as a result of the analysis and specific intervention projects to address system failures were designed. Preliminary acceptance-testing of the proposed interventions was undertaken and the outcomes

were consolidated into a new integrated innovation intervention framework underpinned by innovation systems theory which was successfully launched into the Australian red meat industry.

While the timeframe for this study did not permit an extensive evaluation of the impact of the interventions, a number of early indicators pointed to industry acceptance and improved practice. In particular, industry investment in innovation more than doubled during the implementation phase following a relatively slow growth in the period prior to the study. Positive feedback was received from firms participating in the study and there are early indications of significant improvements in innovation culture and capability across the sector.

Based on these early results, it is proposed that this study will assist future researchers to develop a more comprehensive understanding of the elements within a sectoral system of innovation that must be evaluated. The approach will also be of particular relevance to industry practitioners and managers who are attempting to improve competitive performance through innovation.

India's Agrarian Crisis and Corporate-Led Contract Farming: Socio-economic Implications for Smallholder Producers

Vijay Paul Sharma

Agriculture is and will remain the mainstay for a large part of the rural population in India in the coming years. Promoting more rapid and broad-based agricultural growth will be extremely important not only for achieving higher economic growth but also for alleviating poverty in rural areas. Most farmers are small and marginal, who have poor linkages with market and who have low risk-bearing capacity restricting their participation in fast changing dynamic agrifood markets. Corporate agriculture, especially through contract farming, is being promoted by central as well as state governments as a part of the strategy to solve some of these problems. Contract farming is expected to enable farmers to access better quality inputs such as seeds, fertilizers, pesticides, extension services, and credit from the corporate sector. Contract farming has also potential to eliminate and/or reduce market and price risks, which farmers face. However, it all depends on the nature of contracts, legislation for regulation of contract farming, enforcement, dispute resolution mechanisms, role of government, etc.

In this study we used a two-stage Heckman model to explain determinants of participation in contract farming. Primary data were collected through formal household survey conducted during May-October 2007 with the use of questionnaires administered to 150 households selected through stratified random sampling from three districts of Punjab, India. The study results indicate that contract farming has a positive impact on crop productivity and farm income. The socio-economic factors that influenced participation in contract farming were education, age, farm size, access to institutional credit, source of off-farm income and membership to an organization. Factors related to the likelihood of

participation in contract farming slightly differed from the factors affecting farm income.

The results of this study have wider significance in connection with the question of how successful approaches to contract farming can be developed. First, there is a need to assist farmers to have better education, access to timely and quality inputs such as extension services, institutional credit, and better opportunities of off-farm income to improve financial status. The results have shown that membership to farmers' organization was positively related to the likelihood of being a contract farmer. Thus, there is a need to promote non-political farmers' organizations to improve smallholders' bargaining power as well as reduce transaction costs to agribusiness companies. Second, it is important to provide an integrated set of inputs and services including credit and not just extension services and seed, as is being done. In order to provide these inputs and services, partnership between public and private sector is needed. Collaboration between public and private sectors for providing extension services can take place easily. Government should initiate amendments in legal and regulatory frameworks in input and output markets, land market policies, etc. to promote private sector participation in agriculture. Finally, small farmers will be able to participate in the changing markets effectively and establish links with new market chains (supermarkets, agribusiness companies, processors, exporters, etc.) only if they have access to better infrastructure, inputs and services, and are better organized. Policy makers can support farmers through provision of required infrastructure and technology, timely information, extension services, enabling policy environment, and promoting public-private partnership through providing incentives.

Economic Value Added versus Traditional Performance Metrics in the Czech Food-Processing Sector

Gabriela Chmelíková

This paper was motivated by the increasing popularity of Economic Value Added (EVA) and by the need to increase management efficiency of Czech agribusiness companies. EVA advocates often consider it superior to the other common performance measures. This article investigates the relationship between Economic Value Added and two traditional performance measures, Return on Assets (ROA) and Return on Equity (ROE), and the ability of each to measure the creation of shareholder wealth in food-processing firms in the Czech Republic. The method of comparison used for this study is similar to those used in studies of firms in the U.S. and EU. However, a critical difference arising from the specific Czech economic conditions must be addressed: high quality information from capital markets which serves as an exogenous criterion for assessing the quality of performance measures in the main world studies is not available for Czech firms. Therefore, a criterion for assessing the information content of performance measures suitable for Czech economic conditions is developed in this paper.

The conclusions of this paper are developed around simple regression tests of the following hypotheses:

1) A strong positive linear relationship exists between EVA and the traditional performance measures of ROA and ROE. A strong linear relationship indicates very similar information content in each measure; rejection of this hypothesis suggests different and perhaps valuable information is contained in EVA that is not available in ROA and ROE.

2) The EVA measure reflects changes in shareholder wealth more consistently than the traditional performance measures ROA and ROE; acceptance of this hypothesis suggests following EVA leads to enhanced creation of shareholder wealth.

The regression results support both hypotheses and are also consistent with corporate finance theory which considers EVA a superior performance measure from a theoretical point of view. In each test, the results indicate a positive correspondence between EVA and the traditional performance measures. The results also suggest EVA is a more consistent indicator of a firm's ability to create shareholder wealth.

Virtual Investment Concepts and the Ethanol Industry

John W. Siebert, Amy D. Hagerman and John L. Park

The US ethanol industry has grown at a rapid pace, attracting large amounts of new investment capital, particularly from farmers. Factors underlying this growth include low crop prices, high oil prices, government subsidies, usage mandates, and more. As with any future investment, capital entering this particular industry faces risks that are not fully understood. Consequently the authors examine a virtual alternative farmers and other investors might instead consider; that of using publicly-traded equities (as opposed to physical construction) in order to make such investments. The VEST formula from Siebert, Jones, and Sporleder's work is presented and modified. The potential of virtual (i.e., stock) investments in ethanol manufacturing, petroleum marketing, and railroad transportation are all examined as to their applicability for assisting those engaged in farming and/or ethanol manufacturing. In regard to the farmer investing in ethanol, the costs of twenty-three new ethanol plants are examined and then compared to the costs of investing in four publicly-traded ethanol manufacturers. It is found that the stock market has discounted the investment cost per bushel substantially below that of current construction costs, indicating that farmers can save money by making a virtual (as opposed to bricks and mortar) investment. At the very least, this valuation imbalance should signal caution to those considering building ethanol plants. However, stock price trend performance itself has not been positive. Regarding the downstream marketing of ethanol, eight refiner-blender-marketers are examined using the VEST model. The cost to participate in blending/marketing profits by means of investing in these companies is found to approach the cost of ethanol plant

construction itself. Using the VEST model, the cost to invest in a railroad transporting ethanol is determined and found to be much less than a refining/blending/marketing investment.

Consumer Preferences and Trade-Offs for Locally Grown and Genetically Modified Apples: A Conjoint Analysis Approach

Nadezhda K. Novotorova and Michael A. Mazzocco

Using conjoint analysis methodology, this study used an online survey to measure consumers' preferences for the following apple attributes: place of production, method of production, and price. Consumers responding to the online survey were asked to rate hypothetical products. The products were defined by combinations of different levels of attributes. The study results indicate that consumer preferences for apples are influenced by place and method of production. While price is still one of the most important attributes, it may play a lesser role for consumers who are willing to pay a premium for locally grown apples with a combination of benefits provided by laboratory transfer of apple genes. The results of the conjoint analysis indicate that some consumers are willing to make trade offs between the studied attributes. The results also suggest using a targeted approach to consumer markets. Four groups of consumers were identified based on respondent's relative factor importance scores. These groups were assigned to four market segments: Place-oriented consumers, Method- oriented consumers, Price- oriented consumers, and Balanced consumers. Segment analysis indicates that Place-oriented consumers may be willing to pay 60% to 70% premiums for locally grown apples. The high consumer preferences for locally grown products combined with environmental benefits transferred through genetic modification provide an opportunity for producers to capture and build their markets, especially within certain market segments.

CASE STUDIES

Competing in a Mature Market: The Case of Super AM Food Markets

Kenneth Harling

The EXPO-AM supermarket entered the Rochester, Massachusetts food market using a retailing format that its parent company had used successfully in England where it went under the store banner "Super EU." This case describes how the concept was developed and implemented in Rochester over a three year period, 2000-2003. At the time of the case, 2003, Ted Edwards, the general manager of Super AM Food Markets has been asked to prepare a turnaround plan for the banner after it has shown poor performance.

The case provides the basis for a discussion of five issues. First, the source of new supermarket formats is often based on the adaptation of retailing concepts found

elsewhere to a local situation. Second, a new strategic approach has significant organizational implications: new tasks, a new organizational structure and systems, and appropriate staffing. Third, top management needs to set reasonable expectations so the new venture time has time to grow and prove itself. And it needs to decide how much time is enough. Fourth, competitors react to a new competitor which enters their market space. Anticipating their reactions helps inform decisions when setting reasonable expectations of performance. Fifth and final, the personal commitments required to make a strategy work have a significant impact on one's career.

The Clustering of Organizational Innovation: Developing Governance Models for Vertical Integration

Molly J. Burress, Michael L. Cook and Peter G. Klein

This case describes the revival of a rural town, population 1300. As farm families dwindled and farm size expanded, Renville area farmers realized horizontal expansion of their farming industry through the acquisition of additional acreage would not allow their community to prosper. A dwindling population threatened to erode the local tax base making it increasingly difficult to support local infrastructure development. To overcome this threat, Renville producers chose to pursue a collective entrepreneurial strategy rooted in joint vertical integration and organizational innovation.

Over the next twenty-five years, farmers developed business experience, professional contacts, and a well-seasoned group of investors as they began to invest in processing facilities, animal agriculture, and the development of new agricultural products. Due to the high levels of investment and risk inherent in their ventures, these collective entrepreneurs advanced an innovative organizational form: the New Generation Cooperative (NGC). This organizational form allowed for the creation of investment incentives inaccessible to traditional forms of producer group action. After two well-publicized, profitable ventures, farmers decided to pursue a similar NGC strategy for several of the crops in their rotation. Producer-owners developed ventures to add value to their sugarbeet, corn, and soybean crops. What began by chance after the closing of a sugarbeet processing facility, evolved into an interconnected agglomeration of local agribusinesses with a similar governance structure. Through deviant case analysis, we examine the role of organizational innovation in the development of this cluster.

Farming Fish in a Transitional Economy: A Case for East Timor

Toby Ryan Wood a and Catherine Chan-Halbrendt

This case study considers the transitional status of East Timor while exploring the potential of introducing an offshore mariculture enterprise as an income generating and capacity building development opportunity. Specific objectives include exploring the economic potential of farming fish in East Timor, defining a feasible and sustainable investment opportunity and providing a blueprint for conducting a

market analysis intended for developing a mariculture enterprise in a transitional nation.

To better understand East Timor's economic potential, this study uses data collected during a 2005 USAID funded research project and highlights various strategic costs and benefits afforded by the nation's investment climate, the availability of feasible markets and the region's production capacity with regard to the prevailing environmental, social, economic and political atmosphere. Particular to this case study focus on the development of a small-scale offshore grow-out mariculture enterprise with respect to two recommended species of fish: orange-spotted and humpback grouper. Scientific and technical recommendations were fielded by the Gondol Research Institute for Mariculture (GRIM), a leading research and extension program in the region, and through consultations with East Timor's Ministry of Agriculture, Forest and Fisheries (MAFF), international mariculture experts, local planning agencies and USAID officials. In addition, on-site face-to-face surveys were used to collect baseline data to assess the communities' willingness to participate in such a project.

Both domestic and international demands for grouper are evaluated and marketing scenarios are considered in support of a local fishery cooperative. Export markets for grouper are assessed using current and historical wholesale market prices for grouper in Hong Kong markets. Hong Kong was selected due to its role as a hub for the region's live reef food fish (LRFF) trade. The two marketing scenarios evaluated in this study include selling grouper at farmgate prices in East Timor or shipping the cultured grouper directly to Hong Kong to be sold at wholesale market prices. An enterprise budget is constructed to analyze cash flow logistics of each marketing scenario. A sensitivity analysis is then performed and it is concluded that positive internal rates of return ranging from 13% to 67% could be obtained if the higher valued humpback grouper were transported directly to Hong Kong and sold at an average wholesale market price of US$60/kg.

The overall purpose of this study is to encourage the sustainable development of grouper mariculture and its potential as a capacity building and poverty reducing development project in East Timor, and for transitional economies in general. As a case study, readers are encouraged to consider alternative parameters for the development of a mariculture enterprise and formulate alternative strategies that might play an important role in enhancing a transitional nation's economy.

INDUSTRY SPEAKS

Reflections on the Irrational

José Gobbée

José Gobbée analyzes the various components of the current financial crisis and its implications for agriculture. While financial markets have been overrun by steep

losses, violent price movements, and irrationality associated with a classic bubble, agricultural markets still have sound fundamentals and their underlying real assets may prove to be a safe haven during these trying times.

INDUSTRY INTERVIEW

Trends and Opportunities in Agriculture

Lowell Catlett

Agriculture will change more in the next decade than it did in the last century. Lowell Catlett is a futurist sharing his knowledge and insight on the new trends and technologies shaping the future of agriculture and how those working in this sector can take advantage of new opportunities.

International Food and Agribusiness Management Review
Volume 11, Issue 4, 2008

Applying a Sectoral System of Innovation (SSI) Approach to the Australian Red Meat Industry with Implications for Improving Innovation and Entrepreneurship in the Australian Agrifood Industry

Christine Pitt [a]Ⓘ and Susan Nelle [b]

[a] *General Manager, Innovation Services, Meat Livestock Australia (MLA), 165 Walker Street, North Sydney NSW, 2060, Australia.*
[b] *Senior Research Fellow, Australian Innovation Research Centre (AIRC) of the University of Tasmania, Level 5, Salamanca Galleria, Hobart, Tas, 7000, Australia.*

Abstract

This paper describes an action research study conducted over four years (2002-2006) in the Australian red meat industry. The study aimed to extend the body of knowledge on innovation and entrepreneurship. It also sought to explore options for improving practice through interventions that would accelerate the development of innovation culture and capabilities. A conceptual framework was developed leading to a new Systems Innovation Intervention Framework. The framework was subsequently implemented via 30 individual pilots. The outcomes of the research study were tested for relevance more broadly within the Australian food industry and high levels of acceptance were reported.

Keywords: innovation, sectoral innovation systems, innovation system failures, intervention strategies

Ⓘ Corresponding author: Tel: + 61-2-9463-9117
Email: cpitt@mla.com.au
Other contact information: S. Nelle: susan.nelle@utas.edu.au

Introduction

The dynamic and often hostile competitive landscape of the twenty-first century has created significant threats to existing patterns of competition. A review of the extant literature and research about innovation and entrepreneurship identifies their importance to ensuring corporate vitality and wealth generation in today's global economy. For over one hundred and fifty years the foundation of Australia's prosperity has been from resource-based industries such as agriculture and mining. Changes in the world economy clearly require a much broader range of globally competitive industries to sustain Australia's strong economic position. It is proposed that the older more traditional industries such as the agrifood sector must also undergo rapid transformation if they are to maintain their competitive advantage.

This paper is based on Dr Pitt's doctoral thesis entitled 'Leading Innovation and Entrepreneurship: An Action Research Study in the Australian Red Meat Industry (Pitt 2007). In addition, the two authors have worked together to develop an integrated innovation systems framework and champion its application more broadly in the Australian food industry. Further research studies are currently underway to continue the development of analytical tools under the (SSI) framework.

Application of a 'Systems of Innovation' Framework to the Agrifood Industry

The agrifood industry is a major contributor to the Australian economy operating in global markets under increasing competitive pressures. Climate change and the development of bio-fuels have created additional uncertainty for the industry. In the face of these challenges, food industry leaders in Australia believe that innovation – in products/services, processes and business models – must be the driver of future prosperity.[2]

Although it is classified as a low-to-medium technology sector because the classifications are based on the level of internal R&D expenditure, the agrifood industry has been highly dependent on science and technology advances. For the most part, these have been developed through sector-specific R&D programs that have created accessible distributed knowledge networks. In addition, the industry has a wide range of future innovation opportunities that include new science-based products and processes including adoption of new technologies developed in other sectors (eg ICT in supply chain management, 'smart materials' in packaging, biotechnology in product development, and robotics in food processing).

[2] The Innovators' Forum – Future Vision for Australia's Food Industry, National Food Industry Strategy, June 2007 (report available on www.nfis.com.au)

Industry leaders and government policy makers understand that the continued competitiveness of the food industry will depend on the extent and rate of innovation within the sector. Innovation studies (Bryant 1998; Dodgson & Bessant 1996; Freeman 1994) have provided substantial empirical evidence of a high correlation between innovation performance and economic growth including:

- Technical change is the most important contributory factor in economic growth;
- Innovative activity as measured by R&D expenditure and by patenting is closely associated with the level of output and income at country level; and
- R&D and innovation are strongly associated with firm productivity growth

From innovation studies results conducted over twenty years primarily in Europe and the United States (Smith & West 2005), we can conclude that:

- Innovation involves continuous interaction and feedback between perceptions of market opportunities, technological capabilities and learning processes within firms;
- R&D is often not a *cause* of innovation, but an *effect* of innovation decisions made by firms;
- Innovation requires sustained investment under conditions of *risk and uncertainty;*
- Innovation capabilities are cumulative, building over time and dependent on sustained investment; and
- Innovation depends in large part on collaboration and interactive learning.

Thus, an accepted definition of innovation is 'the development of new products, services, processes and business models under conditions of risk and uncertainty'. Although enterprises make these decisions, they do not make them in isolation, but within persistent structures of business firms, economic institutions, science and technology infrastructures, policy frameworks and knowledge and resource bases and under varying degrees of risk (Smith & West 2005).

Over the past ten years, the focus of innovation studies has tended to shift from demonstrating the impact of innovation on growth and competitiveness, to analysing 'how' innovation occurs. There has been a convergence in the literature of innovation theory and systems theory giving rise to the concepts of national and regional systems of innovation which are based on geographic location, and sectoral systems of innovation (SSI) which are industry based.

Within a systems approach, innovation performance is seen as a coordination problem, with components of the system needing to work in a coherent way. A systems approach can therefore provide the framework for understanding how the

interactions within a system work together to facilitate (or hinder) innovative behaviour.

Thus, a sectoral system of innovation (SSI) framework provides a means for industry and public policy makers to assess how effectively elements of a system operate and interact under current conditions. It can also be used to assess a system's fit for future purpose when drivers of innovation affecting that sector change.

Building the Conceptual Framework

Prior to commencing the study, a conceptual framework was developed from a review of the literature with further testing of the components for relevance and application based on industry input. To access industry knowledge, a series of 28 in-depth interviews were undertaken from a cross-sectional sample of the key stakeholder groups (based on a stakeholder analysis methodology developed by Elias, Cavana and Jackson 2002) and utilising a snowball method (Glaser & Strauss 1967) to identify individuals. A convergent interviewing technique (Dick 1998) was applied in which open-ended questions were initially posed and modified to include probe questions in subsequent interviews for confirmation and disconfirmation.

An iterative triangulation methodology (Lewis 1998) was used to interpret data that involved multiple iterations between systematic engagement with the literature, analysis of emerging data from the interviews with industry stakeholders, and critical reflection by the MLA research team. The result was the development of a conceptual framework of the sectoral innovation and entrepreneurship system (Figure 1) and a supporting model of firm innovation and entrepreneurship capabilities (Figure 2).

The basic premise of the framework, at both industry sector and firm level, is that innovation and entrepreneurship are context sensitive and should be conceptualised within a systems perspective.

At the level of the industry sector, the proposition is that the over-riding sector culture (mediated by environmental impacts such as economic, social and political/legal conditions) will determine the degree to which firms in the industry exhibit an entrepreneurial orientation. The sector culture, and the resulting entrepreneurial orientation, will impact on how problems and opportunities arising from changes in the external environment are perceived by the players in the sector. This, in turn, will determine how proactively the sector responds.

It is proposed that conditions external to firms (markets, institutional arrangements and resource infrastructure) also impact directly on a firm's

innovation and entrepreneurship capability. In turn, this determines the level and success of corporate entrepreneurship strategies and ultimately the firm's ability to capture competitive advantage through innovation. The framework proposes that the impact of the external elements is mediated by a two-way relationship between the firm and its environment. The degree to which a firm is able to capture new knowledge and capabilities from interacting with other actors in the system is particularly important.

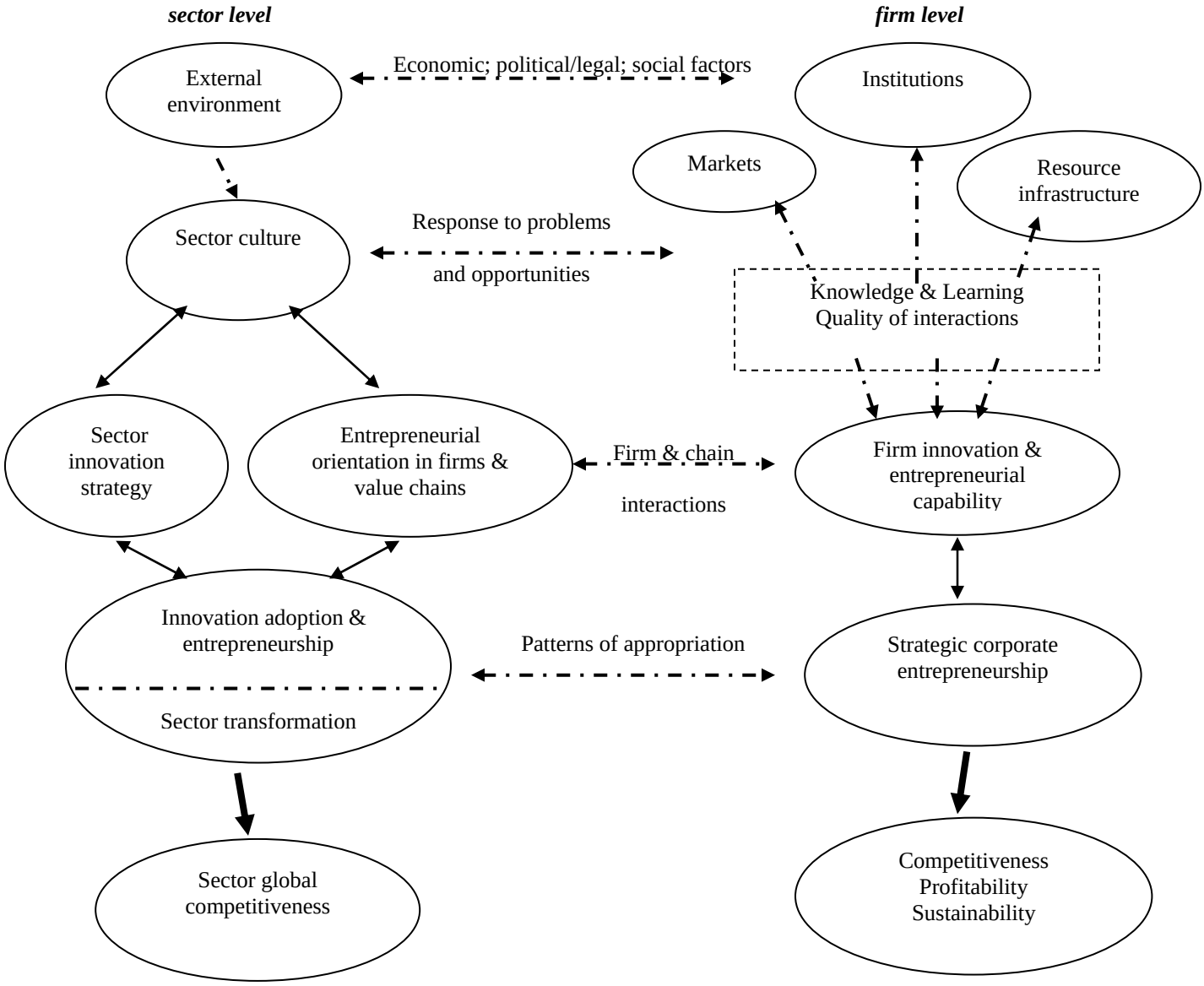


Figure 1: Sectoral Innovation and Entrepreneurship System

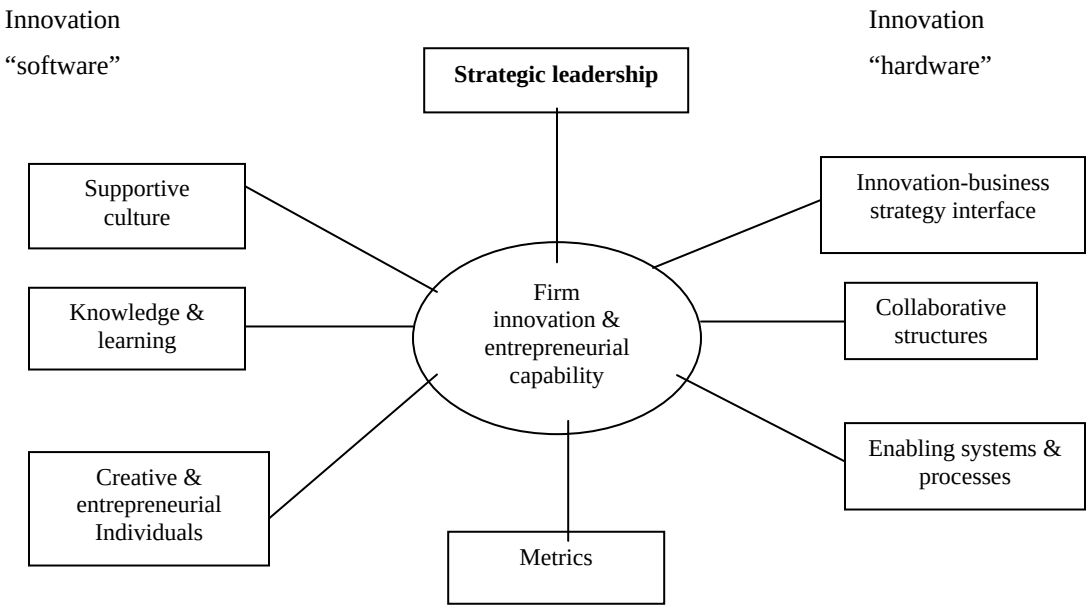


Figure 2: Model of Firm Innovation and Entrepreneurial Capabilities

Clearly the concepts at firm and sector level are interconnected. Ultimately the level of innovation adoption and entrepreneurship occurring within the sector will determine the degree to which the sector transforms itself and achieves a desired level of global competitiveness. However, this success is dependent on a variety of factors and interactions including: the level of entrepreneurial orientation within firms; the innovation options developed as a result of the sector's innovation strategy; the level of interaction between firms and value chains; and the patterns of appropriation associated with individual firm entrepreneurship.

The next stage of the literature review considered the concept of 'innovation system mapping' which has emerged in recent years as an approach to analysing empirical data (Stevens 1997) and comparing innovation systems (Bikar, Capron & Cincera 2006; Georghiou 2002; Nelson 1993). System maps represent an analysis of the various elements of a system that are seen to have an impact on innovation performance. However, there is, as yet, very little theoretical or practical information on how to analyse a system's health or failures in order to inform either policy development or the design of strategies and programs to strengthen a system (Bryant 1998; Edquist et al 2004; Scott-Kemmis et al 2005; Smith 1998).

Based on an approach developed by Woolthuis, Lankhuizen and Gilsing (2005), a system failure analytical framework was adapted for this study in which the effectiveness of system elements is evaluated from the perspective of the key actors within the system. In their model, Woolthuis and colleagues identify the following three groups of actors:

- *Firms/value chains*: large firms; SME's; innovative start-ups; value chain partners such as supermarkets; whole value chains
- *Knowledge providers*: universities; public R&D institutes; technology commercialisers; knowledge brokers and consultants; training and education providers.
- *Third parties*: regulators; finance sector such as banks and VC's; trade unions; industry associations

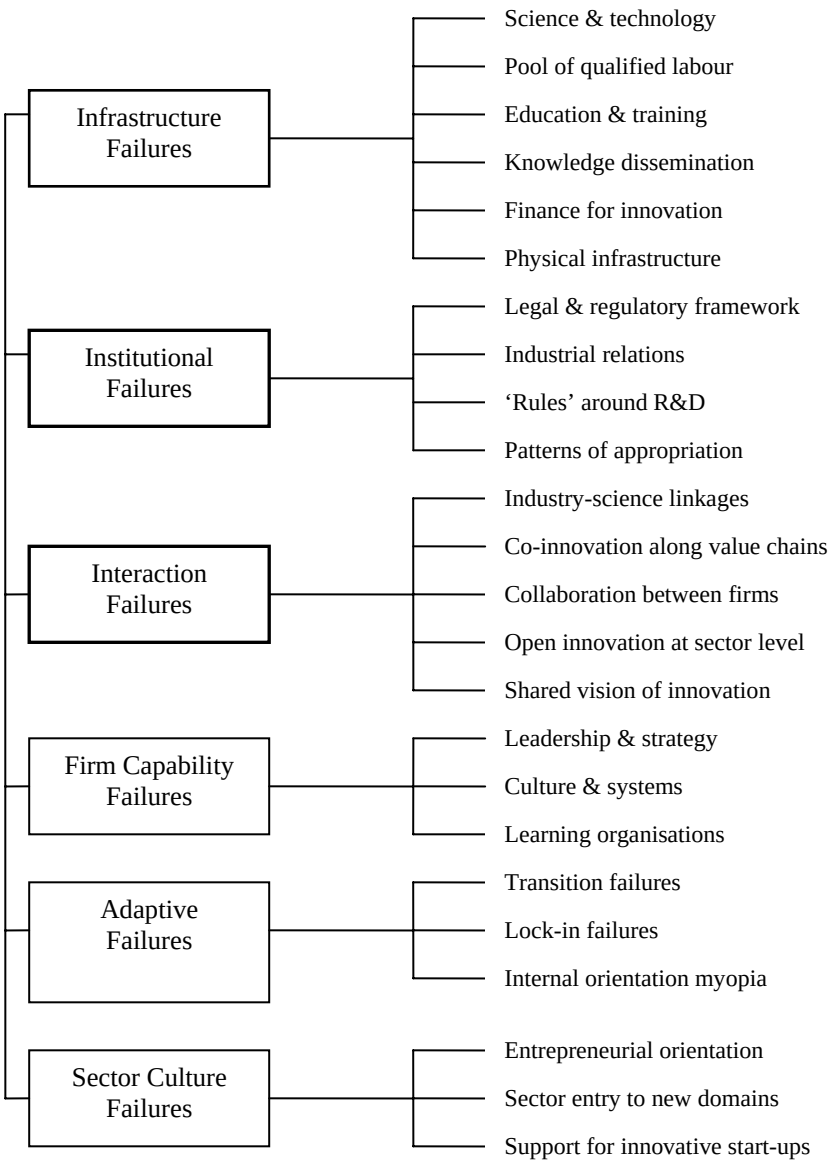


Figure 3: System Failure Analytical Framework

Table 1: List of Possible Evidence of System Failures

Category	System Health	System Failure
Infrastructure	• S&T capability geared to sector • Adequate physical R&D infrastructure • Critical mass of scientific expertise in key areas • Skilled technology commercialisers • Availability of skilled and educated staff • Supportive training and educational structures meeting technical labour supply needs • Competitive intelligence capability developed and used by firms • Access to multiple types of finance for innovation and entrepreneurship • Evidence of investment in R&D in emerging areas such as biotechnology; automation; ICT • Network of knowledge brokers • ICT infrastructure supporting information exchange needs	• Sector lagging competitors in adoption of new S&T • Inability of firms to attract/ retain qualified technical staff • Poor perception of sector by finance industry • Low representation by sector in government R&D programs • Low levels of investment in R&D • Inadequate numbers of S&T providers • Low awareness by firms of emerging issues in key markets • Lack of exposure to formal education and training • Lack of alignment between R&D providers and industry • Low utilisation by firms of external knowledge providers • Inadequate ICT infrastructure and low utilisation of modern ICT
Institutional	• Acceptance from regulators • Balance between consumer protection and operational flexibility • Regulations are science based • Regulators aware of commercial realities • Regulators support innovation and entrepreneurial behaviour • Good collaboration and respect between regulators and firms • High levels of trust between management and employees • Employees involved in innovation and change management • Incentives and rewards in place for innovative firms • Benefits of innovation shared equitably along the value chain • R&D investments support innovative firms	• Industry lagging competitors in relationship with regulators • Regulators perceive role as defending customers at expense of sector • High cost of compliance compared with competitors • Regulators perceived as creating barriers to innovation • Regulators too slow to change • Too many regulations creating confusion and inefficiencies • Regulators lack resources and expertise to address sector issues • High levels of industrial disputes • R&D system discourages private investment in innovation • Benefits from R&D do not flow equally to participants • Outcomes from R&D 'locked up' for long periods
Interactions	• Firms have access to and are aware of multiple sources of knowledge and learning • High levels of trust and interaction between firms and R&D providers • Effective user-producer interfaces in development of new technology • High levels of interaction by firms with sophisticated customers • Effective innovation along the value chain • Effective commercialisation of R&D outputs from R&D providers • Evidence of multiple collaborative R&D projects • Participation by firms in multiple knowledge sharing and innovation networks • Adoption of innovation from outside the sector • Widely supported sector innovation strategy • Use of trusted intermediaries to facilitate inter-firm collaboration	• Limited evidence of public-private partnerships • Minimal exchange of staff between commercial firms and R&D providers • Adversarial relations between segments within the value chain (firms and representative bodies) • Fragmented structures with little value chain integration • Absence of industry networks • Low levels of trust and communication between firms • Incompatible information systems between segments within the value chain • Low participation rates in syndicated R&D projects • Low levels of engagement between technology commercialisers and R&D providers • Low levels of international collaboration • Lack of coherence in sector R&D and marketing strategies

Firm capability	• Successful launch of new products • Successful entry to new markets • Successful adoption of new technologies and business processes • Evidence of entrepreneurial behaviour and implementation of growth strategies • Evidence of excellence in environmental and social sustainability • High scores on innovation capability benchmarks • Ability to foster creativity, innovation and risk taking • Cost competitiveness • Ability to attract new people with new skills • Application of concepts of open innovation	• Falling behind competitors in relation to key performance benchmarks • Low investment in R&D and innovation • Focus on short term payback periods for R&D investment • Absence of skilled R&D and innovation personnel • Absence of clearly articulated innovation strategies • Lack of documented innovation systems • Poor record in implementing change strategies • Poor record in commercialising R&D outcomes • Low scores on innovation capability benchmarks • Low participation rates in industry innovation projects • Lack of investment in training in creativity and innovation • Low tolerance for risk taking • 'Stick to the knitting' mentality • Dominance of commodity focus and production oriented mindset
Adaptiveness	• Cost competitiveness as a result of adoption of new technologies • Adoption of new product development platforms • Sector supported technology innovation strategy • High levels of adoption of new technology • Successful commercialisation of new technology	• Slow to respond to changing market requirements which require implementation of new technologies • Loss of market share due to high costs associated with outdated technologies • Evidence of redundancy in skills and capabilities • Lack of support for R&D providers to build capability in new technology areas • Lagging competitors in relation to new technology • Tight control of investment in technological innovation creating barriers • High capital investment in current technology a barrier to innovation • Poor technology foresighting capability • Mistrust of technology providers
Sector culture	• Support for innovative & entrepreneurial firms • Evidence of innovative & entrepreneurial individuals • Acceptance of legitimacy of entrepreneurship • Participation in new venture creation • Investment by venture capitalists and business angels in start-ups	• Low skill levels in entrepreneurship • Negative attitudes towards risk • High failure rate for new ventures • Suspicion and mistrust of innovators and entrepreneurs • Resistance to engaging in new business opportunities • Low participation rates in entrepreneurship support schemes

The resulting framework (Figure 3) identified six categories with 24 individual dimensions of potential system failures. The underlying assumptions of the approach are that:

- A key activity of the innovation system is "to enhance the entry and survival of new firms and the growth of successful SME firms by facilitating and supporting entrepreneurship" (Chaminade & Edquist 2005, p.25);
- System failures act as barriers or inefficiencies to the creation, distribution and application of knowledge that produce value-creating innovations; and
- System failures are caused by key system actors or activities being missing or ineffective.

A 'system failure' approach provides an alternative to the 'market failure' approach to underpin innovation policy and program decisions. The market failure approach 'rests on the idea that existing markets fail to coordinate behaviour effectively, but assume that such problems can be resolved by the creation of new markets, or by substituting government action for a market… However, overcoming problems related to knowledge creation and distribution or technology 'lock-in' requires institution building, not market rectification' (Smith & West 2007).

Finally, a preliminary methodology for determining evidence of system failure was developed which considered both positive and negative indicators as evidence of system 'health' or system 'failure'. It was identified that both quantitative and qualitative data would be relevant, with qualitative data likely to be most useful when designing intervention strategies and quantitative data required to undertake comparisons over time and between systems. While the design of a comprehensive qualitative and quantitative system diagnostic instrument was outside the scope of this study, Table 1 represents the preliminary list of possible evidence of 'system health and failure' applied in this study.

Research Objectives

The challenge within this study was to determine how best to integrate the various views of innovation systems thinking and to test how useful the SSI framework would be in assessing the effectiveness of the current innovation system in supporting the innovation endeavours of firms and value chains within the Australian Red Meat Industry, and in providing guidance for future innovation policies and investments in system improvements by MLA (the industry-owned innovation services provider).

The overall aim of the research was to develop an integrated intervention strategy that would build innovation capabilities within firms and facilitate the emergence of a much stronger culture of innovation and entrepreneurship across the red meat industry. The specific objectives were to:

- Apply the integrated model of sectoral innovation and entrepreneurship to the red meat industry to develop a better understanding of the environment in which the industry was operating and of how the innovation system could be supported to deliver greater impact;
- Apply the methodology for mapping the effectiveness of the innovation system based on the emerging concept of 'system failures' to assist MLA to more effectively deliver innovation services; and
- Apply the SSI framework to developing and testing acceptance of a range of intervention strategies that could shape future MLA policy directions and programs aimed at improving industry competitiveness and sustainability.

The central research question addressed by the study was:

How should MLA (the industry innovation service provider) design and deliver interventions that will significantly enhance the innovation capabilities of the Australian red meat industry in order to sustain competitive advantage in a rapidly changing environment?

Methodology

The methodology used in this study was action research which has been found to be particularly useful when a study is seeking innovation, change, growth and transformation of firms and their leaders/managers (Wilson-Evered & Hartel (2001). It has been suggested that in-depth inductive studies should be conducted in the innovation field to safeguard against the premature adoption of a rigid framework that may limit the scope of inquiry (Dyer & Page 1988; Van de Ven, Angle & Poole 1989). Specifically, the collaborative and participatory approach embodied in action research methodologies was deemed to be most appropriate to MLA's proposed intervention framework as it would require a high degree of stakeholder engagement.

The research design (summarised in Figure 4) consisted of multiple iterative cycles conducted over four years (2002-2006) in the Australian red meat industry. The following four principal steps were undertaken during the study to address the key research question:

1. Based on the conceptual framework, the red meat industry's innovation system was analysed to identify stresses and failures;
2. Based on the priorities identified as a result of the analysis, specific intervention instruments and projects to address system failures were designed;
3. Preliminary acceptance-testing of the proposed interventions to determine potential for impact was undertaken; and
4. Finally, consolidate the outcomes of the research study into an integrated innovation intervention framework underpinned by innovation systems theory to be presented to MLA as a model for future innovation policies and strategies.

To ensure adherence to the collaborative and participatory nature of action research, a seven-member research team was formed within MLA to undertake the study as a key component of the collaborative and participatory approach critical to the action research methodology (Dr Pitt was the leader of this team). In addition, multiple opportunities were created for input and engagement of industry participants to facilitate acceptance of the proposed intervention strategies arising from this research.

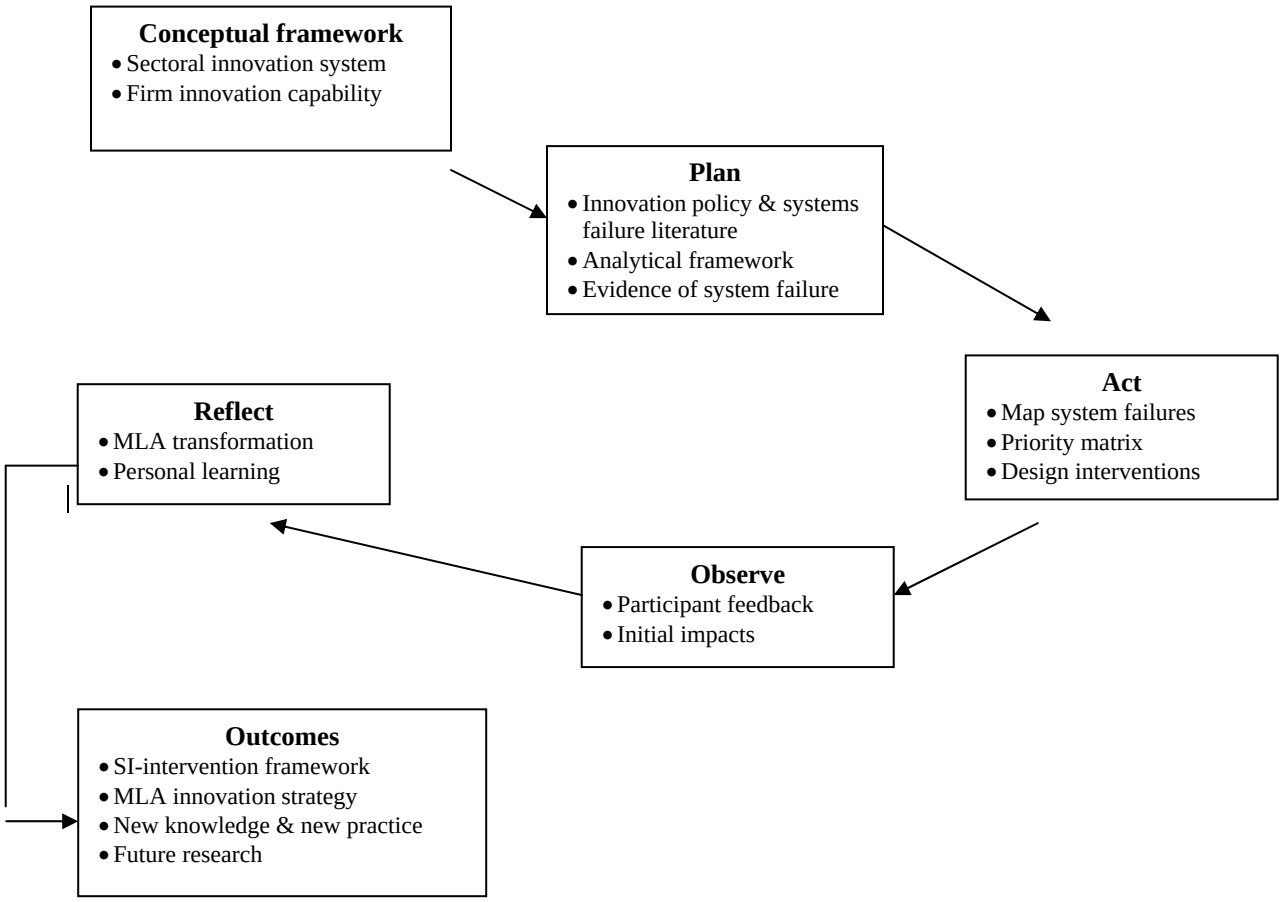


Figure 4: Overview of Research Design

Following is a brief summary of the key activities undertaken during the four principal steps in the research study.

Step One: Identifying Evidence of System Failure

This step involved searching for evidence of system failures (see preliminary list developed for this study in Table 1). The literature review revealed that previous studies seeking to analyse the functioning of an innovation system have taken a pragmatic methodological approach due to the limitations imposed by the availability of existing data and the high costs associated with the collection of specific and targeted data. It was also noted that there are, in fact, very few data sets available which support analysis at a sectoral level. It was therefore determined that for this study, evidence of system failure within the red meat sector

Table 2: Evidence of System Failure in Red Meat Industry

System Failure Category	Evidence in red meat sector (*source*)
Infrastructure	• Industry not aware of R&D outcomes (*MLA/AMPC Impact Report 2004)* • No alignment between R&D providers and industry *(interviews)* • Insufficient technology providers and poor commercialisation history *(interviews)* • Difficulty attracting and retaining skilled staff *(interviews; MLA Report – Abba 2004)* • Education and training providers do not have sufficient industry knowledge *(interviews)* • Low industry awareness of threats and opportunities in global environment *(interviews)* • Lack of benchmarking performance data *(interviews)* • Inadequate physical R&D infrastructure *(interviews; MLA Report – KPMG 2000)* • Inadequate ICT infrastructure *(interviews; MLA/QLD Gov. Report 2001)*
Institutional	• NZ competitors have better relationship with regulators *(interviews; MLA Report – TAP 2000)* • Regulators locked into historical paradigm of representing customer not supporting industry *(interviews)* • Over regulated creating confusion and inefficiencies *(interviews)* • Regulations not science-based and not aligned to commercial realities *(interviews)* • Socialised R&D removes incentives for firms to innovate *(interviews)* • Industry bodies narrow focus on crisis management, not innovation strategy *(interviews)* • Dominance of supermarkets in domestic supply chain removes incentives to innovate *(interviews)*
Interaction	• Limited evidence of public-private partnerships compared with competitors (*MLA Report – MINTRAC study tour 2006*) • Need for closer linkages between industry and researchers *(interviews)* • Fragmented industry structures with little evidence of collaboration along value chain *(interviews; MLA Report – KPMG 2001; MLA Report – Currie 2002)* • Relationships within the value chain limited by adversarial behaviours *(interviews)* • Lack of trust and low levels of collaboration between firms *(interviews)* • Very difficult to engage firms in syndicated projects *(interviews)* • Lack of collaboration has resulted in lack of coherence in industry R&D and marketing strategies *(interviews)*
Firm capability	• Industry firms are dominated by a focus on short-term cost-cutting initiatives at the expense of investment in innovation *(interviews)* • Lack of formal education and training by managers *(interviews; MRC Report – Andrewartha 1995)* • Many CEOs rely on approaches that have worked in the past and are reluctant to embrace new ideas *(interviews)* • Firms are not tolerant of failure and are resistant to change *(interviews)* • General lack of support for creative or entrepreneurial individuals *(interviews)* • Competitors such as NZ firms demonstrate superior innovation capability *(interviews)* • Industry is losing market share to competitors in both domestic and export markets *(MLA Market Intelligence Reports 1999-2006)* • Firms rely on innovations filtering through from overseas and do not take a proactive approach to innovation *(interviews)*
Adaptive	• Firms do not take a proactive approach to technology innovation *(interviews)* • Lack of in-house professional skill base makes it difficult for firms to adopt new technology *(interviews)* • Industry not prepared to support capability building in R&D providers *(interviews)* • Evidence of possible misuse of power on industry committees to block investment in new technology *(interviews)* • Reinforcement of status quo via shared industry perceptions such as "we sell all the meat we can produce – we are pretty right" *(interviews)*
Entrepreneurship culture	• Negative attitudes towards risks associated with innovation due to past R&D failures *(interviews; MLA Report – PIP Review 2005)* • Need to attract more creative and entrepreneurial people to the industry *(interviews)* • Industry culture is dominated by suspicion and mistrust of innovators *(interviews)* • Industry reluctant to enter new domains *(MLA Report – Bioactives 2005)*

would be identified based on: re-analysing the qualitative data collected during the 28 in-depth interviews conducted during the earlier phase of the research; and an analysis of secondary data contained in a wide variety of MLA reports which would provide an opportunity to triangulate the interview data. Table 2 illustrates specific examples of the types and source (interview data and/or MLA reports) of evidence of system failure identified in the red meat sector.

In this phase of the research, the MLA research team also rated the degree of impact on system effectiveness of each of the six system failure categories by each category of actor (firm, knowledge provider, and third party). Based on their own experiences working within the sector, the research team applied a 5-point rating scale to assess the relative importance of each system failure dimension for each of the groups of actors with a rating of '1' indicating 'not relevant' through to '5' indicating 'critical'.

The following summary map (Figure 5) broadly indicates the perceived level of impact of failures in system activities (by actor groupings) within each of the six categories within the analytical model as assessed by the MLA research team. When qualified by the potential for interventions by MLA to have an impact, this mapping framework provided a mechanism for determining where MLA intervention efforts aimed at improving the sector's innovation capability should be concentrated in the future.

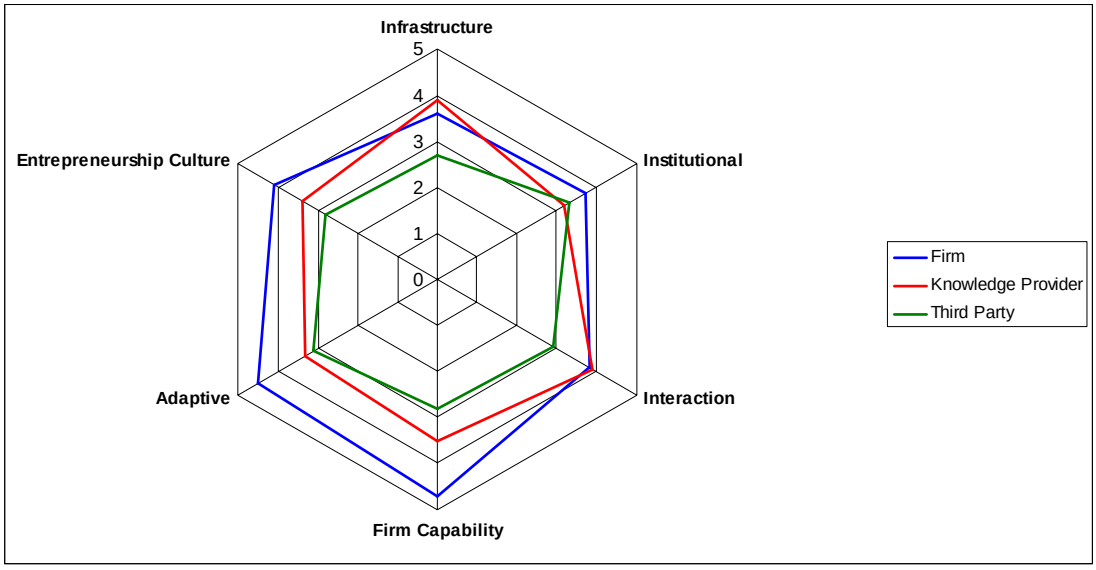


Figure 5: Mapping System Failures in the Red Meat Industry

Step 2: Developing Interventions

As noted in the literature (Edquist et al 2004), system intervention strategies must be comprehensive, efficient and cost-effective; and they must be focused on the

broad range of areas where problems are having the greatest impact and where interventions are most likely to succeed. In the next stage of this research, a suite of intervention instruments and projects were designed to address high priority system failures where the potential for MLA to have an impact was identified. The key inputs into determining potential intervention options were:

- Suggestions made by interviewees during the earlier stage of the research;
- Recommendations by participants in a National Food Industry Strategy food industry stakeholder workshop undertaken in June 2004;
- Review of existing MLA initiatives that the MLA research team believed could be further developed;
- Lessons learned from the lead researcher's past practice; and
- Consideration of the priority areas based on the mapping exercise.

A number of interventions were identified for further investigation by evaluating options against the following criteria:

- Intervention fits broadly within MLA's mandate;[3]
- Intervention fits within the priority areas identified in the mapping of system failures;
- Intervention does not duplicate a service already provided by other industry or government bodies;
- MLA has (or could acquire) the necessary skills to implement the intervention;
- Intervention appears to offer a cost-effective solution and is within MLA's broad budgetary constraints; and
- Intervention would not seriously confront industry political considerations.

Details of the actual design of each of the interventions are too lengthy for inclusion in this paper but may be found in Dr Pitt's doctoral thesis (Pitt 2007).

Step 3: Acceptance Testing of Intervention Initiatives

Figure 6 presents a summary of the interventions that were tested during this research study for acceptance and potential impact via a series of 30 pilots that included multiple engagements with industry participants.

[3] It was noted that the new approach represented a significant expansion of MLA's role. Specifically the approach explicitly challenged the existing paradigm that intervention should only occur in the case of 'market failure'. For this reason a relatively broad interpretation of MLA's mandate was required.

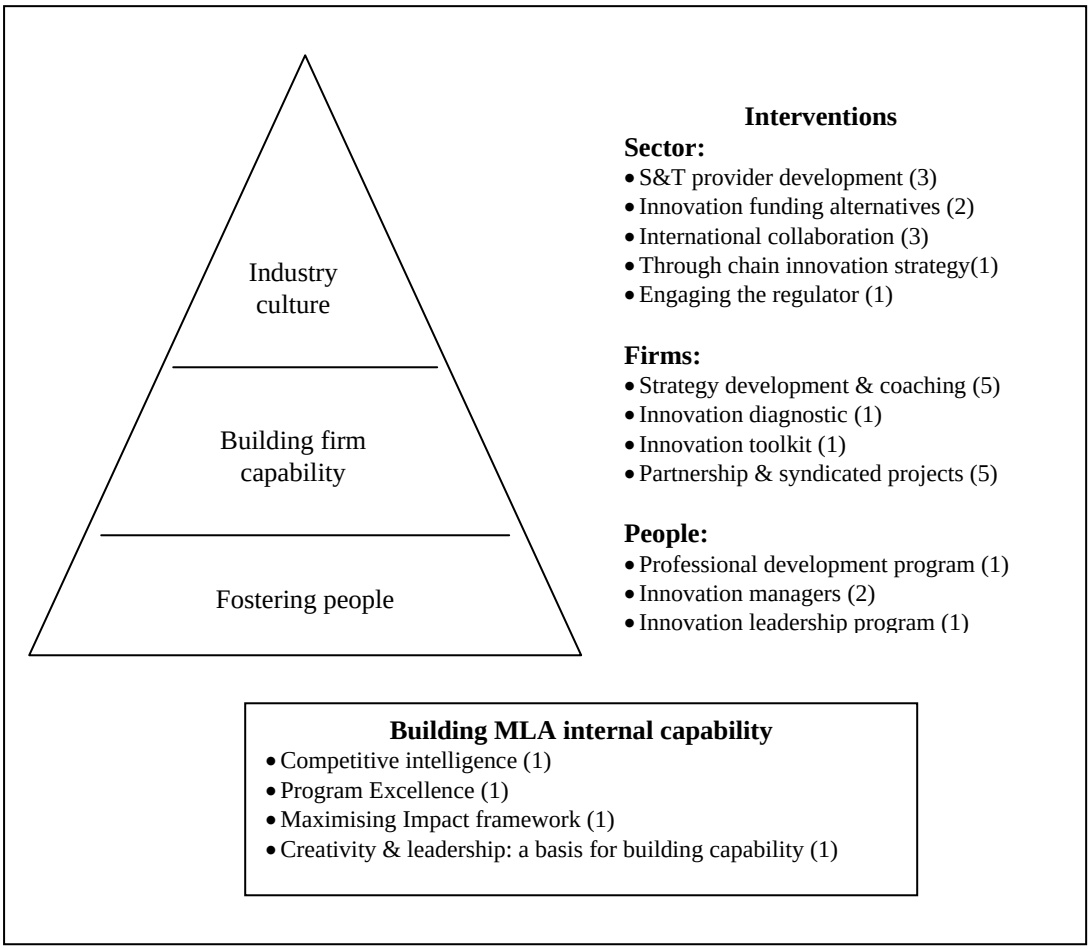


Figure 6: Pilot of Intervention Initiatives

While the numbers of industry participants directly involved in the research varied between each of the 30 initiatives (included both individuals and organisations), following is an overall summary:

- 48 undergraduates and new graduates; 43 universities; and 17 firms participated in testing the Professional Development Program;
- Six industry firms/supply chains participated in testing the new innovation capability building change management program over a period of three years;
- Three major technology providers, an international R&D organisation and four industry firms participated in testing a new technology strategy initiative;
- Two venture capital firms participated in testing new innovation funding models;
- Australia's major food safety regulator participated in testing new approaches to introducing innovation; and

- An MLA business unit involving 26 professional and support staff participated throughout the study in testing application of the new approaches to designing and implementing innovation interventions

A wide range of both qualitative and quantitative data were collected and analysed throughout this phase of the research including: interviews; range of secondary data sources including internal MLA documents, minutes of meetings, independent R&D reports and company innovation plans; and critical reflection by the principal researcher.

Step 4: Consolidation of Outcomes Presented to MLA

As stated, the purpose of the research study was to design an integrated innovation system intervention strategy that would assist the Australian red meat sector to improve its overall global competitiveness.

From the insights derived from the research study, the following 10 key principles for the design of an integrated intervention framework were developed:

1. Principle 1: The overall purpose of the innovation system should be defined (Edquist et al 2004; Lundvall & Borras 1998; OECD 2000).
2. Principle 2: The intervention framework must be based on a comprehensive understanding of the sector's innovation and entrepreneurship system.
3. Principle 3: The intervention strategy must address areas where significant problems have been identified within the system.
4. Principle 4: The intervention strategy should be based on a comprehensive approach to change which provides multiple options at the systems level rather than a piecemeal approach comprised of ad hoc, narrowly-based initiatives (Woolthuis, Lankhuizen and Gilsing 2005).
5. Principle 5: Industry engagement and participation in identifying intervention options is an important design criterion
6. Principle 6: There must be a reasonable expectation that the proposed interventions are likely to have an impact.
7. Principle 7: Clear objectives and measures for the intervention strategies should be articulated in order to facilitate ongoing review and reframing of the strategy.
8. Principle 8: A holistic socio-technical perspective that encompasses people, technology and the organisation should be incorporated into the overall design of any intervention.
9. Principle 9: A multi-level approach should be adopted which includes interventions focused on: developing people; building firm capability; and intervening at the overall sector level.

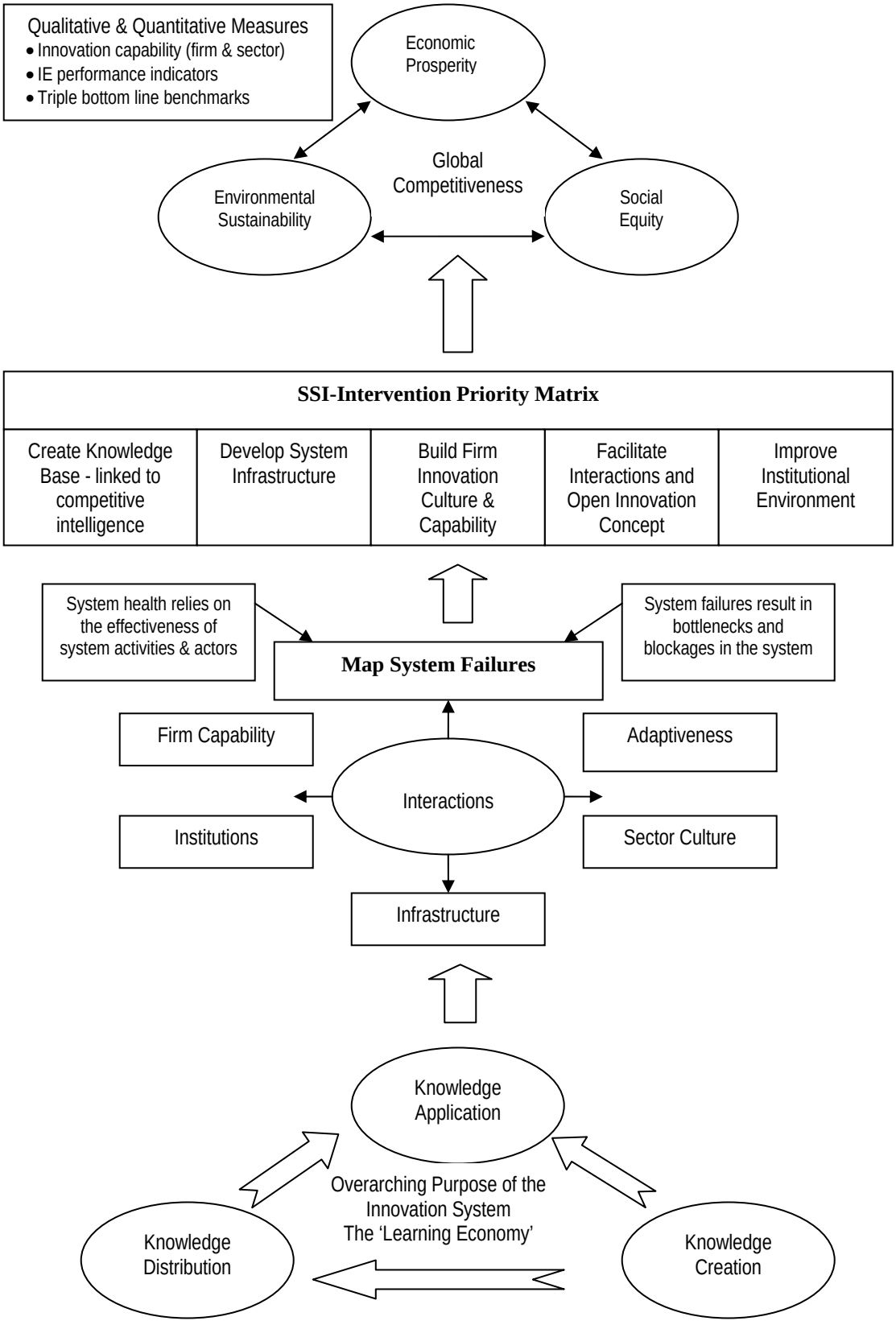


Figure 7: Integrated SSI Intervention Framework

10. Principle 10: Capabilities of the intervention agency must be aligned to the complexities of the innovation system in order to meet changing industry requirements (Hofer & Polt 1998; Scott-Kemmis et al 2005; Smith, K. 1998).

Based on these principles, a new integrated *SSI Intervention Framework* (supported by innovation systems theory) was developed to underpin the design of innovation interventions for the wider industry (see Figure 7). It is proposed that this framework demonstrates how interventions based on identified system failures can enhance the effectiveness of the relationship between the purpose of the innovation system and the achievement of global competitiveness.

Following completion of the study, the new *SSI Intervention Framework* was submitted for consideration by the MLA Board and has subsequently been incorporated within the company's new 5 year *Through Chain Innovation Strategy* which commenced implementation in July 2007 and will be subjected to extensive independent evaluation in 2010.

Results: Industry impact

While the timeframe for this study did not permit an extensive evaluation of the impact of the interventions, the following data are presented as early indicators that point to industry acceptance and improved practice based on application of the models and tools developed in this study:

- The level of investment in MLA's Innovation Partnership Program by the meat processing sector doubled in the two year period (2004-2006) from $16 million to $32 million (following a relatively slow growth over the previous five years). The MLA research team credit this accelerated growth to a number of factors including: higher quality projects resulting in faster approval times; wider awareness of the benefits of innovation encouraging more firms to invest; increased level of in-house skills and confidence as firms took advantage of the professional development program; better alignment and interactions between firms and R&D providers.
- Industry investment in a high risk automation technology strategy grew from zero in 2002 to more than $18 million by 2005-06.
- The automation technology program has provided significant opportunities for individual firms to participate in a range of interaction initiatives through: collaboration with a New Zealand processing company; co-funding a major syndicated R&D program; and involvement in a new technology innovation network that includes international study tours, sharing of knowledge and experience, and input into future industry direction. The willingness of firms to participate collaboratively in this initiative is a first for the Australian red meat industry.

- Venture capitalists were secured as investors in two new start-ups commercialising innovations in the red meat industry, which is another first for this type of investment. This represents a very early indicator of a potential to impact on the infrastructure failure identified in relation to finance for innovation. However, the experience has enabled MLA to develop a much greater understanding of the barriers to this type of investment and the requirements for building productive relationships with the venture capital community. Success in this area is also seen as an early indicator of the emergence of a more entrepreneurial orientation within the industry.
- The Professional Development Program attracted participation from 39 students, nine graduates, 17 companies, and 34 universities with a number of graduates offered permanent positions within the industry.
- A strategic R&D alliance was signed between MLA and a counterpart organisation in New Zealand valued at more than $1 million p.a. that provides access to substantial new intellectual property for the red meat industry. This is seen as an early example of the industry's willingness to apply concepts of open innovation at the sectoral level, a key dimension to be addressed in the area of interaction failures.
- There is early evidence (reported by participating firms) of positive cultural change within firms implementing new technology based on socio-technical approaches.
- Feedback received (at general presentations and input from industry project teams), indicates the response from industry and government representatives, and from the MLA board has been extremely positive to the proposed new intervention approach.

Based on these early results, it is proposed that this study will assist future researchers to develop a more comprehensive understanding of the elements within a sectoral system of innovation that must be evaluated. The approach will therefore be of particular relevance to practitioners attempting to intervene and change system dynamics to improve competitive performance.

Conclusions and Discussion

In summary, it is proposed that the research study discussed in this paper makes a contribution to the field of innovation and entrepreneurship studies in a number of areas including:

1. Contribution to knowledge by identifying specific opportunities for convergence in the two fields of innovation and entrepreneurship that will assist future researchers to develop a more comprehensive understanding of the elements within a sectoral system of innovation.
2. Development of novel theoretical and analytical models in the areas of: a system failure analytical framework; a methodology for determining evidence

of system failure; and a structured methodology to develop an integrated intervention strategy for making industry policy and program decisions. It is noted that these models were subsequently adopted by MLA and NFIS.
3. Improved practice within the red meat industry following implementation of the above models.
4. Evidence of the potential for the innovation systems approach to be a powerful tool in relation to developing innovation policy and investment options and in developing more effective programs to build a community of innovative firms within the red meat industry.
5. Lessons learned within the NFIS initiative independently confirmed the relevance and potential impact of innovation systems thinking on the Australian food industry's capacity to innovate (Nelle 2007).

Opportunities clearly exist to undertake further research to extend the approach within the red meat industry by conducting comparative and longitudinal studies of the effectiveness of MLA's interventions over the next five years. In addition, there are also opportunities to further develop the methodologies to determine evidence of system failure. Such methodologies would include quantitative and qualitative data related to both positive and negative indicators (i.e. system 'health' and system 'failure' indicators).

It is proposed that, based on the models and approaches developed in this study, more sophisticated SSI analytical tools could be developed. Of particular interest is the potential to identify specific areas of competitive advantage based on the 'health' of a sector's innovation system. There would also be opportunities to benchmark innovation systems with competitors' systems as a basis for designing interventions to overcome identified gaps.

This study is based on a single case and therefore does not purport to offer broad generalisations regarding the usefulness of the models and methodologies outside this single case. However it is proposed that the new approaches offered by innovation systems theory and the concept of system failure could provide innovation policy makers with a desirable alternative to the current economic policy paradigm based on the concept of 'market failure'.

Next Steps

Since 2005, the authors have worked together, first under the framework of the National Food Industry Strategy (NFIS) and more recently under the auspices of the Australian Innovation Research Centre (AIRC) at the University of Tasmania, to apply innovation system thinking more broadly across the agrifood industry within Australia. For example, a study with the national dairy industry is currently underway using an SSI framework to determine future RD&E

infrastructure requirements and to identify other priority system improvements that might increase innovation performance.

It is anticipated that this work will be extended to include a series of innovation studies that will apply the SSI framework to a range of agrifood sectors to address issues such as:

- Relative roles of market demand and technology advances as drivers of innovation;
- Roles and inter-relationships of 'actors' in the system (particularly firms and science and technology providers);
- Role and impact of collaborative networks (and network brokers, intermediaries and system integrators)'
- Knowledge creation and distribution across the system;
- Impact of national and regional institutions ('rules') on innovation performance;
- Identification and impact of system failures; and
- Identification and impact of potential intervention strategies.

Ultimately it is the authors' intent to develop a broad set of analytical tools to analyse the structure and functionality of sectoral systems of innovation in the agrifood industry; develop and test system 'health' and 'failure' indicators; and assess 'fit for future purpose' of sectoral innovation systems facing new competitive pressures. The authors also hope to identify common system failures across agrifood sectors that would create opportunities for collaborative policy and program development.

References

Bikar, V. Capron, H. & Cincera, M. (2006) *An integrated evaluation scheme of innovation systems from an institutional perspective.* Working Paper No. 06-09 Dulbea, Brussels.

Bryant, K. (1998) "Evolutionary innovation systems: Their origins and emergence as a new economic paradigm" in K. Bryant & A. Wells (eds.) *A new economic paradigm? Innovation-based evolutionary systems: Discussions of science and innovation.* Department of industry, Science and Innovation, Canberra

Buzan, T. & Buzan, B. (2000) *The Mind Map book.* BBC Worldwide Limited, London

Chaminade, C. & Edquist, C. (2005) *From theory to practice: The use of systems of innovation approach in innovation policy* CIRCLE, Lund, Sweden

Commonwealth of Australia (2003) *Mapping Australian science and innovation: Main report* McMillan Printing Group, Canberra

Dick, B. (1998) *Convergent interviewing: a technique for qualitative data collection.* Available on-line at www.scu.edu.au/schools/gcm/ar/arp/iview.html

Dodgson, M. & Bessant, J. (1996) *Effective innovation policy: a new approach.* International Thomson Business Press, London

Dyer, W. & Page, R. (1988) "The politics of innovation," *Knowledge in Society: An International Journal of Knowledge Transfer*

Edquist, C. Malerba, F. Metcalfe, J. Montobbio, F. & Steinmueller, W. (2004) "Sectoral systems: Implications for European technology policy" in F. Malerba (ed.) *Sectoral systems of innovation.* Cambridge University Press, Cambridge

Elias, A., Cavana, R. & Jackson, L. (2002) "Stakeholder analysis for R&D project management" *R&D Management* 32 (4)

Freeman, R. (1994) "The economics of technical change" *Cambridge Journal of Economics* (18)

Georghiou, L. (2002) "The United Kingdom system of research, technology and innovation" in P. Laredo & P. Muster (eds.) *Research innovation policies in the new global economy: An international comparative analysis.* Elgar, London

Glaser, B. & Strauss, A. (1967) *The discovery of grounded theory: Strategies for qualitative research.* Aldine, Chicago

Hindle, K. (2002) "Small-i or BIG-I? How entrepreneurial capacity transforms "small-i" into "Big-I" innovation: Some implications for national policy" *Telecommunications Journal of Australia* 52(3): 51-63

Hofer, R. & Polt, W. (1998) "Evolutionary innovation theory and innovation policy: An overview" in K. Bryant & A. Wells (eds.) *A new economic paradigm? Innovation-based evolutionary systems: Discussions of science and innovation.* Department of Industry, Science and Resources, Canberra

Lewis, M. (1998) "Iterative triangulation: A theory development process using existing case studies" *Journal of Operations Management* (16): 455-469

Lundvall, B. & Borras, S. (1998) *The globalizing learning economy: Implications for innovation policy.* The European Commission, Brussels

Maxwell, J. (2005) *Qualitative research design: An interactive approach.* Sage, Thousand Oaks CA

Nelle, S. (2007) 'Exploring the Innovation System' paper prepared for *The Innovators Forum, Future Vision for Australia's Food Industry*, June 2007

Nelson, R. (1993) (ed.) *National innovation systems: a comparative analysis.* Oxford University Press, Oxford

OECD (2000) *OECD Science, Technology and Industry Outlook 2000.* OECD, Paris

Pitt, C. (2007) *Leading Innovation and Entrepreneurship: An Action Research Study in the Australian Red Meat Industry* DBA Thesis, Southern Cross University

Scott-Kemmis, D. Holmen, M. Balaguer, A. Dalitz, R. Bryant, K. Jones, A. & Matthews, J. (2005) *No simple solutions: How sectoral innovation systems can be transformed.* Australian National University, Canberra

Smith, K. (1998) "Innovation as a systemic phenomenon: Rethinking the role of policy" in K. Bryant & A. Wells (eds.) *A new economic paradigm? Innovation-based evolutionary systems: Discussions of science and innovation.* Department of Industry, Science and Resources, Canberra

Smith, K. & West, J., *'Innovation Policy, Productivity, and the Reform Agenda in Australia: A Framework for Analysis',* Australian Innovation Research Centre, 2007.

Stevens, C. (1997) "Mapping innovation" *The OECD Observer* 207: 16-19

Ticehurst, G. & Veal, A. (1999) *Business research methods: A managerial approach.* Longman, Australia

Van de Ven, A. Angle, H. & Poole, M. (eds.) (1989) *Research on the management of innovation: The Minnesota studies.* Harper & Row, New York

Wilson-Evered, E. & Hartel, C. (2001) "Creating a climate for innovation: A participative approach," in S. Sankaran B. Dick R. Passfield & P. Swepson (eds.) *Effective change management using action learning and action research.* Southern Cross University Press, Lismore

Woolthuis, R. Lankhuizen, M. & Gilsing, V. (2005) "A system failure framework for innovation policy design" *Technovation* (25): 609-619

International Food and Agribusiness Management Review
Volume 11, Issue 4, 2008

India's Agrarian Crisis and Corporate-Led Contract Farming: Socio-economic Implications for Smallholder Producers

Vijay Paul Sharma [a]ⓘ

[a] *Faculty Member, Centre for Management in Agriculture*
Indian Institute of Management, VastrapurAhmedabad, 380015 India

Abstract

The paper discusses India's agrarian crisis and the role of corporate-led contract farming in addressing these crisis. A two-stage Heckman model was used to explain determinants of participation in contract farming, and whether participation in contract farming affects farm income. The results indicate that contract farming has a positive impact on crop productivity and farm income. The socio-economic factors that influenced participation in contract farming were education, age, farm size, access to institutional credit, source of off-farm income and membership to an organization. Factors related to the likelihood of participation in contract farming slightly differed from the factors affecting farm income.

Keywords: Agrarian crisis, Smallholder producer, Corporate-led contract farming, Agricultural Produce Marketing (APMC) Act, Heckman model

ⓘCorresponding author: Tel: + 91-79-6632 4819
Email: vijays@iimahd.ernet.in

Introduction

The importance of the agricultural sector in the economic development of India is clearly indicated by its contribution to the national gross domestic product (GDP). In 2006-07, agriculture contributed 18.5 per cent to GDP (at current prices), industry 26.4 per cent and services 55.1 per cent (GOI, 2008). The agricultural sector is also important to the socio-economic development, as about 70 per cent of the population live in rural areas and most of them depend on agriculture.

While the economy has been growing at about 8 per cent yearly, agriculture growth has been dismal at nearly 2 per cent during the last ten years. This is in sharp contrast to the average annual growth rate of more than 4 per cent during the 80s and early-90s. It is this sharp decline in agricultural growth that is causing distress in rural areas.

The current crisis has led to renewed focus on agriculture and the government has launched several programmes to tackle the crisis. The government has initiated various reforms such as agricultural market sector reforms, research and development, investment, formulation of integrated food laws, incentives for corporate investment in agribusiness sector, etc. A favourable regulatory environment has attracted the interest of several large corporate to agriculture. While earlier corporate intervention in agricultural activities was limited to agri-input companies, the recent times have witnessed a spurt in initiatives by other industry players as well. These companies offer services such as extension, supply of inputs, market information, etc. to the farming community and commit themselves to purchase farm produce.

Contract farming is increasingly being presented by the government as a solution to the problems of Indian agriculture. Private sector participation promoted through contract farming and land leasing arrangements will allow accelerated technology transfer, capital inflow and assured markets for farmers. Corporate contract farming has taken off in states such as Punjab, Haryana, Maharashtra and Gujarat. However, it is argued that only big farmers benefit from contract farming and under direct purchase arrangements by the private sector small and marginal farmers are likely to be left out.

This paper discusses the role of corporate-led contract farming in transforming socio-economic relations in the countryside. It also investigates the determinants of participation of farmers in contract farming and the effects of participation on crop productivity and farm income.

Contract Farming in India

There is a perception that because of market liberalization, globalization, and expanding agribusiness, small farmers will find difficulty in participating in

restructured markets and could become marginalized. One of the reasons for their exclusion is weak backward (inputs and services) and forward (agro-processing and marketing) market linkages. Farmers have poor access to reliable and cost-efficient inputs such as seeds, fertilizers, credit, extension services, and assured and profitable markets for their output. Well-organized contract farming is expected to provide such linkages, and would appear to offer an important way in which small farmers can be linked to the market. Through contract farming, agribusiness companies can assist smallholders to shift from subsistence or traditional agriculture to the production of high-value/export-orientated products. This not only has a potential to increase incomes of smallholders but also to have multiplier effects in the economy.

Contract farming can be defined as an agreement between a farmer and processing and/or marketing firm for the production and supply of agricultural products under forward agreements, frequently at predetermined prices (Charles and Shepherd, 2001). The arrangement also invariably involves the purchaser in providing a degree of production support through, for example, supply of inputs and provision of technical advice. The basis of such arrangements is a commitment by the farmer to provide a specific commodity in quantities and on quality standards determined by the purchaser and a commitment by the company to support the farmer's production and to purchase the commodity. Contract farming is an intermediate production and marketing system that spreads production and marketing risks between agribusiness and smallholders. Similarly, it also provides agribusiness companies with the opportunity to guarantee a reliable source of supplies of required quantity and quality. It can be regarded as a means of reducing high transaction costs that result from the failure of the market and/or government to provide required inputs and market institutions.

The intensity of the contractual arrangement varies according to the depth and complexity of the provisions in each of the following three areas (Charles and Shepherd (2001) :

> *Market provision:* The grower and buyer agree to terms and conditions for future sale and purchase of a crop or livestock product
>
> *Resource provision:* In conjunction with marketing arrangements the buyer agrees to supply selected inputs, including on occasions land preparation and technical advice
>
> *Management specifications:* The grower agrees to follow recommended production methods, inputs regimes, and cultivation and harvesting specifications.

Contract farming emerged as an important phenomenon in developed countries during the 50s and 60s. By 1980, about one-third of total US farm output, and as much as 100 per cent of poultry meat, milk, and certain vegetables, were produced under contracts (Little and Watts, 1994). In developing countries, multi-national corporations introduced contract farming during the late 70s and early 80s. Contract farming in India is not a new phenomenon as informal contract farming has been practised by cooperatives in some commodities like milk and sugarcane for quite some time. However, corporate-led contract farming system in India is a recent phenomenon.

Until recently, there were several restrictions on participation of the corporate sector in agriculture and all related activities. The Essential Commodities Act (ECA) of 1955 restricted trade in food products to licensed traders, and defined limits on stock holding. Food processing was reserved for the small-scale sector. Most importantly, the Agricultural Produce Marketing Committee (APMC) Act required that farm produce be sold only at designated government markets through registered intermediaries. Under the Act, the private sector was not allowed to buy directly from farmers. Farmers were also restricted from entering into direct contract with any buyer because the produce was required to be channelized through regulated markets. These restrictions acted as disincentive to farmers, trade, and industries. The Central government, therefore, drafted a model APMC Act (since agriculture falls under the jurisdiction of state governments) in 2002, which allowed private players to set up markets not regulated by the market committees. The model APMC Act provides an institutional framework to support contract farming and direct marketing which would link small farmers to the agro-processing industry and provide them an access to better technology, extension services, seeds, credit, and market linkages., Several state governments have already initiated steps to amend the Agricultural Produce Marketing Committee (APMC) Act. Punjab, a leading agricultural state, was one of the first to amend the APMC Act.

The first contract farming initiative in India was taken by Pepsi Foods Ltd (PepsiCo) in 1989 which set up tomato processing plant in Punjab. With the liberalization of the economy in the 90s, there has been a spurt in contract farming in India. Contract farming is practised by domestic and multi-national corporations in foodgrains, spices, oilseeds, fruits and vegetable crops, cotton, tea, coffee, etc. Financial institutions and banks are also promoting contract farming.
Different contract models are available to farmers and agribusiness ranging from simple buyback of produce to provision of inputs and services; single company model to consortium of companies (agri-input, processing, banks, etc.) including statal and parastatal agencies. The partnership will depend on the available institutions to support production and product markets, commodity being produced, resource base of producers and capacity of agribusiness firms. Important contract farming models being practised in India are presented in Figures 1-4.

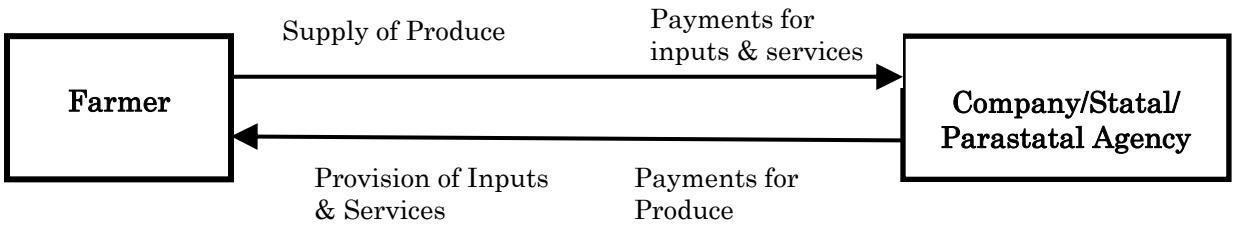


Figure 1. Bipartite Agreement between Farmer and Company/Statal/Parastatal Agency

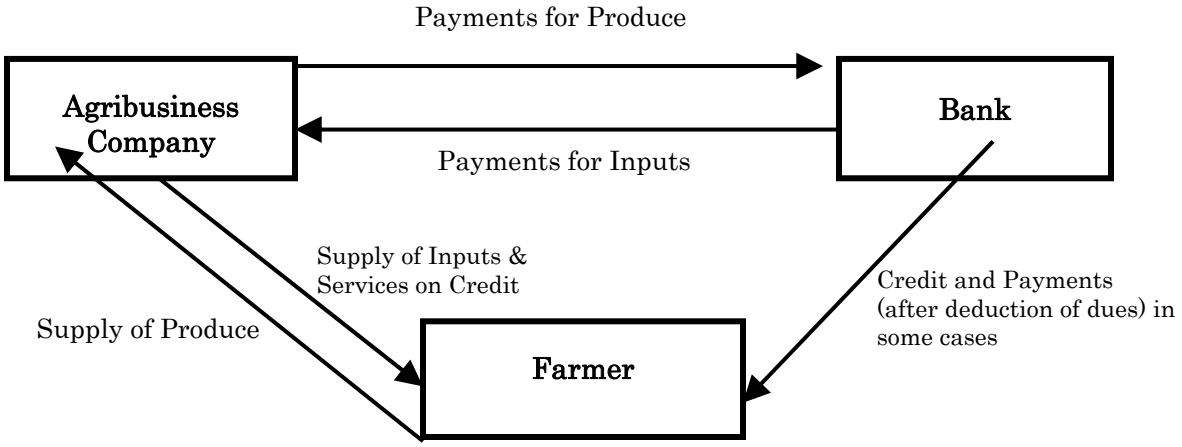


Figure 2. Tri-partite Agreement between Farmer, Company and Bank

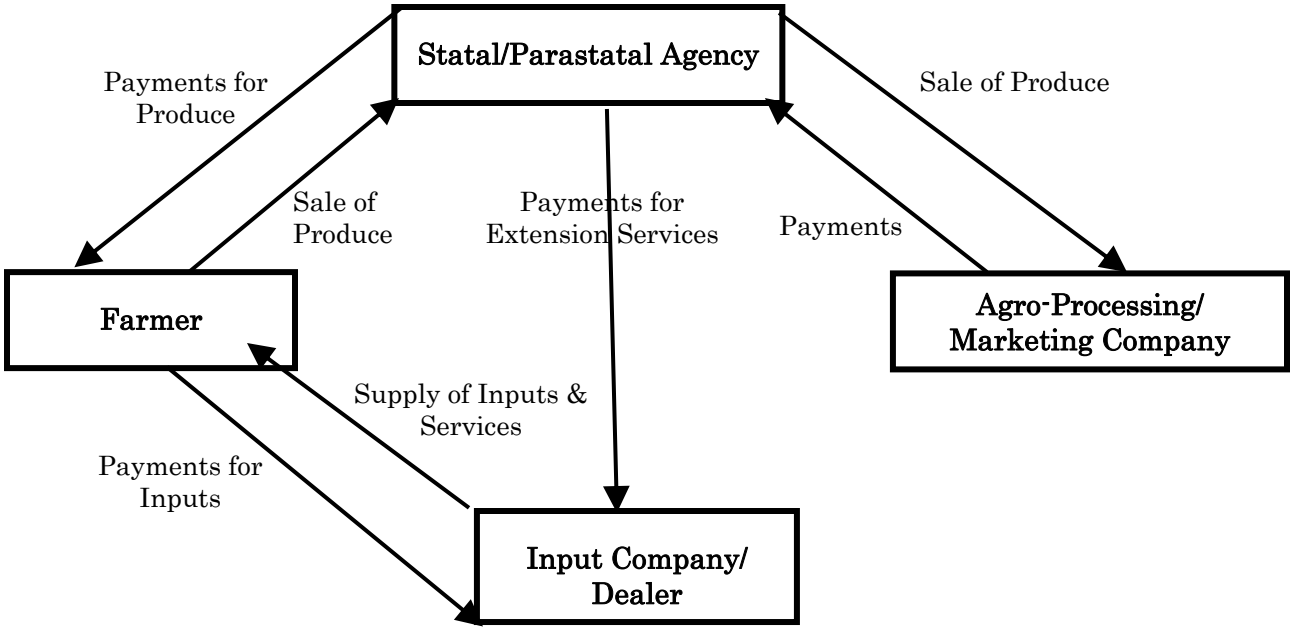


Figure 3. Quad-partite Agreement between Farmer, Input Supplier, Agro-processing Company and Statal/Parastatal agency

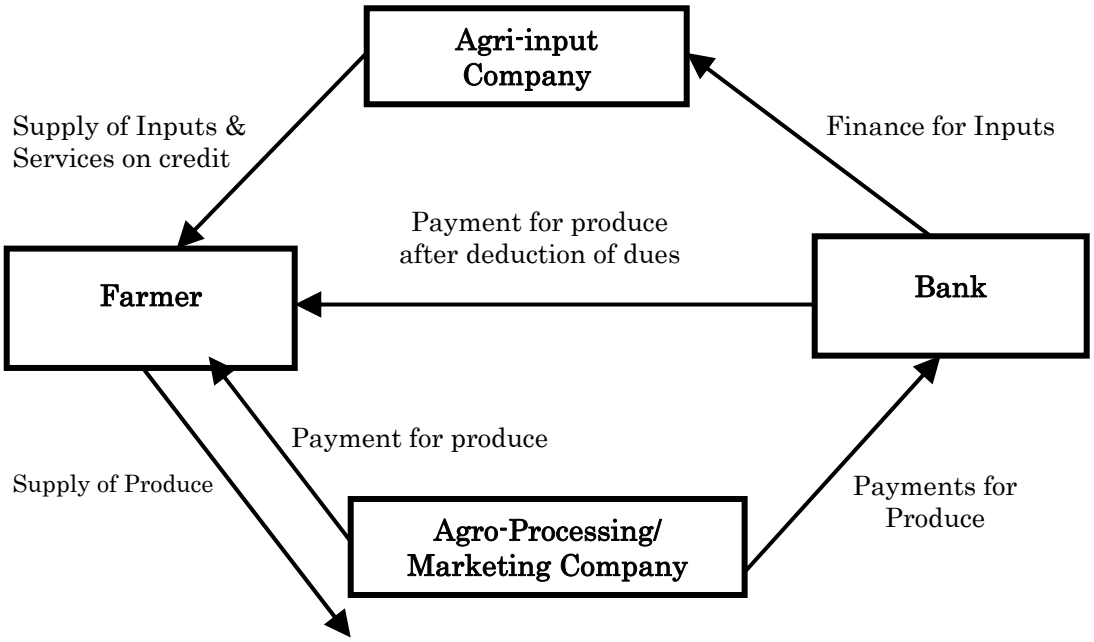


Figure 4. Quad-partite Agreement between Farmer, Agro-processing/Marketing Company, Agri-Input Company and Bank

India's Agricultural Sector Crisis

This section discusses deceleration in the agricultural sector, declining investment, deteriorating institutions mainly extension agencies, and ecological crisis in Indian agriculture.

Deceleration in Agricultural Sector

While India's GDP grew at an annual compound growth rate of 7.6 per cent during the tenth plan[2] (at 1993-94 constant prices), agricultural growth declined to nearly 2 per cent, resulting from stagnation or decline in productivity. Plan-wise trends of growth of GDP and agriculture show that India's agricultural sector has grown more than targeted growth during the sixth, seventh, and eighth plans but fell short

[2] After independence, India opted for a centrally planned economy to achieve an effective and equitable allocation of resources and balanced economic development. In order to achieve these objectives the Planning Commission, headed by the Prime Minister of India as its chairperson, was set up in 1950 and given the responsibility of formulation and direction of the five-year plans. Five year plans build a long term strategic vision of the future, decide on national priorities, work out sectoral targets, and provide promotional stimulus to the economy to grow in the desired direction. The First Five-year Plan was launched in 1951 and currently eleventh plan (2007-2012) is in progress. The content and the strategy of successive five-year plans have varied in response to development issues being addressed.

of the target during the ninth and tenth plans. During the tenth plan, agricultural GDP grew at an annual rate of mere 2.1 per cent against the target rate of 4 per cent (Figure 5). Considering the importance of agriculture in the Indian economy, it would be difficult to imagine India meeting the targeted growth of 9 per cent during eleventh plan without strong agricultural growth.

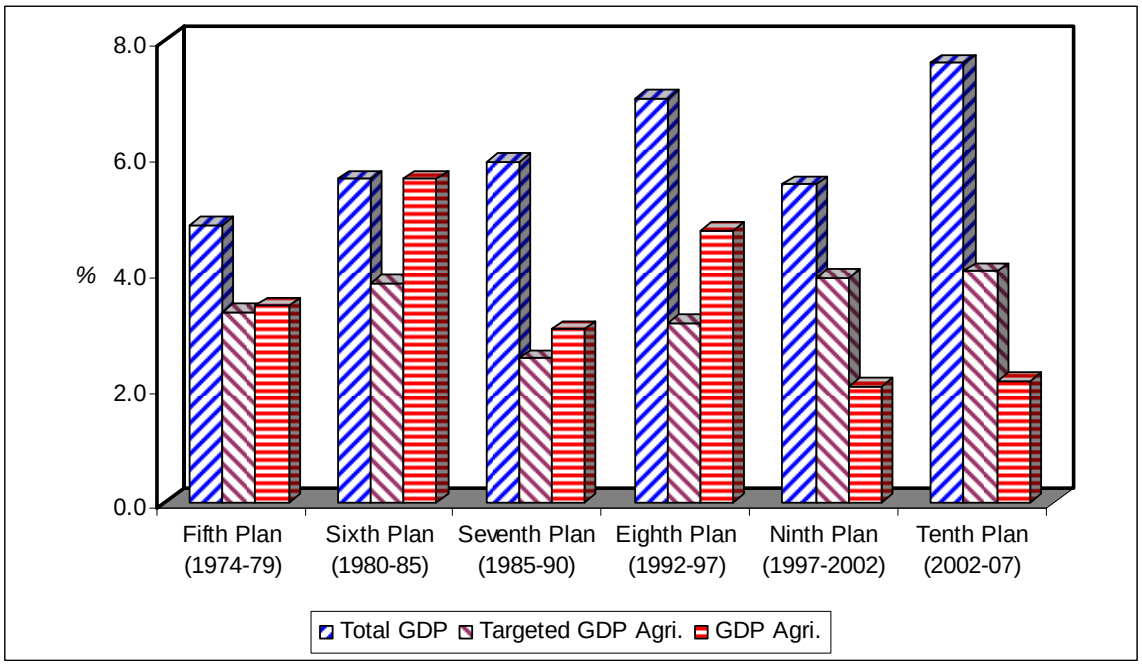


Figure 5. Plan-wise Trend of Growth of GDP and Agriculture GDP including Allied Sectors (at 1993-94 constant prices)
Source: GOI (2006)

Declining Investment and Rising Subsidies

One of the important reasons for deceleration in agricultural growth has been declining levels of investment in agriculture and allied sectors, particularly public investment. The share of agriculture and irrigation in plan expenditure has declined from 37.3 per cent in first plan to 10.6 per cent in the tenth plan (Figure 6). The share of the public sector in gross capital formation in agriculture has declined from 30.9 per cent in 1995-96 to 25.6 per cent in 2003-04, while the share of the private sector has increased from 69.1 per cent to 74.4 per cent during the same period (Sharma, 2007). The share of agriculture sector's capital formation in GDP has declined from 1.9 per cent in the early 90s to about 1.2 in the early 2000s, which is a cause for concern. However, there is an indication of reversal of this trend of late, with public sector investment in agriculture reaching the highest level since

the early 90s at Rs. 5,249 crore[3] in 2003-04 at 1993-94 prices (GoI, 2007). This has helped in improving the share of agriculture sector's capital formation in GDP from 1.28 per cent in 2001-02 to 1.31 per cent in 2003-04.

A key reason for declining public investment in agriculture has been ever increasing agricultural subsidies. Total agricultural subsidies have increased at an annual compound growth rate of about 12 per cent between 1993-94 and 2002-03. Trends in food and fertilizer subsidies during the 1990s and 2000s are presented in Figure 7. Subsidy on fertilizers has increased from Rs. 4389 crore in 1990-91 to about Rs. 22,452 crore in 2006-07 (at an annual compound growth rate of 10.6 per cent). Food subsidies have also witnessed a significant growth during the 1990s and 2000s, rising from Rs. 2450 crore in 1990-91 to Rs. 24,200 crore in 2006-07. Food and agricultural subsidies are far greater than public investment in agriculture and allied sectors. In addition there has been deterioration in quality of institutions/organizations providing inputs and services such as credit, seeds, technology, extension, etc.

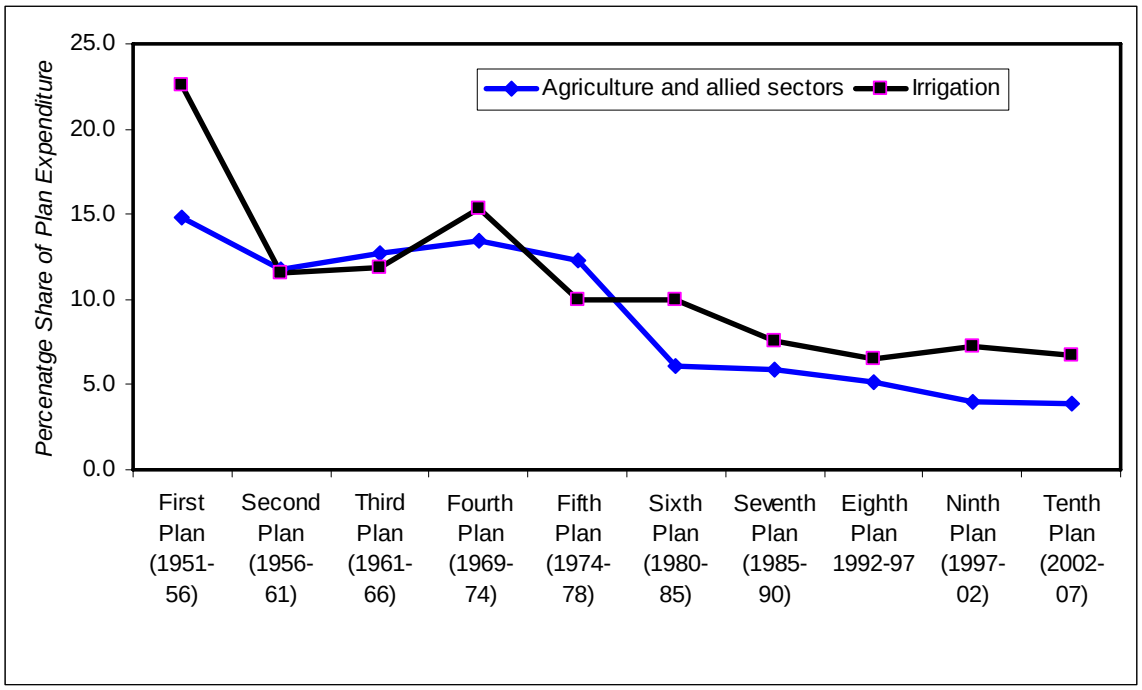


Figure 6. Share of Agriculture and allied Sectors, and Irrigation in Total Plan Expenditure during Plan Periods
Source: GOI (2001)

[3] 1 crore = 10 million; 1 US$ (as on June 8, 2008) = Rs. 42.79

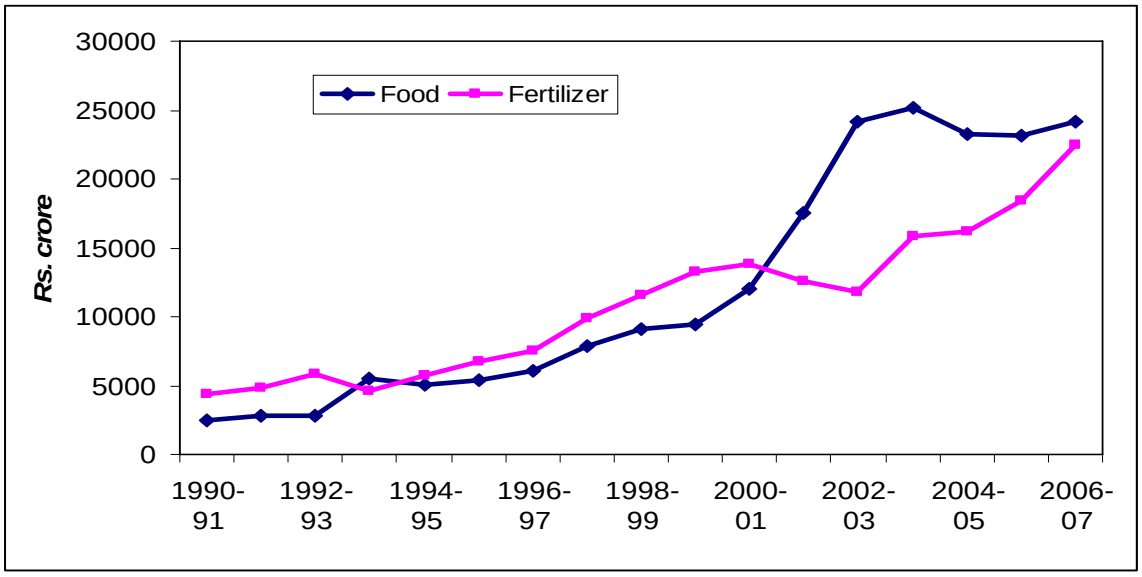


Figure 7. Trends in Food and Fertilizer Subsidies in India
Source: CSO (2008); GOI (2008)

To boost growth rates in agriculture, India needs massive investments in agriculture, particularly public investment. There is ample evidence to suggest that returns on input subsidies are typically lower than returns on investments in public goods. Investment in public goods such as agricultural research and extension, rural roads, and irrigation typically produce returns two to six times greater than spending on input subsidies (Fan, Zhang and Zhang, 2003; Fan, Hazell and Thorat, 1999, Fan, Zhang and Rao, 2004). Therefore, a reorientation of public spending from input subsidies and increased investment in public goods is likely to accelerate agricultural growth. Many of the key investments required to accelerate agricultural growth – technological research, rural infrastructure, etc. - are public goods. Because the private sector cannot capture gains from these investments, they will not invest in amounts sufficient to ensure broad-based agricultural growth. Therefore, public sector needs to provide the necessary technological, institutional, and rural infrastructure to stimulate agricultural growth. But public investments in agriculture have been stagnating or falling over years, while the subsidy bill on food, fertilizer, power and irrigation has been ballooning. If Indian policy planners can reverse this trend, much of the problems of Indian agriculture will solve themselves.

The government is aware of the problem of misdirected and unsustainable subsidies. In its approach paper to the mid-term appraisal of the tenth plan (2002–07), the Planning Commission has indicated that the existing farm price support and procurement policies combined with input subsidies on fertilizer, irrigation, etc. have led to a sharp increase in subsidy based support while public investment in

agriculture has suffered. The outcome is inequitable since subsidies typically go to riche farmers in irrigated areas, while lack of public investment hurts poorer farmers and those in arid regions. However, agricultural subsidies are a politically complex and sensitive subject. The logic that the present subsidy regime benefits better-off farmers disproportionately has failed to carry much political weight. It is also true that even small and medium farmers depend crucially on subsidized inputs such as seeds, fertilizer, irrigation, etc. Attacking subsidies, therefore, translates politically into a direct attack on all farmers' interests.

Declining Farm Size and Land Fragmentation

The agrarian structure in India has undergone significant structural transformation since the 70s. Recent data show that the share of marginal and small farmers (farmers owning <2 ha) has increased from 69.7 per cent in 1970-71 to approximately 82 per cent in 2000-01 (GOI, 2007). The average farm size has declined from 2.3 ha in 1970-71 to 1.69 ha in 2000-01. The average size of land holdings in India is not only very small but is subject to fragmentation owing to imposition of ceilings on land holding, population increase, inheritance laws which have stipulated an equal division of property among sons, lack of off-farm occupations, etc. Such small holdings are often overmanned, resulting in disguised unemployment and low productivity of labour. Moreover, there are several tenancy restrictions in many states, ranging from a complete ban of leasing in some states to complete freedom in some states. There is growing consensus about the need to have a relook at current tenancy legislations, which sometimes restrict participation of the private sector in agriculture. However, under the Indian constitution, land administration falls under state governments and reforms at the state level are most difficult to bring about.

Dominance of Rice-Wheat Cropping System and Stagnant Productivity Levels

Foodgrains continue to occupy an important place in Indian agriculture. Commercial crops such as fruits and vegetables, fibres, condiments and spices, etc. have reported significant increase at the national level during the last decade. The share of foodgrains in the cropped area has declined from about 77 per cent in 1971-72 to about 65.6 per cent in 2001-02. Area under rice has remained almost constant at about 23 per cent while area under wheat has increased from 11.5 per cent to 14 per cent of the cropped area. However area under coarse cereals declined significantly from about 27 per cent in 1971-72 to 16 per cent in 2001-02. Area under pulses has also declined from 13.3 per cent to nearly 12 per cent.
In agriculturally developed states like Punjab and Haryana, the rice-wheat mono-cropping system is predominant. Rice and wheat account for more than three-fourth of the cropped area in Punjab. Share of rice and wheat in the cropped area have increased in recent years. The reasons for this increase are steady increase in minimum support prices (MSP) of wheat and rice and assured procurement by the

government. MSP of wheat has increased from Rs. 280 per quintal in 1991-92 to Rs. 1000 per quintal in 2007-08 and in the case of rice it has increased from Rs. 230 to Rs. 850 per quintal (Figure 8).

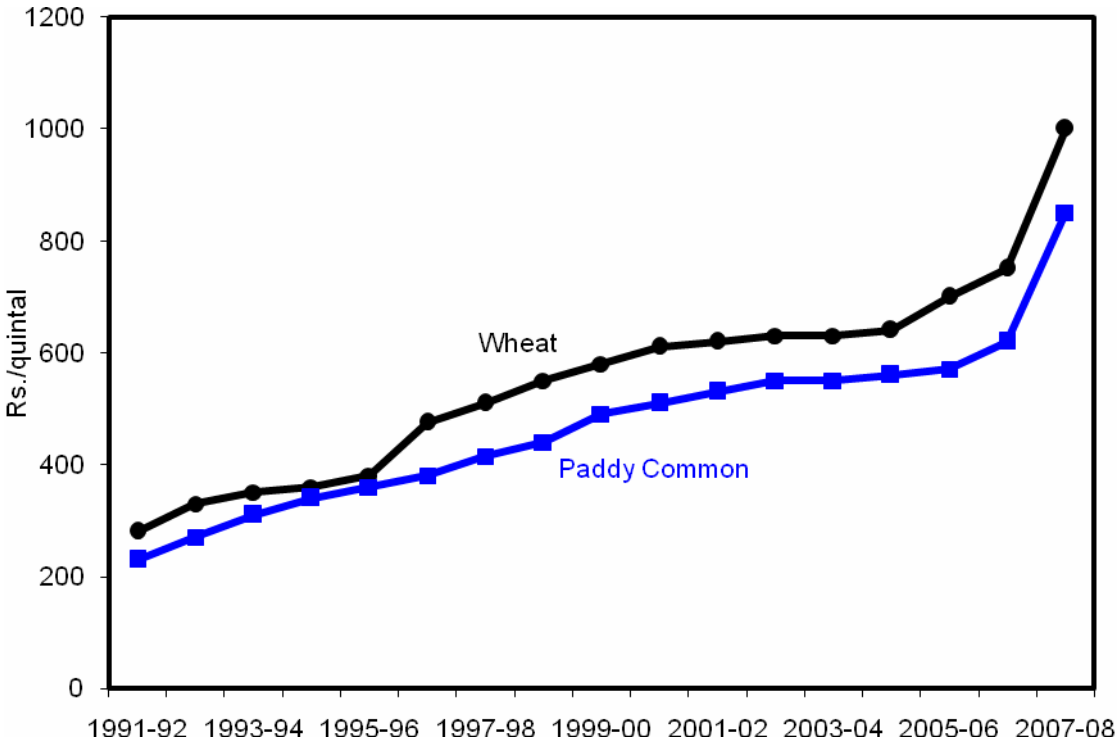


Figure 8. Minimum Support Prices of Wheat and Paddy in India
Source: GOI (2007)

Another major problem is of stagnant rate of growth in agricultural productivity. As shown in Figure 9, productivity of wheat, coarse cereals, pulses and oilseeds has decelerated during the last decade which is a cause for concern.

Ecological Crisis

States like Punjab and Haryana that spearheaded the Green Revolution in the 60s and 70s are facing a major crisis on the agricultural front. Because of the high yielding varieties (HYVs) of seeds during the green revolution period and assured market and price for marketable surplus, rice-wheat crop rotation became dominant. HYVs require assured supplied of water and large amounts of chemical fertilizers and pesticides, which have long-term ecological consequences. About 73 per cent of irrigation in the Punjab is from tubewells and the remaining from

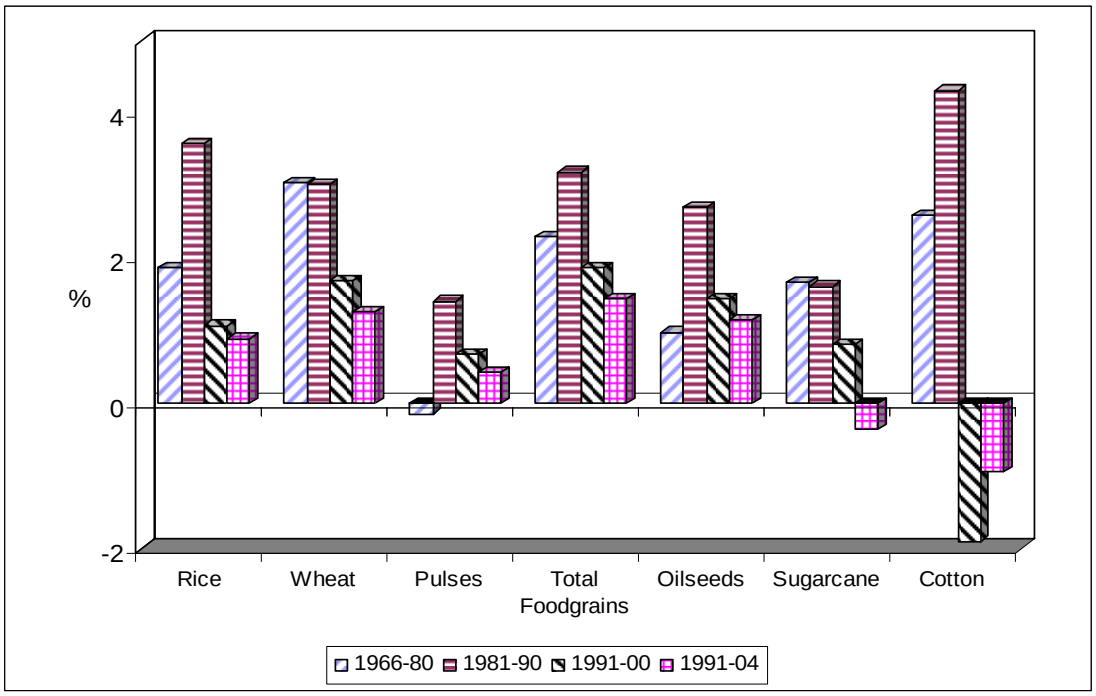


Figure 9. Growth Rates of Productivity of Principal Crops in India
Source: Computed from GOI (2007)

government canals. With rice being heavily water dependant, farmers have every reason to over-exploit groundwater. The inevitability of groundwater extraction has been politically exploited too. Successive governments have even given free electricity to farmers in the state. Water tables have fallen at alarming rates in many places in the state during the last few decades. The government's policy of providing free electricity for agriculture and very low water charges for canal water have encouraged inefficient use of irrigation water. Intensive use of tubewell irrigation has led to depletion of water resources in the state. About 98 per cent of groundwater resources in Punjab have already been exploited. Nearly 59 per cent of development blocks have overexploited groundwater resources, the highest rate in the country, and another 12 per cent are in dark/critical zone. Injudicious use of canal-irrigation water without regard to soil conditions and inadequate attention to drainage have led to water-logging and salinity in many areas, resulting in valuable agricultural land going out of use.

High and Imbalanced Use of Chemical Fertilizers

There has been a substantial increase in fertilizer consumption in the country. Total NPK (N, P_2O_5 and K_2O) consumption has increased from 0.7 lakh tonnes in 1950-51 to 22 million tonnes in 2006-07. Per hectare consumption of fertilizers, which was

less than one kg in 1951-52 has increased to about 113 kg in 2006-07 (FAI, 2007). In addition, overuse of nitrogenous fertilizers because of higher amounts of subsidy on urea has led to imbalanced use of fertilizers. The $N:P_2O_5:K_2O$ ratio in Punjab and Haryana (agriculturally the most progressive states) is one of the most distorted at 20:6:1 and 30:9:1, respectively as against the generally recommended 4:2:1 (FAI, 2007). In short, intensive use of inputs mainly irrigation water and chemical fertilizers, which was central to the green revolution, has created an ecological crisis in the some states. If remedial action is not taken, the ecological crisis is bound to worsen.

Contract Farming Initiatives to Address Agrarian and Ecological Crisis in Punjab

Concerns about the crisis in Indian agriculture and ecological problems were expressed way back in early 90s. Some state governments and the central government initiated reforms like involvement of the corporate sector in agriculture through contract farming for better access to inputs, extension services, and credit from agribusiness companies; diversification towards high-value agriculture, and assured markets. Contract farming is also supposed to eliminate and/or reduce market and price risks, which farmers face. However, it all depends on the nature of contracts, legislation for regulation of contract farming, enforcement, dispute resolution mechanisms, etc. Punjab is one of the states to introduce contract farming to promote diversification of agriculture, risk management, and address the larger issue of agrarian crisis. The Punjab Agro Foodgrains Corporation (a government parastatal) has been helping in diversifying agriculture through promotion of contract farming in the state. This was facilitated by the state government's incentives such as reduction and/or waiver of certain usually mandatory charges like market fee and rural development cess associated with procurement of agricultural commodities. Pepsico was the first company to start informal contract farming with basmati rice in 1998, followed by Hindustan Lever (HLL) in 2000. At present, several companies are involved in contract farming in the state. This paper is an attempt to understand the socio-economic implications of corporate-led initiatives in agriculture.

Methodology

The study was conducted in three districts of Punjab, Amritsar, Jalandhar and Ludhiana. Initially 150 farmers were selected through stratified random sampling but finally 127 farmers (87 contract farmers and 40 non-contract farmers) formed the sample since 23 households provide incomplete information on most of the parameters. Households were interviewed between May 2007 and October 2007.

Econometric Model

In this section we wish to explain determinants of participation in contract farming, and whether participation in contract farming scheme affects farm income. To explain these relationships, we have to account for unobserved factors that may affect both likelihood of participation and farm income. We do this by applying a two-stage Heckman model (1979) to produce statistically unbiased estimates of programme impacts. Two equations estimate the impacts of farmers' characteristics on decisions to participate in contract farming programme. We use this information to produce a statistically unbiased estimate of the impact of program participation on farm incomes. In the first stage a probit model, which is a choice model where the dependant variable is a binary variable (zero [0] or one [1] type of response) is used. This model is estimated using probit model to evaluate the determinants of farmers' participation in contract farming. The second stage model uses ordinary least squares (OLS) method for estimating the impact of contract farming on farm income. The first stage model is specified as:

$$Z_i = \alpha_0 + \alpha_1 \text{ AGE} + \alpha_2 \text{ EDUCATION} + \alpha_3 \text{ Farm Size} + \alpha_4 \text{ CREDIT} + \alpha_5 \text{ EXTENSION} + \alpha_6 \text{ MEMBERSHIP} + \alpha_7 \text{ OFF-FARM INCOME} + \varepsilon_i \quad (1)$$

Z_i is equal to 1 if the respondent is a contract farmer, 0 otherwise. Equation (1) is estimated using a bivariate probit model. After estimating equation (1), an inverse of the mills ratio (IMR) is computed for each observation and included as an independent variable in the second stage model.

The second stage model is:

$$Y_i = \beta_0 + \beta_1 \text{ AGE} + \beta_2 \text{ EDUCATION} + \beta_3 \text{ Farm Size} + \beta_4 \text{ CREDIT} + \beta_5 \text{ EXTENSION} + \beta_6 \text{ MEMBERSHIP} + \beta_7 \text{ OFF-FARM INCOME} + \beta_7 \text{ IMR} + u_{ij} \quad (2)$$

Farm income Y_{ij} is hypothesized to be affected by farmer's participation in contract farming and β_is are the estimation parameters. We estimate the model using OLS. Based on the theoretical framework and previous research, several hypotheses are formulated. Household heads who are younger are hypothesized to be more likely to participate in contract farming. Education is expected to have a positive effect on the likelihood of participation in contract farming and farm income. Households with more assets such as land are expected to be more likely to be part of contract farming initiatives. Those who have better access to institutional credit, extension services, off-farm income and are members of farmers' groups/cooperatives, etc. are more likely to participate in contract farming and have higher farm income.

Results and Discussion

The following discussion is focused on identifying and comparing factors that can be used to explain differences in participation in contract farming. Results for participants of contract farming are compared with non-participant farmers.

Socio-economic Characteristics of Sample Households

Table 1 shows demographic and socio-economic characteristics of sample households. Almost all households in the sample were male-headed with an average family size of six members per household under contract farming and nine members in the case of non-contract households. Contract farming farmers were more educated, had larger farm size, and were young compared to non-participants. Crop farming is a main occupation for almost all contract and non-contract farmers. Dairy farming is a subsidiary occupation for more than 80 per cent of households.

The average size of operational holdings was higher (10.3 hectares) in the case of contract farmers than non-contract farmers (4.8 hectares). Tenancy is allowed in the state, therefore, leasing of land is quite common. The average area under lease is higher in case of the contract farmers than non-contract farmers. Area under lease has increased from 2.3 hectares in 2002 to 4.3 hectares in 2007 in the case of contract farmers; while the corresponding figures for non-contract farmers are 1.4 and 2.2 hectares. Largely medium and large farmers lease-in land to increase their operational holding to enter into contract farming, since most companies prefer large landholdings. Fixed rent and payment in cash are dominant practices. The average cropping intensity is marginally higher in the case of contract farmers than non-contract farmers.

Cropping Pattern

Farmers grow a variety of crops in the study area but rice (basmati and non-basmati) is the main crop occupying 41 per cent of the gross cropped area during summer and wheat (34.9%) in winter, accounting for over three-quarters of the cropped area. Area under basmati rice has increased between 2002 and 2007, whereas, area under non-basmati rice has declined during the same period.
The cropping pattern of non-contract farms is also dominated by rice (36 per cent) in summer and wheat (42 per cent) in winter season. It is interesting to note that area under basmati rice is significantly higher (23 per cent) in the case of contract framers than non-contract farmers (8%). In contrast, area under non-basmati rice is higher (28%) in non-contract farmers compared to contract farmers. It is evident that there is shift in area from water-intensive non-basmati rice to less water intensive basmati rice by both contract and non-contract farmers. However, this shift is more pronounced in the case of contract farmers than non-contract framers.

These results clearly show the impact of government efforts to shift area from water-intensive non-basmati rice to less water intensive basmati.

Table 1. Socio-economic Characteristics of Contract and Non-contract Farmers\

	Contract farmers	Non-Contract farmers
Age of household head (Years)	38	43
	(8.10)	(9.23)
Education (Years of schooling)	10	7
	(2.86)	(3.85)
Family Size	6	9
	(1.24)	(0.99)
Main occupation		
Agriculture	94	100
Subsidiary		
Dairy	80	87
Others	20	13
Farm size (ha)	10.3	4.8
	(8.40)	(3.38)
Leased-in-land (ha)	4.3	2.2
	(3.82)	(3.79)
Area under rice + wheat (% to total cropped area)	76	78
	(11.32)	(14.36)

Figures in parentheses show standard deviations

Impacts of Contract Farming on Crop Productivity

Contract farming has been used to promote new high-value crops, which are more input intensive, risky, and market dependent for profitability, to lower costs either by yield improvement or cutting input costs through better quality inputs and services, and to raise returns by value addition to primary produce. In order to examine impact of contract farming on yields, we compared productivity levels of major crops such as rice (basmati and non-basmati) and wheat between 2002 and 2007 on contract farms as well as between contract and non-contract households in 2007.

Per hectare productivity of basmati rice under contract farming showed an increase of about 19 per cent (3.8 tonnes in 2007 against 3.2 tonnes in 2002), followed by non-basmati rice (10 per cent increase). Wheat productivity declined from 4.5 tonnes per ha in 2002 to 4.2 tonnes in 2007, which is consistent with state level productivity trends (Figure 10). Because of improvement in crop productivity, area under basmati increased over the years.

A comparison of productivity levels between contract and non-contract farmers shows that the average yield of rice (basmati and non-basmati) is higher in the case of contract farmers (Figure 11). Basmati rice yield is about 23 per cent higher in the case of contract farmers than non-contract farmers. Important reasons for higher yield include better quality seeds, appropriate crop management practices introduced by sponsors, and close monitoring of the crop at all stages. The average cost of production is higher on contract farms than non-contract farms but increased costs are compensated by higher yields. Net income per hectare is higher on contract farms than non-contract farms (Sharma, 2007).

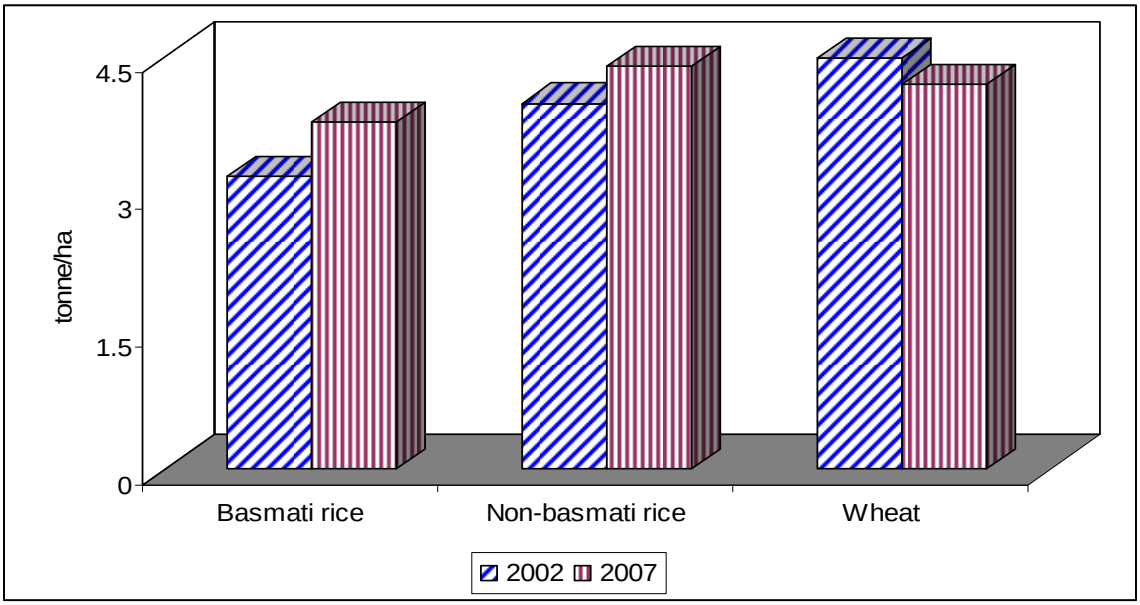


Figure 10. Trends in per hectare Productivity of Rice and Wheat on Contract Farms

Perceived Benefits of and Constraints in Contract Farming

Selected households were asked to list reasons for adopting contract farming and the results are presented in Table 2. Although producers participate in contract farming for many reasons, access to assured market was the most opted reason with 76 per cent respondents. Assured price was another reason for adopting contract farming in the case of about two-thirds of the respondents. This shows that farmers prefer assured market to assured price. Some companies offer a floor/minimum price in the agreement and final price is decided based on market conditions, while in some cases companies announce a pre-decided price. However, under both conditions, farmer is free to sell in the market if market price is higher than sponsor price. Some estimates indicate that more than half of farmers honour the agreement and sell to the company. Other reasons for contract farming include higher returns compared with competing crops, less water requirement of basmati rice, inspiration from fellow farmers who had adopted contract farming, and

personal relations with the company. Access to better seed and extension services are also reasons for participation in contract farming.

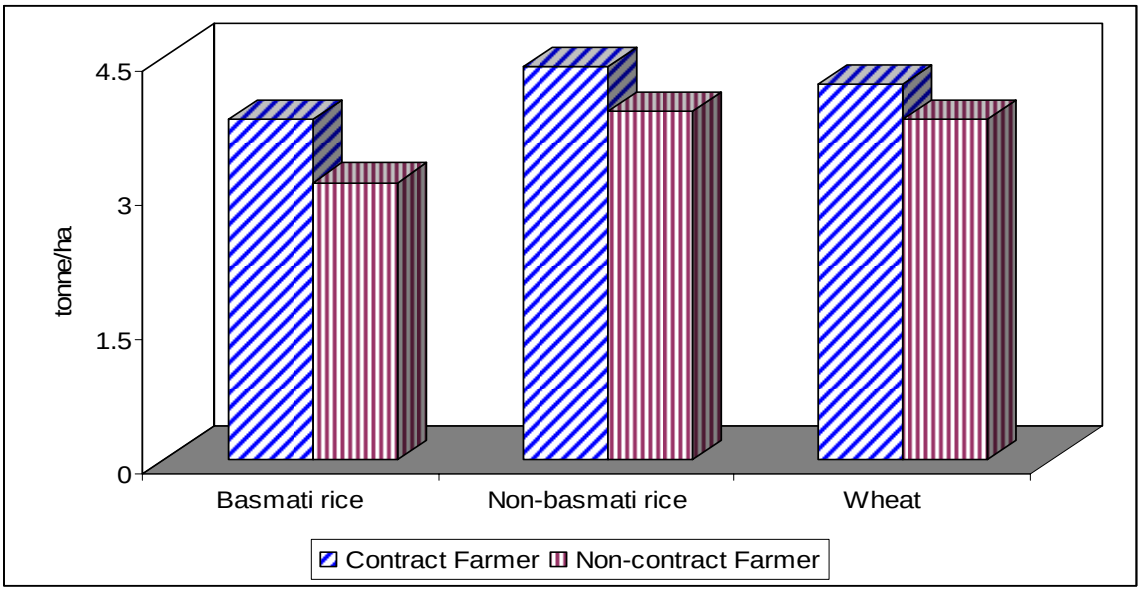


Figure 11. Productivity of Rice and Wheat on Contract and Non-Contract Farms

It is also important to understand the downside to contract farming. Some farmers have discontinued contract farming or changed the company. Majority of farmers identified stringent quality control provisions by the company to be the most problematic since they were accustomed to quality checks by private traders and/or Food Corporation of India (government parastatal), whose quality standards were not very stringent. Most companies engaged in contract farming are export-oriented, therefore, emphasize on quality. The rejection rate was quite high in some cases and that was one of the reasons for discontinuing contract farming. Some companies paid a marginally lower price than market price because they provided better extension services, seeds, and other inputs, which improved farm productivity, thereby enabling the farmer get higher net income. However, the farmers could not appreciate the increase in net income owing to better quality seeds, and better extension services; they were driven more by price and discontinued contract farming. Some farmers reported other reasons such as distance of sales/delivery point from farm and delay in payments for discontinuing contract farming. However, failure to meet quality standards turned out to be the most important reason for discontinuing contract farming. Therefore, farmers should be trained to improve agricultural practices to improve standards and thus, meet buyers' expectations.

Non-contracting farmers cited small size of holding to be the major constraint to enter into contract farming because companies prefer large farmers. In some cases market prices were marginally higher or at par with contract prices, so farmers did not find it beneficial to enter into contract farming. Public good nature of extension services/knowledge was also mentioned as one of the reasons for not adopting contract farming. Other reasons were reluctance on the part of farmers to share information about land with private companies, uncertainty about company policies and lack of provision of credit by agribusiness companies.

Table 2. Perceived Benefits of Contract Farming as Reported by Respondents

Reasons	Percent of respondents
Access to assured market	76
Assured price	67
Access to better seed	50
Access to better extension services	42
Less water requirement	26
Higher returns than competing crops	18
Inspired by other contract farmers	15
Less incidence of crop diseases	10
Personal relations	8

Factors influencing Farmers' Participation in Contract Farming: Probit Analysis

The results of probit analysis were obtained to examine the probability of participation in contract farming and provide the inverse mill's ratio for the second stage analysis (Table 3). As hypothesized, farm size, human capital, and credit constraints were related to the likelihood of being a participant in contract farming. The positive and significant coefficient of farm size indicates positive influence on participation in contract farming. Small farmers are highly risk averse because of limited holdings, moreover, firms are also not interested in having contracts with small farmers because of high transaction costs. The positively significant coefficient of credit implies that availability of institutional credit encourages farmers to participate in contract farming as they are less dependent on informal sources, mainly money lenders, for credit requirements. Small farmers are forced to sell their produce to traders who finance credit requirements. Age and age squared were tried to measure a possible curvilinear effect on participation in contract farming but did not change the results so age variable was included in the final analysis. The coefficient of age was negatively significant, which implies that older the farmers, lesser the probability of participation in contract farming. It means that risk aversion increases with increase in age and experience.

The coefficient of years of schooling was positively significant, which implies that participation in contract farming goes up with increase in years of schooling. The coefficient of education was expected to decrease risk aversion behaviour and

increase participation in contract farming. The coefficient of off-farm income was found positively significant, which implies that it widens the possibility of participation in new models/innovations by mitigating the shortage of capital. Households without off-farm income are likely to be highly risk averse. The coefficient of extension service by public agencies was found to be non-significant, which implies that public extension system is not very effective. Membership in farmers' group/association /cooperatives significantly determines participation in contract farming. Membership is positively related to participation; if a farmer is a member of farmers' group/association/cooperatives, he/she is likely to participate in contract farming. It is also known that collective action enables small farmers to attain better bargaining power, economies of scale and reduce transaction costs.

Table 3. Probit Estimation of Factors affecting Participation in Contract Farming and Farm Income

Explanatory variables	Parameter estimates			
	1st Stage: Participation@		*2nd Stage: Farm Income*	
	Coefficient	*Std. Error*	*Coefficient*	*Std. Error*
Constant	0.0759	0.8531	7234.96	1456.65
Age of the farmer (years)	-0.0512***	0.0198	11.21	33.98
Education of the farmer (years of schooling)	0.1273**	0.0562	427.35***	89.15
Farm Size (ha)	0.0743*	0.0452	35.08	46.43
Access to institutional credit (1 = yes; 0 = No)	0.5412*	0.3075	1653.45**	646.95
Access to extension services (1 = yes; 0 = No)	0.1036	0.0519	1147.91*	695.98
Membership to an organization (1 = yes; 0 = No)	0.8090***	0.3048	-563.30	603.52
Source of off-farm income (1 = yes; 0 = No)	0.7708*	0.4086	501.35	620.92
Lambda (Inverse Mills Ratio)	-	-	109.67**	41.59
Number of observations	127	-	-	-
Chi^2	55.20	-	-	-
Probability > Chi^2	0.0000	-	-	-
F (8, 118)	-	-	8.85	-
Probability > F	-	-	0.0000	-
Log pseudo-likelihood	-51.52	-	-	-
R^2	-	-	0.38	-

@ Probit equation for participation in contract farming, 1 if participant, 0 otherwise
*** Significant at 1 per cent level; ** significant at 5 per cent level; * significant at 10 per cent level of significance.

Impact of Participation in Contract Farming on Farm Income

Table 3 also provides second-stage impact results using gross farm income as the dependent variable. Ideally, our dependent variable should be net income. Unfortunately, accurate data on the value of some of inputs are difficult to obtain. This is particularly true for inputs for which markets are not well developed. Therefore, we have use gross income per hectare per household as the dependent variable in the second stage of regression.

The second stage is corrected for sample selection bias. The inverse mill's ratio, lambda, corrects the error terms in the impact equations to achieve consistent and unbiased estimates. Lambda is the expected value of the residuals that are truncated at the second stage OLS. The coefficient estimates in the second stage are used to determine whether and how household characteristics, farm size, and other factors affect farm income.

The second stage results support two conclusions. First, the Heckman selection model used in this study is systematically related to the variables, showing a statistically significant coefficient. Second, many of the variables are statistically significant with coefficient signs consistent with expectations. However, the factors that are statistically significant are not the same as those in the first stage suggesting that there are differences in the determinants of being contract farmers and farm income.

The results indicate that education has a statistically significant and positive impact on farm income, which supports our hypothesis. Contract farming firms demand minimum quality standards from producers while traditional channels are not so strict about quality issues. Educated producers are more capable of meeting these standards. Farmers with better access to institutional credit and better extension services are likely to have higher income.

Concluding Observations

Agriculture is and will remain the mainstay for a large part of the rural population in India in the coming years. Promoting more rapid and broad-based agricultural growth, particularly achieving 4 per cent agricultural growth not only in the eleventh plan but for medium to longer term, will be extremely important not only for achieving higher economic growth but also for alleviating poverty in rural areas. Most farmers are small and marginal, who have poor linkages with markets and who have low risk-bearing capacity restricting their participation in fast changing dynamic markets. Corporate agriculture, especially through contract farming, is being promoted by central as well as state governments as a part of the strategy to solve some of these problems. Contract farming is expected to enable farmers to

access better quality inputs such as seeds, fertilizers, pesticides, extension services, and credit from the corporate sector. Contract farming has also potential to eliminate and/or reduce market and price risks, which farmers face. However, it all depends on the nature of contracts, legislation for regulation of contract farming, enforcement, dispute resolution mechanisms, role of government, etc.

The conclusions from this study have wider significance in connection with the question of how successful approaches to contract farming can be developed. First, there is a need to assist farmers to have better education, access to timely and quality inputs such as extension services, institutional credit, and better opportunities of off-farm income to improve financial status. The results have shown that membership to farmers' organization was positively related to the likelihood of being a contract farmer. Thus, there is a need to promote non-political farmers' organizations to improve smallholders' bargaining power as well as reduce transaction costs to agribusiness companies.

Second, it is important to provide an integrated set of services including credit and not just extension services and seed as is being done. In order to provide these inputs and services, partnership between public and private sector companies is needed. Collaboration between public and private sectors for providing extension services can take place easily. Government should initiate amendments in legal and regulatory frameworks in input and output markets, land market policies, etc. to promote private sector participation in agriculture.

Finally, small farmers will be able to participate in the changing markets effectively and establish links with new market chains (supermarkets, agribusiness companies, processors, exporters, etc.) only if they have access to better infrastructure, inputs and services, and are better organized. Policy makers can support farmers through provision of required infrastructure and technology, timely information, extension services, enabling policy environment, and promoting public-private partnership through providing incentives.

Acknowledgements

The author wish to thank two anonymous reviewers and Managing Editor of the journal for their valuable comments.

The paper derives from the Regoverning Markets Programme to analyze growing concentration in the processing and retail sectors of national and regional agri-food systems and its impacts and implications for rural livelihoods and communities in middle and low income countries, which was coordinated by International Institute for Environment and Development (IIED), London. The author would like to thank IIED and other institutions/individuals who have helped during the study.

References

CSO (2008), National Accounts Statistics, various issues, New Delhi: Central Statistical Organization, Ministry of Statistics and Programme Implementation, Government of India.

Eaton, Charles and Andrew W. Shepherd (2001), Contract Framing: Partnerships for Growth, FAO Agricultural Services Bulletin 145, Rome: Food and Agricultural Organization (FAO) of the United Nations.

FAI (2007), Fertilizer Statistics 2006-07, New Delhi: Fertilizer Association of India, New Delhi.

Fan, Shenggan, Linxiu, Zhang and Xiaobo Zhang (2003), The Role of Public Investments, *Research Report No.125*. Washington, DC: International Food Policy Research Institute.

Fan, Shenggen, Peter Hazell, and Sukhadeo Thorat (1999), Linkages between government spending, Growth and Poverty in Rural India, *Research Report No.110*. Washington, DC: International Food Policy Research Institute.

Fan, Shenggen, Xiaobo Zhang, and Neetha Rao (2004), Public Expenditure, Growth and Poverty Reduction in Rural Uganda, Development Strategy and Governance Division Discussion Paper No.4. Washington, DC: International Food Policy Research Institute.

GoI (2001), Indian Planning Experience - A Statistical Profile, New Delhi: Planning Commission.

GoI (2006), Towards Faster and More Inclusive Growth: An Approach to the 11th Five Year Plan (2007-2012), New Delhi: Planning Commission.

GoI (2007), Agricultural Statistics at a Glance 2006, New Delhi: Directorate of Economics and Statistics, Ministry of Agriculture.

GoI (2008), Economic Survey 2007-08 and back issues, New Delhi: Economic Division, Ministry of Finance.

Heckman, J (1979), Sample Selection Bias as a Specification Error, *Econometrica,* 47(1), pp. 153-61.

Little, Peter D, and Michael J Watts (1994), Living under Contract - Contract Farming and Agrarian Transformation in Sub-Saharan Africa, Madison: University of Wisconsin Press, pp. 216-47.

Sharma, Vijay Paul (2007), "India's Agrarian Crisis and Smallholder Producers' Participation in New Farm Supply Chain Initiatives: A Case Study of Contract Farming", W.P. No.2007-08-01, Ahmedabad: Indian Institute of Management, Ahmedabad.

International Food and Agribusiness Management Review
Volume 11, Issue 4, 2008

Economic Value Added versus Traditional Performance Metrics in the Czech Food-Processing Sector

Gabriela Chmelíková [a]ⓘ

[a] *Assistant Professor, Department of Business Economics, Mendel University of Agriculture and Forestry Brno, Zemědělská 1, 613 00, Brno, Czech Republic.*

Abstract

The aim of this article is to investigate the relationship between Economic Value Added, traditional performance measures (Return on Assets 'ROA' and Return on Equity 'ROE') and their ability to measure the creation of shareholder wealth in food-processing firms in the Czech Republic. To assess the relationship, a simple regression test was used and the following hypothesis were tested:

- a strong positive linear relationship exists between EVA and the traditional performance measures of ROA and ROE and
- the EVA measure reflects changes in shareholder wealth more consistently than the traditional performance measures ROA and ROE.

The regression analysis results indicate in all cases a positive correspondence between EVA and financial performance metrics and show higher quality information content of EVA indicator as regards the ability to create shareholder wealth than the traditional performance measures.

Keywords: economic value added, traditional performance metrics, information content, food-processing sector

ⓘCorresponding author: Tel: + 420728552603
Email: chmelikova.gabriela@seznam.cz

Motivation and Research Goals

From the long-term perspective, each firm aims to maximize its value which consequently leads to growth in shareholder wealth. Managing a firm in accord with the principle of value maximization requires an operational criterion for growth in shareholder wealth. Thus, it is necessary to find a tool which enables planning, management, and control the firm's processes in accordance with this principle. In general, firms are managed on a combination of strategic and financial goals. Under strategic goals one usually undertakes, for example, the development of new technologies, the search for new market segments, or the development of market share. Financial goals (defined and monitored by financial measures) then enable the quantification of these strategic goals, and thus transfer them into measurable and controllable form. The creation of shareholder value can be measured by a range of financial performance measures.

For centuries, economist have reasoned that for a firm to create wealth it must earn more than its cost of debt and equity capital – in the microeconomic terminology, this principle is titled "creating the economic profit". A good financial performance measure should describe how well the firm has generated operating profits given the amount of capital invested to produce these profits. In recent years, the Stern Stewart & Company has operationalized this concept under the label Economic Value Added. Similar to many accounting innovations, the concept of EVA promises better performance measurements, incentive schemes, and equity valuation. The concept behind EVA is quite simple – maximize the spread between the return on capital used to generate profits and the costs of using that capital. Through its adoption, corporate executives hope that EVA will lead to increased efficiency in the allocation of all assets and hence increased shareholder wealth. In fact, Stern Stewart & Company has advocated that EVA can be used instead of earnings or cash from operations as a measure of performance. They have proclaimed "Eva is almost 50 % better than its closest accounting-based competitor in explaining changes in shareholder wealth" (Stewart, 1994), and "Forget EPS, ROE and ROI. Eva is what drives stock prices" (Stewart, 1995).

Since the authors came up with EVA, numerous researchers attempted to verify the effectiveness of EVA using independent empirical evidence (see Biddle, Bowen, and Wallace 1997; Turvey et al. 2000; Feltham et al. 2004; Bacidore et al. 1997; Berenstein 1998; Kramer and Pushner 1997). Among both the Czech academic researches and practical financial analysts, the use of EVA is still limited due to the lack of empirical evidence of the behaviour of EVA within the Czech economy. Agribusiness firms are no exception. This article evaluates EVA behaviour in the conditions of the Czech food-processing sector and attempts to develop independent empirical evidence on the indicator's qualities.

The research is presented in six sections. The first section of the article describes the motivation for this research and the aim of the study. The second section illustrates the food-processing sector in the Czech Republic and the performance measures – EVA, ROE and ROA as such. The third part of this article covers the hypothesis and statistical test performed to investigate the relationship between EVA and the traditional performance measures. The fourth describes the tests and the fifth presents the results. Finally, the last section offers concluding remarks and describes management implications.

Food-Processing Industry in the Czech Republic

Food processing is the fourth largest manufacturing sector in the Czech Republic, after the manufacture of metal, electrical products, and vehicles. Currently, there are estimated 1,070 food processing firms in the Czech Republic, generating nearly 130,000 jobs (the number of employees in the food-processing industry has decreased significantly in mid 90's following the restructuring of the industry). Although this represents only minor portion (3%) of all jobs in the Czech Republic (figure 1), the industry represents an important factor in local economic development by providing employment for relatively less skilled labour in the regions.

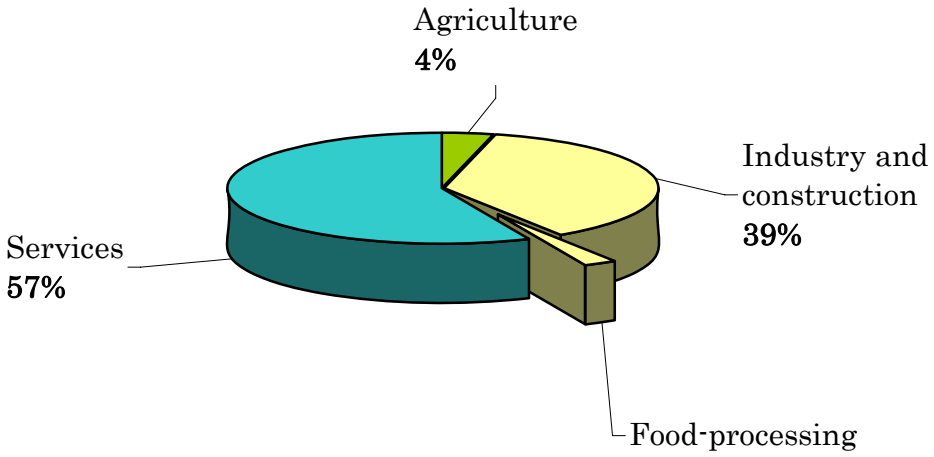


Figure 1: Employees in the Czech Economy by Sectors
Source: Czech Statistical Office and Ministry of Industry and Trade of the Czech Republic

The annual growth rate in food industry has fluctuated from –2% to 8% since the beginning of this century. In the last three years, growth has remained negative due to the large share of imports in domestic consumption. At present, the Czech food-processing industry generates USD15 billion in annual sales, of which 20 % is

exported. The sector satisfies a wide range of consumer needs which explains its extensive segmentation. Figure 2 shows the structure of food-processing sector in the Czech Republic, the extent of particular segments is expressed by the share on total revenues of the sector in 2006.

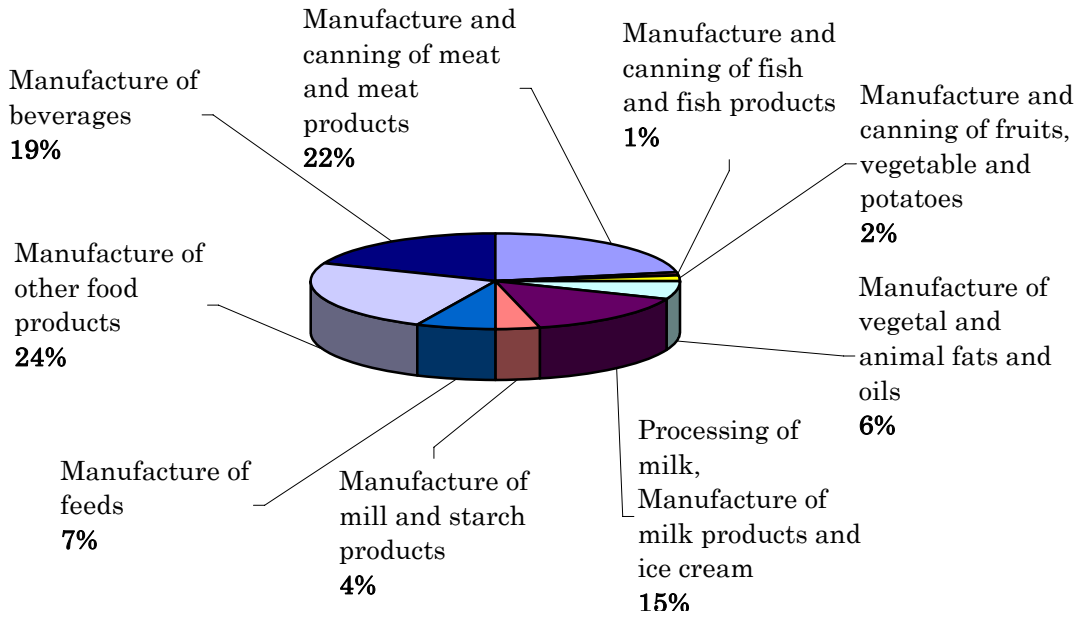


Figure 2: Structure of Food-Processing Sector in the Czech Republic
Source: Czech Statistical Office and Ministry of Industry and Trade of the Czech Republic

The segments in figure 2 represent core food industry activities. In addition to directly generating significant economic activity and employment in the Czech Republic, the food industry also has a multiplier effect which generates growth in related industries serving the sector. These include packaging, production of food industry equipment, biotechnology, agriculture, specialized storage and transportation, food science, and other support industries.

The food processing sector, I argue, provides an appropriate research setting to compare EVA and traditional performance measures. The relatively high marketing and advertising expenses in this sector could lead to significant divergence between performance measures. In addition, in Czech accounting system alternative forms of financing are not a part of the financial statements. This boosts the expectation of divergence, because traditional performance measures, unlike EVA, work entirely with accounting data.

Judged Performance Measures

The EVA Metric

EVA is defined as the spread between the return on capital invested and the cost of capital invested. It describes the ability of the firm to create the economic profit. Contrary to the traditional performance metrics, EVA reflects real costs of the firm since it includes equity costs in additional to the costs included in traditional performance measures. The EVA metric is based on a simple and straightforward notion, as described in the following equation from Maříková (2001):

$$1)\ EVA = NOPAT - Capital * WACC,$$

where NOPAT is Net Operating Profit After Taxes, Capital is Capital Employed to Generate Operating Profit, and WACC is Weighted Average Cost of Capital.

The EVA concept is based entirely on operating activity; thus, the components of EVA cannot be obtained directly from the financial statements. The EVA authors define operating activity as those operations that serve the basic entrepreneurial purpose. Therefore, it is necessary to convert the accounting data. Under Czech accounting rules, "operating profit" and the corresponding capital include activities that are not directly aimed at fulfilling the basic entrepreneurial purpose. Examples include the investment of temporary free operating financial asset into securities and creating constructions in progress; neither contributes to current operating activities. On the other hand, other activities necessary for meeting the basic entrepreneurial purpose of the firm are not included in operating profit and capital. Some important exclusions include financial and operative leasing, as well as capitalization and amortization of certain marketing costs, research and development costs, and unrecorded goodwill.

The EVA model works with three basic components - Capital, NOPAT and WACC which are, according to Maříková (2001), defined as follows:

Capital – the amount of capital employed corresponds to the amount of assets (in the EVA concept they are called Net Operating Assets 'NOA') which are used to generate the operating profit. The structure of these assets is once again determined by the fact that the EVA concept works entirely with items referring to operating activity - the total assets used in the calculation must be free of non-operating items while the operating items not included in the given account of total assets must be added.

To arrive to NOA start with total assets and subtract non-operating assets and decrease of assets value due to price differences. Further add long-term internally

generated intangible assets, add increase of assets value due to price differences and add leased assets. Table 1 provides detailed descriptions of the components of NOA.

Table 1: Components of Net Operating Assets (NOA)

Component	Effect	Explanation/Example
Fixed assets		
Non-operating fixed assets	-	e. g. long-term investments or construction in progress. The investments having portfolio character should be singled out of fixed assets as not being connected with the main business activity. Given that construction in progress does not generate current profits, it should be excluded.
Long-term internally generated intangible assets	+	Intangible assets such as expenditure on research, marketing, employees training, etc. create future value. These costs should be recognized as an investment and should be activated.
In(de)crease of assets value due to price differences	+ (-)	These arise as a consequence of difference in market and accounting prices and are usually less significant as regards current than fixed assets.
Leased assets	+	Leasing is a popular way of obtaining fixed assets in the Czech Republic. As the title to the asset is legally held by the lessor, it is not shown in the financial statements of the lessee under the Czech accounting standards. As a result, the value of leased assets should be added to NOA.
Current assets		
Non-operating current assets	-	Short-term financial assets can be separated into two groups. First, financial assets that are necessary for continuous firm operation – e.g. cash or money on bank accounts that are used during the firm operations and, second, financial assets that serve as a financial reserve – e.g. short-term securities, ownership interests or other short-term investments. The latter should be singled out as non-operating financial assets, because they do not serve to the basic entrepreneurial purpose.
In(de)crease of assets value due to price differences	+ (-)	These arise as a consequence of difference in market and accounting prices of stock and receivables as well.

NOPAT – The most important principle when converting accounting profit into NOPAT is maintaining the symmetry between NOA and NOPAT. If any operations influence NOA then the same operations have to be taken into account when determining NOPAT. The most suitable profit basis for the determination of NOPAT in Czech accounting is Profit from ordinary activities.

To arrive to NOPAT start with profit form ordinary activities before taxes and add interest expenses, add non-operating assets costs and original expenditure on internally generated intangible assets, subtract revenues from non-operating assets, subtract amortization of internally generated intangible assets and subtract tax. Table 2 provides detailed descriptions of the components of NOPAT.

Table 2: Components of Net Operating Profit after Tax (NOPAT)

Component	Effect	Explanation/Example
Profit from ordinary activities (before tax)		
Interest expenses	+	The costs of foreign capital must be included in profit, only to be subtracted later on together with equity costs within the WACC determination. The same applies to the interest from explicitly non-interest charging liabilities (trade payables, liabilities shareholders and alliance partners, payables to employees, payables to social security and health insurance…), as well as to the interest from leasing contracts.
Non-operating assets costs Revenues from non-operating assets	+ -	Revenues and costs connected with financial assets having portfolio and reserve character and revenues and costs of construction in progress.
Original expenditure on internally generated intangible assets Amortization of internally generated intangible assets	+ -	Correction of expenditures on research, marketing, employees training, etc.
Tax	-	Subtracting of tax estimation.

WACC – In the EVA model, the costs of capital determine the lowest acceptable rate of profitability for operating assets. They are usually determined by using traditional formula for Weighted Average Costs of Capital:

2) $WACC = c_e\ E/TC + c_d\ D/TC\ (1\text{-}TR)$,

where D/TC is debt to total capital, E/TC is equity to total capital, c_e is cost of equity[2], c_d is cost of debt and TR is tax rate.

Conventional Performance Measures

The approaches to measuring a firm's effectiveness have noticeably changed in the last several decades. Thanks to the growing informative efficiency of capital markets, there is an apparent drift from traditional measures established on accounting basis towards the tools following the shareholder value. Traditional accounting measures have been used since the middle 1980's and today represent the most often used performance tools in the Czech Republic. The popularity of these measures, as opposed to shareholder value orienting tools, is the result readily available information needed for their metrics. The traditional accounting measures include, for example, Earnings before Interests and Tax (EBIT), Earnings before Interests, Tax and Appreciation (EBITDA), Return on Capital Employed (ROCE), Return on Total Assets (ROA) or Return on Equity (ROE). The last two measures are the most commonly used profitability ratios among Czech financial analysts. They were also the subject of previous studies evaluating EVA; see Turvey et al. (2000), Krištof and Suchánek (2002).

Return on Total Assets (ROA) indicates the owners' profitability achieved by all the resources used in the business. Since the ratio shows the earning power of company as a whole, it was chosen for comparison with the EVA metric. Return on Equity (ROE) expresses the relationship between the shareholders' share of revenues and their previously contributed capital, including retained earnings. From the shareholders' point of view, ROE is the most important profitability ratio and therefore is suitable for comparison with EVA. Since these metrics aim to provide information content similar to EVA since they have been used in previous research, ROA and ROE were chosen for comparison with EVA in this paper.

---

[2] Usually Capital Asset Pricing Model (CAPM) is used for cost of equity estimation. This model determines the cost of equity capital by using the data from the capital market and efficiency of capital market is important here. Unfortunately, CAMP is not a suitable tool for the Czech Republic because of the immaturity of the local capital market. As an alternative tool build up models are used very oft. For example Neumaireová (2002) have developed a model for the Czech domestic environment. The model uses the following procedure for the calculation of the cost of equity:

$$c_e = r_f + r_{size} + r_{entrepreneurial} + r_{FinStab} + r_{FinStr}$$

where
r_f …risk-free rate,
r_{size} …function characterizing size of the company,
$r_{entrepreneurial}$ …function characterizing earning power,
$r_{FinStab}$ …function characterizing the relation between assets and liabilities,
r_{FinStr}…function characterizing capital structure.

The Relationship between EVA and Traditional Performance Measures

As mentioned above, in the last decade EVA has been the focus of intense research. While from the theoretical point of view EVA is seen as a superior performance metric, several empirical studies contradict this claim (see Biddle, Bowen, and Wallace (1997); Turvey et al. (2000)). One standard argument against the superiority of EVA results from the statistical relationship between EVA and traditional performance measures. This motivates the first aim of this article - to investigate the relationship between Economic Value Added and traditional performance measures ROA and ROE for food-processing firms in the Czech Republic and identify the differences in the information content of these performance concepts.

This paper assumes (with regard to the specifics of the Czech food processing sector) a difference in the information content of EVA and the traditional performance metrics. This expectation is motivated by two specifics of the Czech food-processing sector:

- Firms of the food-processing sector have specific position in the vertical chain of products as they are positioned on the semi-final position on the way to the customer. As a result, they incur high marketing and advertising costs which should, according to EVA theory, be recognized as an investments rather than expenses. Expenditure on research, marketing, employees training, etc. creates future value and should thus be capitalized.
- In recent years, alternative forms of financial sources, such as financial and operating leasing, has spread among the Czech firms. In contrast to International Financial Reporting Standards (IFRS) or U.S. Generally Accepted Accounting Principles (US GAAP), the alternative forms of financing are not a part of Czech financial statements and the traditional performance measures do not incorporate these figures into their metrics. The EVA metric does take these financial sources into account.

These two facts are essential for Czech food-processing firms and challenge the deduction of the first hypothesis investigated in this paper:

H_1: *A strong positive linear relationship exists between EVA and the traditional performance measures of ROA and ROE.*

The similarity of the measures as performance indicators can be tested with simple linear regression. A strong positive relationship indicates similar information content, and would suggest EVA is easily replaced by ROA or ROE. However, a weak relationship suggests different and potentially valuable information content exists in EVA.

Statistical Test for H_1

To examine the relationship between EVA and the traditional performance measures, the statistical significance of the following ordinary-least-squares regression will be examined:

$$3)\ EVA_i = a + b * X_i,$$

where EVA_i represents the dependent variable, a value of economic value added for given firms in a given time period; X_i stands for a value of traditional performance ROA and ROE metrics for the corresponding firms and the given time period of EVA_i; a and b are the values of regression coefficients.

The Relationship between Economic Value Added, Conventional Performance Measures, and Shareholder Wealth Creation

The second aim of this research is to independently attest whether following EVA leads to enhanced creation of shareholder wealth at Czech food-processing firms. The method of this attesting is similar to Turvey et al. (2000). The key question explored in Turvey's et al. article is whether EVA actually leads to improved share value, and whether increases in share value are more highly correlated with EVA than any other financial performance metrics. The obvious indicator for judging the improvements in shareholder wealth is the development of the stock price. As the quality of information offered by Czech capital market[3] in this respect is very low, one must first find a criterion for assessing the information content of performance measures suitable for conditions of Czech economy.

The discipline of business valuation deals with the problems of alternative expression of market value of the firm. By approximation of the market value of a firm, the present value of investors' expected returns can be calculated, which in turn characterizes the firm's ability to create shareholder wealth. This characteristic can be subsequently used as an objective criterion for assessing the performance measures in the ability to create shareholder wealth.

Methods dealing with business valuation are usually classified into three groups:

- methods based on analysis of revenues,
- methods based on analysis of information from capital market,
- methods based on analysis of firms property.

[3] Using stock price when making financial decisions requires efficiency of capital market. This prerequisite is not met even in many developed countries, and the possibility is much less in transitive economies like the Czech Republic with little developed capital market.

Considering the limited availability of trade market data for research of Czech food-processing sector, the first group of methods based on the analysis of revenues appears to be the most appropriate one. The basic method from this group, Discounted Cash Flows (DCF), exists in several variants. For the approximation of market value of equity, the method of Discounted Cash Flow to Equity (DCFE) is the most fitting. The DCFE method directly quantifies the value of equity on the basis of free cash flows for owners and hence expresses the ability of the firm to create the shareholder wealth.

The validity of equity valuation, like all of the valuation methods, is subject to discrepancies in the estimation of future returns. The estimation depends on the quality of the future revenues forecast, which requires analysis and prognosis of the relevant market as well as analysis of strengths and weaknesses of the firm. The subjective quantification of these categories subsequently results in limited accuracy of revenues forecast and contributes to discrepancies in the approximation of market value. This handicap is, however, largely overcome in the current setting. For the sample of food-processing firms used in the test, financial figures are available for the last 5 years. Because historical data is used, at least 5 years of "future values" are known rather than estimated, which is what helps overcome the valuation problem. As a result, the discrepancies in the approximation of market value are eliminated and the indicator offers objective criterion for the evaluation of judged performance measures.

The calculation of DCFE is usually performed in two phases. In the first phase the economist quite reliably forecasts the free cash flow to equity for each of the forecasted years. The length of the first phase must not be longer than time period in which the financial figures are easy predictable. Usually this phase is about 5 years long. The second phase then covers the period from the end of the first phase to the infinity where the value of the equity in this period is usually determined as the annuity of free cash flow in the last year of the first phase.
The length of the first phase in this research is determined by the accessibility of financial statements following the year when the assessed performance measures were calculated which is 5 years. The length of such time series corresponds to the common length of the first phase when making business valuation.

The market value of the equity MVE can be according to Mařík (2003) specified as:

$$4)\quad MVE = \sum_{t=1}^{5} FCFE_t \frac{1}{1+i} + \frac{CV}{(1+i)^T}$$

where I is discounting rate equals costs of equity, $FCFE$ is free cash flow to equity[4], CV is continuing value and T is duration of the first phase in years (in this case 5 years).

As mentioned above, the majority of the authors trying to tackle these questions examine the relationship between performance measure being assessed and stock market performance of the firm. Although limited data availability prohibits using this straightforward model in this case, an alternative objective criterion was developed above. Using this criterion, I will evaluate the EVA measure. The result is of critical importance to shareholders.

While formula 4 expresses absolute market value of equity, the economical content of quotient MVE/Equity reveals the firm ability to create value (market value of equity) from the initiate amount of investment (book value of equity).

Using this evaluation criterion the following hypothesis can be deducted:

H_2: *EVA measure reflects changes in shareholder wealth, which is determined by quotient MVE/Equity, more consistently than the traditional performance measures ROA and ROE*

Statistical Tests for H_2

To investigate the relationship between EVA, traditional performance measures and shareholder wealth the statistical significance of the following ordinary-least-squares regressions will be examined:

$$5)\ MVE/Equity_i = a + b * ROA_i$$

$$6)\ MVE/Equity_i = g + h * ROE_i$$

$$7)\ MVE/Equity_i = l + m * EVA_i$$

where ROA_i, ROE_i, EVA_i are the independent variables, measures of return on assets, return on equity and economic value added for given firms and time period; $MVE/Equity_i$ is the variable explained above and represents improvement in the shareholder wealth for the tested firms and time period; a, b, g, h, l and m are values of regression coefficients. The hypothesis will be tested at 95% statistical significance level.

[4] Operating profit is used as the basis of the Free Cash Flow to Equity.

Data

The information content of the performance measures is assed using a sample of food-processing companies in the Czech Republic. The data used for calculating the EVA metric were obtained from the project "The EVATM Ranking Czech Republic", which was a joint project of Stern Stewart & Co., Central European Capital CZ, s.r.o. and Čekia, a.s. The project ranked first 100 companies in the Czech Republic based on their ability to create economic value added.

The sources for calculating the traditional performance measures as well as for the approximation of the market value of equity[5] were the financial statements of evaluated companies, obtained in Obchodní věstník or directly from the companies. Obchodní věstník is a journal where financial statements of the firms that have publication obligation are made public (companies with/above the specified threshold of revenues, number of employees, total assets or legal form have the publication obligation). Where the financial statements were not publicly available, interviews were carried out.

The investigated sample included 18 food-processing firms[6] which appeared on the lists of 100 companies in the Czech Republic with the best ability to create economic value added, published since 2000. Since some of the companies appeared on the list more than once, 42 observations of the relationship between EVA, ROA, ROE and ability to create shareholder wealth were gathered for testing.

Empirical Results

The regression results in Table 1 indicate in both cases a general positive correspondence between EVA and both accounting performance metrics. The model is statistically significant at 95% level. However, the values of the coefficients of determination indicate that very little of the variation in EVA is explained by the traditional performance metrics. A strong positive linear relationship, which would indicate very similar information content in each measure, does not exist between EVA and the traditional performance measures of ROA and ROE. This fact give evidence against the tested hypothesis H1. According to this empirical evidence of food-processing companies in the Czech Republic, Economic Value Added is

[5] A critical point of the EVA's research in the conditions of Czech economy is a lack of good quality information from a capital market, which in the most of EVA studies serve as an exogenous criterion for assessing the ability of a firm to create shareholder wealth. In the absence of quality capital market information, a criterion for assessing the information content of performance measures suitable for conditions of Czech economy is developed in this paper.

[6] Bestfoods CZ, a.s.; Carla, s.r.o.; Cukrovary TTD, a.s.; Česká drožďárenská společnost, a.s.; Danone, a.s.; Jihočeská drůbež, a.s.; Karlovarské minerální vody, a.s.; Kofola, a.s.; Maso Planá, a.s.; Opavia-LU,a.s.; Pivovar Radegast, a.s.; Pivovar Velké Popovice, a.s.; Plzeňský prazdroj, a.s.; Povltavské mlékárny, a.s.; Sladovna Hodonice, a.s.; Stock Plzeň, a.s.; Vitana, a.s.; Wrigley, s.r.o.

positively correlated with the conventional performance measures. However, due to the low variation explained by the model it is not possible to replace the information content of EVA by the one of other performance metrics. From the theoretical point of view EVA is considered to be more complex performance metric; it reflects equity costs, capitalizes R&D and marketing expenses, includes leasing into company's balance sheet, etc. The results of this analysis serve to further the econometric investigation of EVA components which stand unexplained by the traditional performance measures. The difference in the marginal response between ROE and ROA would be due to the capital structure and financial leverage.

Table 1: OLS Regressions for Testing H_1

Independent variable	R^2	Coefficient b	F-statistic Limit	
ROA	0,44850	600233,6	*4,2*	22,77103
ROE	0,17188	214241,2	*4,2*	5,811525

The regression results in Table 2 go along with the tested hypothesis H2; they confirm the EVA measure is more associated with improved shareholder wealth (determined by quotient MVE/Equity) than traditional performance measures ROA and ROE. The model with the explaining variable EVA demonstrates unambiguously the highest value of the coefficient of determination R2 (almost 80%) and is statistically the most significant from all of the tested models. The coefficient m, representing the slope of the regression line, is statistically significant at required significance level 95%. The models with traditional performance measures ROA and ROE are statistically significant at 95% level. However, the values of the coefficients of determination indicate very low dependency of these measures on the improvements in shareholder wealth (in ROE model the coefficient of determination did not exceed 56%, in ROA model it is only 16,5%).

Table 2: OLS Regressions for testing H_2

Independent variable	R^2	Coefficients b, h, m	F-statistic Limit	
ROA	0,165	0,778	4,2	7,726
ROE	0,556	0,051	4,2	48,892
EVA	0,786	0,364	4,2	143,444

Empirical evidence from food-processing companies' performance in the Czech Republic indicates higher quality information content of EVA indicator with regard to the ability to create shareholder wealth when compared with the traditional performance measures. This finding is consistent with the conclusions of corporate finance theory, which views EVA as theoretically superior performance metric.

Conclusion

The aim of this paper was to assess the claims of EVA proponents on a small group of Czech food companies and define the implication for their managers. From a theoretical point of view, EVA represents a management tool that leads to the efficient use of operating and long- term assets, leads to efficient cost of capital and capital structure decisions, and compels management to focus on value. These are the facts readable from its formula. The question is whether this results in return to shareholders as well.

The analytical results provide some support for the use of EVA as a performance metric:

- With regard to the relationship between EVA and traditional performance metrics, it is empirically confirmed that strong positive linear relationship, which would indicate very similar information content in each measure, does not exist between EVA and the traditional performance measures of ROA and ROE. Subsequently, the traditional performance metrics are not able to sufficiently explain the observed values of EVA. This conclusion contradicts the result of Krištof (2002). Thus, it is not possible (assuming a theoretical superiority of EVA) to identify oneself with the recommendations of these authors – that it is not necessary to follow EVA because it can be easily replaced by traditional performance measures.
- With regard to the relationship between EVA and shareholder wealth creation, the results of regression analysis show higher quality information content of EVA indicator in relation to the ability of shareholder wealth creation than traditional performance measures. This result is consistent with that of proponents of EVA such as O'Byrne (1996) and contrary to the results of Biddle (1997) or Turvey et al. (2000).

Implications for Managers

The empirical analysis demonstrates that EVA, not accounting performance measures, is the basis of market value. The study has shown that EVA explains differences in market value better than ROE and ROA, which currently represent the most common performance measures in the Czech firms. The results suggest that EVA should be considered when measuring performance of Czech-food processing firms. This recommendation doesn't mean exclusive using of EVA and throwing out the other measures, considering especially the small sample size and single analysis. Nevertheless it was shown that EVA is better measure than ROE and ROA under certain circumstances (Czech food-processing firms in this case) and should be considered with examining valuation methods in this industry.

It can therefore be recommended that owners of food-processing firms in the Czech Republic should insist on using EVA metric in their firms when making financial decisions. This conclusion should not be seen as rejecting the traditional performance measures. The EVA metric cannot answer the call for a complex performance measure, which would under any circumstances lead to the maximization of shareholder wealth. However, the results of this research present important empirical argument, built on data from food-processing sector in the Czech Republic, for the discussion about EVA's position amongst the performance measures.

Acknowledgements

This paper has arisen in the framework of the projects: GAČR (Czech Science Foundation) no. 402/06/P206 "Research of possibilities and limits of EVA ratio in financial management of businesses from food-processing sector" and within the Research plan of FBE MUAF MSM 6215648904, thematic direction No. 4 „The development tendency of agribusiness, forming of segmented markets within commodity chains and food networks in the process of integration, globalization and changes of agrarian policy".

References

Bacidore, J.M., J.A. Boquist, T.T. Milbourn, and A.V. Thakor. 1997. The search for the best financial performance measure. *Financial Analysis Journal* 53(3): 11–20.

Biddle, G., R.M. Bowen, and J.W. Wallace. 1997. Does EVA beat earnings: Evidence on associations with stock returns and firm values. *Journal of Accounting and Economics* 24: 301-336.

Berenstein, R. 1998. *An analysis of EVA*. Merrill Lynch Quantitative Viewpoint.

Feltham, G.D., G.E. Isaac, C. Mbagwu, and G. Vaidyanathan. 2004. Perhaps EVA Does Beat Earnings – Revisiting Previous Evidence. *Journal of Applied Corporate Finance* 16(1): 83–88

Kramer, J.K., and G. Pushner. 1997. An empirical analysis of economic value added as a proxy for market value added. *Financial Practice and Education*, Spring/Summer: 41–49

Krištof, M., and P. Suchánek. 2002. Využití ukazatele EVA při analýze úspěšnosti průmyslových podniků. *Systémové řízení. Vyd. 1. Brno, Masarykova univerzita v Brně:* 463-476.

Maříková, P., and M. Mařík. 2001. *Moderní metody hodnocení výkonnosti a oceňování podniku*. Ekopress Praha.

Mařík, M. 2003. *Moderní metody hodnocení výkonnosti a oceňování podniku*. Ekopress Praha.

Neumaierová, I., and I. Neumaier. 2002. *Výkonnost a tržní hodnota firmy*. Grada Publishing. Praha.

O'Byrne, S.F. 1996. EVA and market value. *Journal of Applied Corporate Finance* 9: 25-116.

Stewart, S. 1994. EVA Roundtabel. *Journal of Applied Corporate Finance* 7: 46-70.

Stewart, S. 1995. Advertisment in Harvard Business Review, November-December: 20.

Walbert, L. 1994. The Stern Steward performance 1000: Using EVA to build market value. *Journal of Applied Corporate Finance* 6: 109-120

Turvey, C.G., L. Lake, E. Duren, and D. Sparling. 2000. The Relationship between Economic Value Added and the Stock Market Performance of Agribusiness Firms. *Agribusiness* 16 (4): 399-416

International Food and Agribusiness Management Review
Volume 11, Issue 4, 2008

Virtual Investment Concepts and the Ethanol Industry

John W. Siebert [a]ⓘ, Amy D. Hagerman [b] and John L. Park [c]

[a] *Professor, Department of Agricultural Economics, Texas A&M University, 2124 TAMU, Blocker Bldg., College Station, TX 77843-2124, USA.*
[b] *Graduate Student, Department of Agricultural Economics, Texas A&M University, 2124 TAMU, Blocker Bldg., College Station, TX 77843-2124, USA.*
[c] *Associate Professor, Department of Agricultural Economics, Texas A&M University, 2124 TAMU, Blocker Bldg., College Station, TX 77843-2124, USA.*

Abstract

The fast-growing US ethanol industry has historically been characterized by large downstream investments made by farmers. The authors assess the value which the stock market may hold for downstream investment by farmers as well as by ethanol manufacturers themselves. The model framework used herein expands on the original VEST framework developed by Siebert, Jones and Sporleder. A word of caution, the model herein is not intended to provide an on-going, risk-reducing business strategy. However, it can and does provide a quick method to calculate the reasonableness of a downstream investment request that a farmer (or any business person) might be challenged to consider. Although virtual stock market investments may certainly assist in value added performance, they (just like brick and mortar processing plants) can provide no guarantee of performance.

Keywords: cooperatives, corn, equities, ethanol, value added

ⓘCorresponding author: Tel: + 1-979-845-4805
Email: j-siebert@tamu.edu
Other contact information: A. Hagerman: adhagerman@ag.tamu.edu; J. Park: jlpark@ag.tamu.edu

Introduction

In their 1997 *Agribusiness, an International Journal*[2] article entitled, "The VEST Model: An Alternative Approach to Value Added," Siebert, Jones and Sporleder began with a relatively simple observation. Namely, when farmers take a further step to process the crop they are producing, these farmers are entering a new and different industry. The authors went on to argue that, with only a little imagination, publicly traded stocks could be used to take such a step in a virtual fashion as opposed to a physical one.

It is interesting to apply the VEST Model to the growth of the U.S. ethanol industry, a growth which has occurred in part due to direct investment by farmers via both cooperatives and limited liability companies. When one asks why such direct investment took place rather than virtual stock market investments, a number of possible reasons surface. These would include the following. First, the presence of state and local government subsidies to encourage new ethanol production as a means of needed local economic development. Second, few people within the US (outside of those in the rural Midwest) had sufficient familiarity with the ethanol industry to consider such investments. Third, until recently no pure-play, publicly-traded ethanol companies existed. No doubt many other reasons can also be suggested.

Today it is the case that several publicly traded firms have entered the ethanol industry and that recent capacity expansions have brought about new ethanol industry challenges. Within such a context we examine the applicability of the VEST model to this industry. We do so from both the perspective of a farmer considering integrating downstream (i.e., toward the consumer) into ethanol manufacturing as well as from the point of view of an ethanol plant manager regarding investment still farther downstream in the marketing chain. Although only exploratory, the contributions of this research pertain to both a better understanding of the farmer-investors' changed position in the marketing chain and also to what agribusiness managers might consider doing differently in regard to ethanol marketing and the stock market.

A word of caution, this model is not necessarily intended to provide an on-going, risk-reducing strategy. Instead it can be used to provide a timely look at the reasonableness of a downstream investment request that a farmer (or any business person) might be challenged to consider relative to their own pre-existing business. The Siebert, Jones and Sporleder model thus provides a timely yardstick. The examination of the model is likely to sharpen the business manager's (and

[2] *Agribusiness, an International Journal* was published under the auspices of IAMA prior to 1998. At that time, IAMA ceased publishing that journal and began publishing *the International Food and Agribusiness Management Review*.

downstream investor's) understanding at a time when they are being asked to make a large investment. We find herein that on a per bushel basis ethanol plant stock market valuations are much less that that of ethanol plant construction costs. This may, in and of itself, convey an important cautionary message to would be bricks and mortar investors. Although virtual stock market investments may certainly assist in on-going value added performance, they (just like brick and mortar plants) provide no guarantee of future performance.

The Vest Model

With the VEST Model, Siebert, Jones and Sporleder made that case that farmers might do well to consider investments in publicly-held companies as an alternative to direct investment in their own further processing operations. The *vest equation* was initially suggested so that interested farmers could calculate how much stock to purchase so as to virtually process their crop and hence capture the added value. This topic, of relating a crop's production to the value added processing of that crop, has most certainly been a motivation for farmers building ethanol plants. For example, to explain the motivation of a corn farmer who was also a member of the Mid Missouri Energy cooperative member, Reinhart, Weber and Shelman state, "when corn prices were high, he made money on corn. When corn prices were low, he was potentially able to offset this with higher profits from the sale of ethanol" (p.1). An investment in the right publicly held company could do the same thing. The VEST equation shows the stock investment, in dollars, needed to achieve this as,

$$1)\ VEST = MKTCAP\ (FS / COGS)$$

where, MKTCAP stands for market capitalization, or the value of all shares outstanding. This is calculated as a public firm's individual stock share price multiplied by its number of shares of stock. FS denotes farm sales measured as the annual total sales of the farmer seeking a value added investment. Last, COGS is the public firm's annual cost of goods sold. Conceptually, the ratio FS / COGS gives a farmer's own crop sales dollars as a percentage of the public firm's total raw product input purchases. When this ratio is multiplied by MKTCAP, the result is the investment in shares (VEST) a farmer would need to make in order to virtually account for the processing volume of his/her farm's crop. From another perspective, the ratio of MKTCAP / COGS can be termed the VEST *coefficient*. When the VEST coefficient is multiplied by any size farm sales (FS), the result again is VEST. Note that the VEST model is intended to do much more than simply size a stock market investment in downstream processing to a farmer's output. It finds a mid-point between integrating downstream by means of the farmer building and running his/her own processing plant (or doing so via a co-operative or LLC) versus remaining as an independent producer with no downstream integration. Siebert, Jones, and Sporleder discuss this matter when they present a table comparing nine

different characteristics of "farm raw commodities versus the finished product made from them" (p.562). VEST eliminates the classic marketing cooperative conflict between a member and his/her cooperative because the farmer now stands at arms length from any such relationship as far as the VEST investment goes.

Siebert, Jones and Sporleder calculated VEST coefficients for farmers in the red meat, poultry, and also grain sectors. They stated that such a manner of investing in value added enterprises offered the following advantages: "It does not require the hiring of new employees, the hiring of management, the purchase of facilities or equipment, the development of new products, the acquisition of new customers nor various other efforts. Apart from the stock price itself, it eliminates the costs associated with vertical integration. As a consequence the time required to manage a stock portfolio is much less than that needed to manage a bricks and mortar extension of the farm into value added or to participate in the governance of a cooperative" (p. 562-3). They admit to several limitations of VEST including an "insurmountable limitation" for farmers who produce a commodity which is not processed by any publicly traded investor owned firm (p.566). Of course, it must also be pointed out that when a farmer becomes his/her own customer, at least for the sales step from farmer to first handler, such a farmer gains substantially more control than is made available from a stock purchase.

The Case of the Farmer and the Ethanol Plant

One can compare the cost of constructing a new ethanol plant to the cost per bushel of investing in a publicly held ethanol firm. Exhibit 1 shows the *cost per bushel to construct* 23 different corn-based U.S. ethanol plants. These figures are from a wide variety of sources ranging from individual manufacturing plant's websites, to local newspapers, and more. The calculated average capital cost to build a plant (i.e., total capital outlay divided by annual bushel processing capacity) was $3.86/bu. This bricks and mortar investment figure of $3.86/bu. can be compared to the cost per bushel for a farmer to virtually invest in an ethanol plant via the VEST model. To do so, equation (1) can best be re-expressed on a simplified basis as,

$$2)\ VEST_e = MKT\ CAP / Bushel\ Capacity$$

where $VEST_e$ is the cost of the processing capacity for a bushel of corn to be converted into ethanol, MKT CAP is a publicly-traded ethanol company's total number of shares outstanding times the market price of those shares of stock, and Bushel Capacity is the ethanol processing company's annual total corn input volume.

The companies to which we can apply equation (2) are Aventine Renewable Energy (AVR), MGP Ingredients (MGPI), Pacific Ethanol (PIEX), and VeraSun Energy (VSE). All four of these companies have the vast majority, or the entirety, of their

assets devoted to ethanol processing. Exhibit 2 calculates $VEST_e$ over an eighteen month period dating back to July 2006. This is as far as one can go back as stock in both VeraSun and Pacific Ethanol only began trading in June 2006. $VEST_e$ ranges from a high of \$2.11/bu. in July 2006 to a recent low of \$0.73/bu. in December 2007.

Exhibit 1: Construction Cost per bushel for a Sample of Ethanol Plants [a]

Plant Name	Location	as of	Annual Capacity	Annual Capacity	Cost	Cost
			(Mil.Gal.)	*(Mil.Bu.)*	*(Mil. $)*	*($/Bu.)*
ACE Ethanol, LLC	WI	2004	41.0	15.0	$ 50.0	$ 3.33
Badger State Ethanol	WI	2002	47.0	14.8	$ 54.0	$ 3.65
Central Illinois Energy Coop	IL	2003	38.0	11.3	$ 90.0	$ 7.96
Commonwealth Agri-Energy LLC	KY	2004	20.0	8.0	$ 33.0	$ 4.13
Cornhusker Energy Lexington, LLC	NE	2004	40.0	15.0	$ 50.0	$ 3.33
Golden Grain Energy, LLC	IA	2003	40.0	15.0	$60.6	$4.04
Great Plains Ethanol, LLC	SD	2003	40.0	15.0	$52.0	$3.47
Husker Ag LLC	NE	2003	24.0	8.8	$29.4	$3.36
Iowa Ethanol, LLC	IA	2004	45.0	16.0	$60.0	$3.75
KAAPA Ethanol LLC	NE	2004	40.0	16.0	$53.0	$3.31
Lincolnland Agri-Energy	IL	2003	40.0	16.0	57.0	3.56
Little Sioux Corn Processors, LP	IA	2003	40.0	15.0	$52.0	$3.47
Mid Missouri Energy, LLC	MO	2004	40.0	15.0	$60.0	$4.00
Midwest Grain Processors	IA	2002	45.0	17.0	$57.0	$3.35
Northern Lights Ethanol, LLC	SD	2002	40.0	15.0	$50.0	$3.33
Otter Creek Ethanol, LLC	IA	2005	45.0	16.0	$60.0	$3.75
Pine Lake Corn Processors, LLC	IA	2005	22.0	7.0	$35.0	$5.00
Platte Valley Fuel Ethanol, LLC	NE	2003	40.0	15.0	$60.0	$4.00
Quad County Corn Processors	IA	2002	18.0	7.8	$20.0	$2.56
Sioux River Ethanol, LLC	SD	2005	45.0	15.5	$60.0	$3.87
Tall Corn Ethanol	IA	2003	40.0	15.0	$55.0	$3.67
United Wisconsin Grain Producers, LLC	WI	2005	40.0	15.0	$59.3	$3.96
Western Plains Energy, LLC	KS	2004	30.0	10.7	$41.1	$3.84
Averages			37.4	13.7	$ 52.1	$3.86

[a] Sample taken from various internet sources and other sources on January 25 and 26, 2007. A more detailed version of this table, with all web addresses and sources, is available from the authors upon request.

Exhibit 2: Weighted Average Estimated Market Capitalization per Bushel for Four Publicly Held Ethanol Manufacturers[a]

Date	Market Capital[b]	Market Capital per Bu.[c]	Change vs. Previous Month	Cumulative Change
	($000)	*($/Bu.)*	*(%)*	*(%)*
July '06	$5,518,903	$2.11		
Aug.	$4,670,160	$1.78	-15.64%	
Sept.	$4,444,078	$1.70	-4.49%	
Oct.	$3,271,866	$1.25	-26.47%	
Nov.	$3,552,117	$1.36	8.80%	
Dec.	$4,493,278	$1.72	26.47%	
Jan. '07	$3,821,893	$1.46	-15.12%	
Feb.	$3,378,992	$1.29	-11.64%	
Mar.	$3,207,555	$1.23	-4.65%	
Apr.	$3,600,249	$1.38	12.20%	
May	$3,531,162	$1.35	-2.17%	
June	$3,006,581	$1.15	-14.81%	
July	$2,888,817	$1.10	-4.35%	
Aug.	$2,817,211	$1.08	-1.82%	
Sep	$2,511,830	$0.96	-11.11%	
Oct.	$2,000,015	$0.76	-20.83%	
Nov.	$2,107,178	$0.80	5.26%	
Dec.	$1,903,216	$0.73	-8.75%	-65.40%

[a] Ethanol manufacturing firms included are Aventine, MGP, Pacific Ethanol, and VeraSun. Production capacity is estimated at the 2007 level of 2,618 billion bushels per year.
[b] Calculated as the sum of each individual firm's (stock price x shares outstanding) across each of the four different publicly traded ethanol manufacturers. Price in this calculation is the market close on the first trading day of the month from Thompson Financial.
[c] This is $VEST_e$ of equation (2). Processing capacity estimated at these firms' aggregate 2007 level of 2,618 million bushels of corn per year. (This means the decline in the value of market capital per bushel shown is an understatement as companies' bushel processing capacity would have been smaller in the earlier year 2006.)

These figures are all considerably below $3.86/bu. which was the average cost of construction from Exhibit 1. This would indicate that the stock market values ethanol production capacity at less than those who are building (or have built) ethanol plants. This fact should be a cautionary message to bricks and mortar investors. When compared to a direct investment, the VEST approach offers a cheaper way for a farmer to invest in ethanol manufacturing capacity.[3] However, it

[3] It must also be noted that, over the eighteen months presented, exhibit 2 shows ethanol stock market capitalization (defined as stock price x shares outstanding) to have declined by a cumulative 65.40%. Thus an ethanol stock purchase and re-sale over this time would have constituted a significant financial loss to the investor.

is uncertain as to whether the stock market investors or the other non-stock market investors will be correct as to their relative degree of bullishness in their investment.

Earnings from Farming and Ethanol Manufacturing

When a farmer invests in the bricks and mortar of an ethanol plant, the variety of combined earning outcomes rendered are presented in Exhibit 3. Running across the top of this table two abstractedly-simple alternatives are presented for farming net income, namely below normal and above normal.[4] Similarly, down the left side of this chart two equally simple alternatives are presented for ethanol plant net income, again above normal and below normal.[5] The recent success of the ethanol industry has occurred in an environment much like that of box A which depicts below normal corn farming net income and above normal ethanol plant net income. In such a case an ethanol plant investment held great appeal to many Midwestern farmers. With the corn price increases beginning in the fall of 2006, it was evident that enough ethanol plants had been built to positively influence the price of corn. Farmers owning ethanol plants at this later time thus found themselves in a situation more similar to box B, namely that of off-farm income not being needed nearly as much, but plant ownership likely still helpful. For farmer-investors, this was a very attractive situation marked by both above normal net income on the farm as well as at the plant. Starting one year later, in the fall of 2007, it was evident that enough ethanol plants had been built that the situation became more equivalent to box C wherein farming net income remained above normal, but plant net income suffered. Ironically, box C depicts a case where non-plant-investing corn farmers could be better off than plant-investing corn farmers.

Farmer-investor concerns are reflected in a recent statement by Rick Tolman, the CEO of the National Corn Growers Association: "I try to remind members that this [an ethanol plant] is an investment, like other investments. You decide the time to get in and time to get out" (Lambrecht, p.1). Such caution marks a contrast to the ethanol plant investment enthusiasm which existed over the previous several years. This concern motivates the corn farming industry's on-going enthusiasm for ever higher reformulated gasoline requirements and raises once again the basic conflict explored over two decades ago by Chattin and Doering. At that time Chattin and

[4] Although it is very difficult to provide a precise definition of normal, the following can be said. Regarding farming, in a lengthy on-going farm records study, Norquist *et.al* calculate the 20 year average return on farm assets to be 9.25% in southwestern Minnesota. Regarding ethanol, ADM's 20 year average return to stockholders has been 26.3%. Admittedly, neither of these statistical series are entirely pure. ADM includes many types of grain handling businesses while the southwestern Minnesota series includes 59% crop farms and an additional 14% which receive some income from cash crops. On the positive side, both these series are actual historical information as opposed to being mere simulations.

[5] See footnote 4 for a definition of "normal."

Exhibit 3: The Relative Need for Ethanol as an Off-Farm Income Source as Determined by the Four Possible Combinations of Corn Farming Net Income and Ethanol Plant Net Income

	If Corn Farming Net Income Below Normal:	*If Corn Farming Net Income Above Normal:*
If Ethanol Plant Financial Performance Above Normal:	A. Off-farm Income Needed, Plant Ownership Helpful	B. Off-farm Income Not Needed, Plant Ownership Helpful
If Ethanol Plant Financial Performance Below Normal:	D. Off-farm Income Needed, Plant Ownership Harmful	C. Off-farm Income Not Needed, Plant Ownership Harmful

Doering discussed the fact that corn growers advocated ethanol for its corn price enhancing potential (a pseudo farm policy) whereas renewable energy advocates preferred low corn prices as it would reduce ethanol manufacturers' cost of goods (i.e., corn price).

In all of the above discussed combinations of exhibit 3, either farming or ethanol manufacturing, or both operate in the investor-farmer's favor. Only box D depicts the simultaneous occurrence of below normal corn farming net income and below normal ethanol plant net income. Corn farmers have yet to confront this eventuality. However, other heavy corn using industries such as feedlots, swine producers, sweetener manufacturers, and feed mills have, from time to time, all experienced losses due to excess capacity. There is no reason to believe that the ethanol industry will be immune. In the situation of box D, a farmer-investor might well find a publicly traded ethanol stock to have been a preferable investment *vis-à-vis* an ethanol plant, as public stock shares have greater liquidity.

A Corn Farmer's Cost

Using the virtual approach, how much would a farmer have to spend in order to own the processing capacity used to make ethanol out of his/her crop? Exhibit 4 shows that in the 2005-6 marketing year, the average corn grower in Iowa is estimated to have grown 40,952 bushels worth a total value of $75,761. Were a farmer of this size to participate in building an ethanol plant in order to accommodate all his/her corn production, then the cost might be approximated as $3.86/bushel in capital (from exhibit 1) multiplied by the 40,952 bushels of corn production giving a total of $158,075. When compared to this farmer's 2005-6 corn sales of $75,761, such is a very large figure. On the other hand, making this investment on a virtual basis would have only cost approximately $0.73/bu.in December 2007 (exhibit 2) times the 40,952 bushels of corn production or $29,895. Alternatively, in July 2006, it would have cost as high as $2.11/bu. for a total of $86,409. Thus one can see that the virtual investment is the least cost approach. Of course, the wisdom of any ethanol investment is uncertain at this time. One

important reason for this is so many plants are currently under construction. In December of 2007 the Renewable Fuels Association (RFA) shows sixty-six new plants under construction. Ethanol company stock prices reflect this uncertainty as they show a stock price decline of 65% in only one and one-half years (exhibit 2).[6]

Exhibit 4: Iowa Corn Production, Value of Production, Number of Farmers, and Associated Averages for Marketing Years 2002-3 to 2005-6.

	2002-3	2003-4	2004-5	2005-6
Iowa Corn Production (000 bu.)[a]	1,931,550	1,868,300	2,244,400	2,162,500
Value of Iowa Corn Production ($000)[a]	$4,288,041	$4,427,871	$4,466,356	$4,000,625
No. of Iowa Corn Farmers[b]	52,806	52,806	52,806	52,806
Averages per Iowa Corn Farmer:				
Dollars	$81,204	$83,852	$84,580	$75,761
Corn Production (Bu.)	36,578	35,381	42,503	40,952

[a] USDA-NASS. *Agricultural Statistics*, various years.
[b] USDA. *Census of Agriculture.* 2002.

Ethanol Plant Downstream Investment - Marketing

The VEST model was originally conceived as a theoretical means by which farmers could integrate farther downstream in their marketing chain, in effect adding value to the raw commodity they grow. Accordingly, the model sprang from the size of a farmer's annual crop production and used that as a means to calibrate the cost of purchasing stock in publicly held firms so as to virtually process farm output. In like fashion, one can apply the VEST model to the farther downstream integration of an ethanol plant.

Most ethanol is used by automobile fuel blenders to make either E-15 (a fifteen percent ethanol/gasoline product) or, less commonly, E-85 (an eighty five percent ethanol/gasoline product). Accordingly, when applying the VEST model here, the ideal company to invest in would be one whose assets were focused on the blending, marketing, and retailing of gasoline. As such the largest five US oil companies, Exxon, Chevron, Conoco-Phillips, Shell, and BP, would not be ideal candidates because much of their capital structure is devoted to oil exploration, recovery, and transportation.

[6] Another key reason for uncertainty regards the need to continue the blender's credit of $0.52 per gallon of ethanol used in motor fuels. This will be an on-going political effort, and an uncertainty, facing many involved in the ethanol industry.

Exhibit 5 presents a December 2006 calculation of VEST coefficients for eight US oil companies potentially more suitable to the case at hand. These have a business emphasis on the downstream activities of refining, blending, delivery, and retailing. Valero is largest with market capitalization of $36.6 billion while Delek US Holdings is smallest with market capitalization of $1.1 billion. The VEST coefficients for these eight companies range from a high of 1.07 in the case of Frontier Oil to a low of 0.26 in the case of Sunoco. Exact reasons for variation are unknown as each company has a somewhat unique business model and each is also evaluated differently by stock market investors. When a weighted average is taken amongst these eight companies, the vest coefficient is 0.43. In other words, when taken as a group, these eight oil marketing companies have a stock market evaluation equal to 43% of their cost of goods for processing and subsequent resale.

Exhibit 5: VEST Coefficients for Selected Oil Companies with a Downstream Emphasis [a]

Company Name	Ticker Symbol	Market Capitalization	Cost of Goods Sold	Vest Coefficient[b]
		($000)	*($000)*	
Alon USA Energy	ALJ	$1,366,320	$2,734,000	0.50
Delek US Holdings	DK	$1,112,480	$2,818,000	0.39
Frontier Oil	FTO	$4,406,000	$4,115,000	1.07
Holly Corp.	HOC	$2,875,670	$3,349,000	0.86
Sunoco	SUN	$8,507,050	$32,947,000	0.26
Tesoro	TSO	$6,557,280	$16,314,000	0.40
Valero Energy	VLO	$36,686,559	$81,267,000	0.45
Western Refining	WNR	$1,729,310	$3,653,000	0.47
Totals / Average		**$63,240,669**	**$147,197,000**	**0.43**

[a] Source: Thompson Financial for the fiscal years ending 12/31/06.
[b] vest coefficient = (market capitalization / cost of goods sold).

The product of this vest coefficient of 0.43 and an ethanol plant's annual sales determines the amount of stock needed to virtually account for the capital cost (and reap the benefit from) the downstream sale of ethanol. Ethanol plant sales, as shown in figure 1, averaged 37.4 million gallons. If multiplied by the Nebraska 2007 average ethanol price of $2.24/gal. (Jan. – Nov. basis) an ethanol plant's annual sales can be estimated at $83.8 million. Thus the virtual amount of stock an ethanol plant would need to purchase to reach VEST would be $36.0 million (that's .43 x $83.8 mil.). On a per bushel basis (using the 13.7 million bushel plant input average in exhibit 1) this investment equals $2.62/bu. Hence one can see that to receive such downstream earnings, substantial investment is required relative to the cost of an ethanol plant itself. (From exhibit 1, it can be seen that the ethanol plant itself is estimated to cost $3.86/bu.). With or without such a virtual

downstream investment, ethanol plant owners still need to search for the best possible way to sell their physical commodity.

Ethanol Plant Downstream Investment - Transportation

According to Denicoff, "in 2005, rail was the primary transportation mode for ethanol, shipping 60 percent of ethanol production" (p.6). Denicoff also notes, "concern about the adequacy of transportation infrastructure to efficiently ship ethanol and co-products" (p.7). If ethanol plant management wants to take some protection from this problem, an application of the VEST model could be made to rail transportation as follows. Namely,

$$3)\ VEST_r = EPHC \times (MKT\ CAP / TRR)$$

where $VEST_r$ is the dollar amount of railroad stock an ethanol manufacturer would need to purchase to be fully vested in the capital requirement of its rail shipping needs, EPHC is the annual rail hauling cost of the ethanol plant, MKT CAP stands for the market capitalization of the publicly-held railroad company which is shipping the plant's ethanol, and TRR is this railroad's total annual revenue.

Equation (3) can be quantified for 2006 as follows. The Burlington Northern Sante Fe railroad (stock symbol BNI) had a VEST coefficient (MKT CAP / TRR) of $2.94 million in MKT CAP divided by $14,985 in TRR or 0.20. An estimate of EPHC can be taken from Denicoff who reported that the single car rate to ship ethanol from the Midwest to west coast markets was $5,300 per car for a 29,400 gallon railcar. Our average plant from exhibit 1 produced 37.4 million gallons of ethanol per year. Thus 1,272 cars would be shipped annually for a total EPHC of $6,742,000. Multiplying this amount by the 0.20 VEST coefficient yields $VEST_r$ of $1,348,000. When $VEST_r$ is divided by corn input of 13,700,000 bushels (from exhibit 1), the per bushel cost of reaching VEST would be $0.10/bu. This then would be a per bushel approximation of the amount of BNI stock such an ethanol plant could choose to purchase so as to realize an investment return from general (not necessarily ethanol) shipping rents successfully captured by this railroad.

Conclusion

Many Midwestern corn farmers have already chosen to invest heavily in a bricks and mortar extension of their farms into ethanol manufacturing. We present the VEST model first as a means to understand what the stock market can tell us about these investments. We conclude that the stock market values ethanol companies at less than the cost to build their physical plant. This may be because the U.S. stock market is discounting the future success of all new public companies in the ethanol industry or simply because the present financial outlook for the industry is not a good one. We show that farmers investing in ethanol plants face a changed matrix

of outcome and risk. In the present environment of above normal farm earnings this may be tolerable. However, should it be the case that farm earnings retreat from their above normal levels while ethanol plant earnings are also at below normal levels, it is the case that stock market investments in ethanol can hold more appeal than direct investment due to the stock market's greater liquidity. Lastly, we suggest that ethanol plant owners themselves might consider using the VEST model to capture downstream returns from the ethanol they produce and/or to limit exposure to transportation expenses. Stock market investment to capture downstream marketing returns is very costly; almost equaling the cost of an ethanol plant itself. Taking protection from transportation cost problems associated with rents imposed by rail carriers is far less costly to do.

Siebert, Jones and Sporleder state, "VEST must be viewed not so much as an optimization strategy but instead as one dimension among many to be included in the farmer's evaluation of any new value added investment" (p. 566). Great uncertainty exists surrounding US ethanol plant profitability. Factors such as ethanol supply, the US government's ethanol blending credit of $0.52/gal., the supply of corn, the price of oil, and many other factors will determine the future profitability of this industry. Further, trends regarding many of these matters have been at least partially responsible for increases in world grain prices. As agribusiness managers at all levels in the food marketing chain continue to adapt to such price change, future research on the potential of virtual investment concepts is likely to have considerable merit.

References

Chattin, B. and O.C. Doering III. "An Alcohol Fuels Programme: Will it Solve Surplus Grain Production?" *Food Policy* (February 1984): 35-43.

Denicoff, M.R. Ethanol Transportation Backgrounder. USDA-AMS. September 2007. 29pp.

Lambrecht, Bill. "Big Guys Step In As Ethanol Hit a Wall." *St. Louis Post-Dispatch*. December 2, 2007.

Nebraska. Official Nebraska Government Website. Nebraska's Unleaded Gasoline and Ethanol Average Rack Prices. www.neo.ne.gov/statshtml/66.html (accessed on April 5, 2007).

Norrdquist, D.W., J.N. Kurtz, R. Holcomb, and G.J. Paulson. 2007 Annual Report of the Southwestern Minnesota Farm Business Management Association. Staff paper P08-2 Dept. of Applied Economics. University of Minnesota. March 2008. 87pp.

Reinhardt, F. J. Weber, and M. Shelman. *Mid-Missouri Energy 9-706-016.* Boston: Harvard Business School. July 2006.

Renewable Fuels Association. Ethanol Biorefinery Locations. (www.ethanolrfa.org, accessed on December 17, 2007).

Siebert, J.W., R. Jones and T.L. Sporleder. "The VEST Model: An Alternative Approach to Value Added." *Agribusiness: An International Journal* 13 (November – December 1997): 561-567.

Thompson Financial. Thompson ONE Banker.

USDA-NASS. *Agricultural Statistics.* nass.usda.gov/publications/ag-statistics/agr/06 (and various earlier years).

USDA. *Census of Agriculture*. 2002.

International Food and Agribusiness Management Review
Volume 11, Issue 4, 2008

Consumer Preferences and Trade-Offs for Locally Grown and Genetically Modified Apples: A Conjoint Analysis Approach

Nadezhda K. Novotorova [a] and Michael A. Mazzocco [b]Ⓘ

[a] *Assistant Professor, Department of Business Administration, Augustana College, 639 38th Street, Rock Island, IL, 61201, USA.*

[b] *Associate Professor, Department of Agricultural & ConsumerEconomics, University of Illinois at Urbana-Champaign, 326 Mumford Hall, 1301 W. Gregory Dr., Urbana, IL, 61801, USA.*

Abstract

Using conjoint analysis methodology, this study used an online survey to measure consumers' preferences for the apple attributes as place of production, method of production, and price. The results of the conjoint analysis indicate that consumers are willing to make trade offs between the studied attributes. Segment analysis indicates Place-oriented consumers may be willing to pay 60% to 70% premiums for locally grown apples. The high consumer preferences for locally grown products combined with environmental benefits transferred through genetic modification provide an opportunity for producers to capture and build their markets, especially within certain market segments.

Keywords: conjoint analysis, consumer preferences, GM, locally grown

Ⓘ Corresponding author: Tel: + 1-217-333-1816
Email: mmazzocc@illinois.edu
Other contact information: N. Novotorova: nadezhdanovotorova@augustana.edu

Introduction

Midwestern U.S. fruit production is increasingly characterized by two contrasting dimensions. There is growing interest in locally grown food, suggesting growing demand. However, climate conditions in the Midwestern U.S. often favor the support of pests and diseases (such as apple scab), which thrive on fruit, requiring costly and intensive management and chemical applications to combat these challenges. Recently the successful use of biotechnology has resulted in the development of new disease-resistant commercial apple varieties by isolating and cloning the apple scab-resistance genes and transferring them into commercially grown apples. Thus, the increasing production of apples with less pesticide application (up to 60% less) using apple-to-apple gene technology is a feasible approach for the Midwestern apple sector. However, growers need to understand consumer perception of GM apples that provide for both reduced pesticide application and local production.

The main objective of this study is to investigate consumer preferences for scab-resistant genetically modified (GM) apples that are locally grown and the trade-offs among these attributes. A secondary objective is to develop consumer segments reflecting these preferences. Market participants will then be better positioned to make decisions regarding technology adoption, market segmentation, and product positioning.

Previous studies have indicated that GM food products are more acceptable if they are produced with reduced use of pesticides (Richardson-Harman et al., 1998; Kaye-Blake et al., 2005; Laureiro and Bugbee, 2005). On the other hand, results of many consumer surveys indicate that consumers are willing to pay a premium for locally grown products (Brown, 2003; Schneider and Francis, 2005). This begs the question as to whether these two findings hold there if the two attributes, environmental benefit through genetic modification and local production, are combined. That is, if GM products are produced locally, would it increase the level of consumer acceptance of such products? As far as we know, none of the previous studies have investigated the benefits of genetic modification with respect to local production. This study is the first attempt to investigate consumers' preferences for a combination of two product attributes–place and method of production. The results will elucidate whether consumers make distinctions between locally grown and non-locally grown products, and conventionally produced versus genetically modified products with environmental benefits such as reduced use of pesticides. By stressing specific local product characteristics, small farms and orchards may find significant growth opportunities that are available through product differentiation. For the Midwestern apple sector as well as for other small and midsize farmers, it would be valuable to have a better understanding of consumer preferences and behavior toward locally grown agricultural products. The results would provide producers information that would aid in production and marketing decisions.

Previous Studies

Biotechnology claims to have a great potential for farmers and ultimately for consumers. However, consumer acceptance of this technology is still not well understood. According to Curtis et al. (2004), differences between consumer attitudes towards GM foods are significant worldwide. Studies of consumers' price response to GM foods have results ranging from price discounts of greater than 50% to price premiums of 38%. Some studies have shown that genetic modification has been found to be more acceptable by consumers when it provides specific benefits. The empirical study conducted by Hossain and Onyango (2004) on U.S. consumers' acceptance of GM foods suggests that American consumers are not decidedly opposed to food biotechnology if such foods provide additional nutritional benefits. Moreover, if GM foods offer significant benefits, these benefits can compensate for the perceived risks resulting in a positive attitude towards GM food (Frewer et al., 1999). Other studies have indicated that when specific benefits are provided, some U.S. consumers may actually be willing to pay premiums for GM foods (Lusk et al., 2002; Lusk, 2003). It has also been found that acceptance of GM products is greater if the gene introduced into a variety is derived from the same plant (Gamble and Gunson, 2002).

A few recent studies have used apples as a genetically modified experimental product. Taking into account that close to 100% of apples sold in New Zealand were sprayed with pesticides, Richardson-Harman et al. (1998) found lack of awareness of the use of pesticides on apples among New Zealand consumers. Thirty-six percent of their respondents indicated that they would like to see genetic engineering used to reduce pest damage of apples. A majority of their respondents also stated that they would eat an apple that had been genetically engineered to increase size, improve flavor, and reduce chemical residues. Kassardjian et al. (2005) evaluated consumer willingness to purchase GM apples using experimental auctions on 80 New Zealand consumers. The apples were introduced to consumers as resistant to pests, eliminating any need for any chemical sprays, and as GM apples with a gene coming from another apple. Results showed that a majority of participants were ready to pay a premium for these GM apples. However, generalizability of these results to Midwestern U.S consumers is not certain. Furthermore, the added attribute of "local" production and the trade offs among these attributes remains unknown.

Brown (2003) indicated that marketing local products should stress quality, freshness, and price competitiveness, and must appeal to environmentalists and consumers supporting family farms. It was reported that 16% of their study respondents would pay a 5% premium, and 5% of respondents would pay a 10% premium for local foods. Similarly, Schneider and Francis (2005) found that consumers were willing to pay a 10% price premium for locally grown foods.

Loureiro and Hine (2001) assessed consumer's willingness to pay for a labeled value-added potato that could be marketed as organic, GMO-free, or Colorado-Grown. They found that consumers were willing to pay a higher premium for local Colorado-Grown potatoes.

Results of the above studies are used herein to focus on hypothetical GM apples requiring reduced pesticide applications while providing a basis for serving an expanding market for local production. The emphasis is on the trade-offs among these attributes by Midwestern U.S. consumers in the context of price premiums and discounts to value the attributes. Would consumers accept GM products resulting in less use of pesticides and reduced environmental impact in combination with being locally grown as a high quality product? Would any price penalty for being GM be offset by a price premium for being locally grown? These types of questions are addressed in this study.

Method

There are few available econometric techniques to model consumer preferences. Previous studies on new product development and identification of consumer preferences have mostly focused on such techniques as contingent valuation and conjoint analysis. Contingent valuation techniques are usually used when determining consumer willingness-to-pay for a product or service (Loureiro and Hine, 2001; Louriero and Bugbee, 2005). The willingness-to-pay approach frequently employs a questionnaire asking survey respondents to choose a price point at which they would purchase a hypothetical product.

In contrast, conjoint analysis is a multivariate technique applied to estimate how respondents develop preferences for products and services (Hair et al., 1992). The conceptual basis for conjoint analysis models is Lancaster's theory of consumer demand, which is based on the proposition that consumers value products because of the products' characteristics (Lancaster, 1971), one of which may be price. Therefore, in conjoint analysis a series of products is described to survey participants in terms of the products' attributes and the level of each attribute. Respondents score (rank or rate) each product given its combination of attributes and the relative scores are compared to identify preferences for attribute levels and the trade-offs among the attribute levels. Lancaster characteristics models have been used in a number of recent studies of GM foods (Baker, 1999; Baker and Burnham, 2001; Baker and Mazzocco, 2005) and are applied in this study because they directly yield answers to the research questions. The major steps of applying Lancaster characteristic models are the following: (1) construction of product profiles; (2) data collection; and (3) model specification and estimation.

Construction of Product Profiles

Attributes are the key product characteristics consumers consider when making a purchase decision. Previous studies indicate that consumers of food products are primarily concerned with price, quality, and safety attributes and are willing to pay a modest premium for chemical free or chemical reduced produce (Baker and Crosbie, 1994; Baker, 1999; Kaye-Blake et al., 2005; Kassardjian et al., 2005). Among other potential attributes are size, shape, color, consistency, texture, flavor, and brand appeal. Due to the large number of attributes and possible levels representing each attribute, the number of hypothetical product profiles could be very high. As Quester and Smart (1998) indicated, a key to the reliability of conjoint output is to select the appropriate product attributes with realistic attribute levels. Based on the study objectives, findings from the previous studies, and to insure that the number of hypothetical products is not overwhelming to the respondents, the following three attributes were selected for the purpose of this study: price, place of production, and method of production (Table 1).

Table 1: Attributes and Their Levels Used in the Study

Attribute	Levels
Place of production	Locally grown
	Non-locally grown
Method of production	Conventional
	Genetically modified (GM)
Price, per pound (USD)	$1.39
	$1.59
	$1.79

Price and quality characteristics are attributes usually mentioned by consumers as major factors influencing their purchase decisions (Baker, 1999). Thus, price was included in the study as one of the most important tradeoffs with other attributes. Price levels were selected to reflect a range paid by consumers in retail stores at the time of the study. These were defined as low ($1.39), medium ($1.59), and high ($1.79).

The second attribute, place of production, was included in the design because one of the main objectives of the study is to determine whether place of production affects consumer preferences and their purchase decisions. Place of production was introduced at two levels: (1) locally grown, defined for this study as apples grown within 150 miles of the place of purchase, and (2) non-locally grown, defined as being grown in other commercial apple growing areas of the U.S.

The third attribute was method of production, with two attribute levels: (1) conventional, meaning that apples were grown using common breeding techniques

and normal chemical sprays; and (2) genetically modified, meaning that apples were modified to include a gene cloned from a naturally occurring disease resistant apple, resulting in up to 60% less use of pesticide applications. This attribute was included in the study to investigate consumer preferences for GM products.

To fix levels of unobserved attributes, all hypothetical products were described to survey respondents as brightly colored, firm, fresh, appropriately sized, and blemish free. According to Orme (2006), fixing the levels of unobserved attributes increases the confidence in choices, and assures that differences in ratings are due to differences among manipulated attributes. All three attributes, place, method, and price, and their definitions were tested on a sample of undergraduate students for clarity.

The full-profile method, as a method of designing product profiles for evaluation, was used in this study by generating all possible combinations of attribute levels. This method is the most popular method in conjoint analysis because it provides more realistic descriptions through defining levels of each attribute in a product profile, and is recommended when the number of attributes is six or less (Hair et al., 1992). The selection of three attributes with two or three levels each (see Table 1) yielded 12 product profiles (2 x 2 x 3 = 12). Respondents were asked to rate product profiles on a scale of 1 to 10 (with 1 being the least desirable and 10 being the most desirable). Figure 1 is an example of a product profile presentation.

Apple Description:
Locally Grown
Genetically Modified
$1.39

Your Rating: 1 2 3 4 5 6 7 8 9 10

Figure 1: Example of Rating-Based Product Presentation

Data Collection

An online survey instrument was applied in this study to collect primary data. The survey was conducted in January, 2007 using Marketing Systems Group programming and services. The Marketing Systems Group (MSG) is a web-based survey hosting company recruiting survey participants from within their panel (http://www.m-s-g.com/). Although early adoption rates of internet usage may cause some researchers to believe that web-based surveys have an inherent sample bias, Sethuraman et al. have recently shown that "no practical differences in attribute preferences were observed between …" online and traditional rating-based conjoint

surveys and that the use of online data collection was "superior to … a traditional … method on the basis of internal consistency and predictive validity (p. 602)."

Conjoint analysis surveys are typically designed to present consumers with realistic product choices. In this study consumers were asked to express their preferences for the introduced products by rating alternative products. Multiple observations for each subject permit the estimation of a preference function (regression) for each individual and an estimate of how each attribute is valued.

While traditional conjoint analysis has no sample size requirements and could be utilized for a single respondent (Hair et al., 1992), the larger sample size enhances the reliability of the results and allows the researcher to make some generalizations. To provide reliable estimates, Green and Srinavasan (1978) suggest a minimum sample of 100 respondents. Some studies suggest using the ratio of the number of parameters to the number of respondents when identifying the sample size (Xu and Yuan, 2001). The rule of thumb for the ratio is between 5 and 10. With two attributes with two levels and one attribute with three levels, we would have a total of 5 parameters (the total number of levels minus the total number of attributes plus one). Then we need at least 25 respondents (5 parameters x 5) to complete the study. The target sample size for this study is 200, which is large enough to provide reliable data.

The number of observations per respondent is the number of product profiles each respondent rates. The minimum number of product profiles depends on the number of attributes and attribute levels. In general, it is suggested that the number of profiles is at least 1.5 times the number of parameters (Xu and Yuan, 2001). With five parameters to be estimated, this guidance indicates a minimum number of product profiles per respondent of approximately eight. In this study, a full factorial design resulted in twelve product profiles, which is a sufficient number to keep the measurement error small. Previous similar studies have used eight to twelve product profiles (Baker, 1999; Baker and Burnham, 2001; Baker and Mazzocco, 2005).

The qualified subjects for our survey were adult consumers 21 years of age and older with Illinois addresses. Selection of subjects was done from a random sample with no screening protocols. Marketing System Groups identifyed respondents only based on their age and residency. The surveys were posted until 200 surveys were completed.

The survey assessed two types of information: (a) information about individual consumer preferences for hypothetical apples based on the combinations of different attributes and their levels; and (b) information about consumer socio-demographic characteristics.

Each survey included a letter with an instruction sheet, a description of product attributes, product rating form, and a consent statement form. Comparisons of socio-demographic characteristics among U.S. population, Illinois population, and survey respondents are presented in Table 2.

The results indicated that survey participants were more highly educated compared to the U.S. and Illinois populations. However, other socio-demographic characteristics of respondents, such as median age and income category, proportion of women, and proportion married were roughly similar to the socio-demographic characteristics of the U.S. and Illinois populations. Thus, the sample appears to provide good representation of the Illinois population within the dimensions of these characteristics.

Table 2: Socio-Demographic Characteristics of the U.S. and Illinois Populations, and Survey Participants

Characteristics	U.S. Population[a]	Illinois Population[a]	Survey Sample
Gender, % female	51.01	51.04	53.65
Median Age, years	36.40	35.60	37.0
Marital Status, % married	53.40	52.90	57.89
Median Income, $	46,242	50,260	40,000-60,000
Education Level[b], %			
High School or Less	45.3	42.4	14.44
Some College	27.5	28.3	34.76
College	17.2	18.3	31.02
Advanced	10.0	10.9	19.79

[a] Source: U.S. Census Bureau, 2005 American Community Survey.
[b] The distribution of the U.S. and Illinois populations by level of education includes only people of age 25 and over.

Model Specification

The general model is introduced in the form of a consumer's utility function, which provides a convenient framework for evaluating consumers' preferences for alternative products. It assumes that a rational consumer will always maximize his/her utility by selecting the most preferred product from the set of alternative products based on the product's attributes, subject to the budget constraints.

Given that consumers may not be able to explicitly judge the importance of different attributes and how they may make trade-offs between different attributes, it is more appropriate to ask consumers to provide overall preference ratings of product profiles whose attributes have been varied systematically, and then analyze these results statistically to understand the importance of the attributes. A general linear

form of the rating-based conjoint model following Lancaster (1971) can be expressed by the following equation:

$$1)\ P_i = a_{i0} + \sum_j a_{ij} Attribute_j + e_i, \qquad i = 1, \ldots, I,$$

where P_i is the utility or preference rating of the *i-th* individual, $Attribute_j$ represents the level of each of J attributes of the hypothetical product $(j = 1, \ldots, J)$, and e_i is a random error term. It was assumed that the preference function can be presented by an additive model with no interaction effects, since a full factorial design was applied in this study, and part-worth values can be estimated using linear regression. Under these assumptions, the preference function of *i-th* individual can be described as the following:

$$2)\ P_i = a_{i0} + a_{i1}PLACE + a_{i2}METHOD + a_{i3}PRICE + e_i \qquad i = 1, 2, \ldots, I$$

where P_i is a preference rating for the *i-th* individual (on a scale of 1 to 10); *PLACE* is a binary variable representing the place of apple production (0 if non-locally grown, 1 if locally-grown); *METHOD* is a binary variable representing the method of apple production (0 if conventionally produced, 1 if genetically modified); *PRICE* is a continuous variable represented by three levels (low - $1.39 per pound, medium - $1.59 per pound, and high - $1.79 per pound).

Applied conjoint analysis often includes interaction variables to identify interaction effects among the principle attributes. Baker (1999), Baker and Burnham (2001) and Baker and Mazzocco (2005) have shown the absence of interaction affects among the attributes used in this study. Therefore, we assume no interaction effects in the specified model. Furthermore, interaction affects cannot be estimated in a full factorial design with a small number of product profiles, especially when two of the three attributes are binary, having an end-point design and no intermediate values.

Based on the above specified model, each respondent provided twelve product ratings on a scale of one to ten. These product ratings (dependent variable) were then subjected to regression analysis on the price and binary variables (place and method) for each individual. The survey data were analyzed using the conjoint analysis procedure in SPSS 15.0 for Windows, which uses OLS. The regression results then were converted into part-worth scores. For the continuous variable price, this was accomplished by multiplying the price coefficient by the difference between the minimum and maximum price. For the binary variables place and method, the part-worth scores were coefficients for the respective variables. The part-worth or utility scores may be interpreted as the impact of each variable on an individual's preference for the product over the range of the variable. For example, for the price variable the part-worth indicates the estimated change in the product

rating for each individual based on the difference between the maximum and minimum price levels.

Results

Invalid data resulted in the elimination of eight observations, reducing the sample size to 192. To estimate the accuracy of conjoint models in predicting consumer preferences for products, the Pearson's *R* and Kendall's tau statistics were computed as two measurements of correlation between the observed and estimated preferences. Both indicate how well the conjoint models fit the data for the overall sample and for each individual for validity purposes.

In our conjoint study, the Pearson's *R* statistic value for the overall model was equal to 0.994, indicating a good fit of data. The Pearson's R statistic was found to be significant for all individual cases having a Pearson's R greater than or equal to 0.50 ($p<0.05$). More than 80% of all cases had Pearson's R higher than 0.75 ($p<0.001$). However, 8 % had Pearson's R values less than 0.50, indicating poor correlations between observed and predicted ratings. These respondents were found to be "inconsistent" in their rating task. The analyses were rerun with these respondents excluded as suggested by Moskowitz et al. (2002). This adjustment made no difference to the findings. Therefore, the data were analyzed with these cases included. Table 3 reports the regression estimates of the aggregate preference function, which are the mean coefficient estimates and part-worths of the 192 individual regressions.

As expected, the signs of the part-worth scores of locally grown and conventionally produced apples have positive values, while the estimated coefficient of price has a negative value. This implies that, on average, respondents give a higher rating to

Table 3: Regression Estimates of Aggregate Preference Function

	Mean	St. Dev.
Constant	12.050	0.305
Place:		
Part-Worth: Local	0.466	0.032
Part-Worth: Non-local	-0.466	0.032
Method:		
Part-Worth: Conventional	0.296	0.032
Part-Worth: GM	-0.296	0.032
Price:		
Coefficient	-3.773	0.191
Part-Worth: $1.39	-5.244	0.265
Part-Worth: $1.59	-5.999	0.304
Part-Worth: $1.79	-6.753	0.342

locally grown, conventionally produced apples at the low price compared to the other hypothetical apple profiles.

Based on the aggregate preference function, the preference rating of any combination of attributes and their levels (1 to 10) can be calculated (see Table 4). For example, the highest rated apples (locally grown, conventionally produced, and priced at the lowest price) have a mean predicted rating of 7.57. The lowest rated apples (non-locally grown, GM, and priced at the highest price level) have a mean predicted rating of 4.53.

Table 4: Actual and Predicted Ratings of Apple Profiles

Product Profile	Actual Ratings		Predicted Ratings	
	Mean	St. Dev.	Mean	St. Dev.
1. Locally Grown Conventional $1.39	7.64	2.171	7.57	2.022
2. Locally Grown Conventional $1.59	6.90	2.069	6.81	1.866
3. Locally Grown Conventional $1.79	6.14	2.518	6.06	2.219
4. Locally Grown GM $1.39	6.89	2.615	6.98	2.410
5. Locally Grown GM $1.59	6.21	2.251	6.22	2.088
6. Locally Grown GM $1.79	5.33	2.311	5.47	2.225
7. Non-locally Grown Conventional $1.39	6.57	2.238	6.64	2.123
8. Non-locally Grown Conventional $1.59	5.84	2.106	5.88	2.020
9. Non-locally Grown Conventional $1.79	5.00	2.463	5.13	2.387
10. Non-locally Grown GM $1.39	6.05	2.439	6.04	2.635
11. Non-locally Grown GM $1.59	5.41	2.106	5.29	2.380
12. Non-locally Grown GM $1.79	4.64	2.311	4.53	2.538
Pearson's R statistic = 0.994, p = 0.000; Kendall's tau statistic = 0.939, p = 0.000				

From Table 4 it is clear that conventional production is preferred to GM production when other variables are held constant. A pair-wise t-test shows the differences in product ratings is significant at the 1% probability level (t =3.208, p=0.003). This finding is consistent with expectations and the literature cited earlier.
To determine if the differences in ratings of locally grown and non-locally apples were statistically significant, pair-wise t-tests were performed. The t-test results indicated that differences in mean ratings of locally grown and non-locally grown apples (with all other variables held constant) were statistically significant at 0.001 probability level (t = 9.189 with p = 0.000). The study results were consistent with the findings of Gallons et al. (1997), Brown (2003), Schneider and Francis (2005), which report a high level of consumer interest in purchasing locally grown/produced food from farmers' markets, local grocery stores, local restaurants, and directly from farms and are willing to pay a premium for locally grown products.

However, it is particularly noteworthy that respondents indicated no statistically significant difference in product ratings for locally grown GM apples compared to

non-locally grown conventional apples when prices are held constant (t=1.598, p=0.112) As indicated in Table 4, any leaning one might have toward accepting a t-value in this range would point toward apparent higher ratings for the locally grown GM product over the non-locally grown conventional product.

Another way to evaluate various product attributes is by computing the monetary value of each attribute, as was suggested by Baker and Mazzocco (2005). By following the methodology used in their study, the part-worth score of each product attribute was divided by the price coefficient, which represents the value of a $1.00 increase in the price per pound of apples. The computed monetary values of the method attribute shows that consumers would place a penalty of $0.08 per pound (-0.296 divided by -3.773) on GM apples. However, it was found that the premium associated with marketing apples as locally grown was $0.12 (0.466 divided by -3.773), sufficient to offset the penalty associated with the GM method of production ($0.12 + (-$0.08) = $0.04).

In conjoint analysis, part-worth or utility scores provide only a rough estimate of how important each attribute level is in a consumer purchasing decision. Relative factor importance scores, calculated by dividing variation in the preference rating due to each individual attribute by total variation in the preference rating due to all attributes, allow the researcher to compare the importance of each attribute to either the individual consumer or to the aggregate group of consumers. Relative factor importance scores for an overall sample can be computed in SPSS in two different ways. One way of computation is to average all individual relative factor importance scores. Another way is to compute relative factor importance scores from average part-worth scores. Orme (2002) suggests that when summarizing attribute importance scores it is better to compute importance scores for respondents individually first and then average them. This way of computation indicates that method attribute (39%) was almost equally important as price (37%), followed by place attribute (24%). These results support the findings of Baker and Burnham (2001), reporting that both attributes – Price and GMO content – were approximately equal in their influence on consumer product ratings.

Table 5: Relative Factor Importance Scores

Attribute/ Relative Factor Importance Score	Average of Individual Importance Scores, %
Place	23.66
Method	39.17
Price	37.17

Comparison of Demographic Characteristics

The study also examines the relationships between consumer preferences and consumer socio-demographic characteristics, such as gender, age, marital status, income category, level of education, number of adults and children in household. Previously, no consistent findings were observed on the influence of socio-demographic characteristics on consumer acceptance of GM foods. Some studies (Schaffner et al., 1998; Engel et al., 1995; Barton and Pearse, 2003; Baker and Mazzocco, 2005) reported that socio-economic factors affect consumer preferences due to their influence on consumer behavior; while others did not (Kolodinsky et al., 2002; Baker and Burnham, 2001).

One advantage of traditional conjoint analysis is the ability of the researcher to evaluate each respondent's preference function. Using the conjoint analysis procedure in SPSS 15.0, individual part-worth scores for each of the 192 respondents were computed and examined, and then compared with respect to age group, gender, marital status, income category, and education level of respondents using comparative analysis performed in SPSS with a one-way ANOVA procedure. First, the group variances were evaluated for homogeneity with Levene's test. Then, the *F*-statistics were calculated to determine whether the means were significantly different from each other. To determine which pairs were significantly different, pair-wise *t*-tests were computed. When more than two groups were compared, a Bonferroni multiple comparison test (assuming equal variances) or a Tamhane test (assuming unequal variances) were used as more appropriate tests, since the probability of Type I error can be guaranteed not to exceed a certain level of significance only individually or for each pair-wise comparison separately, but not for the whole family of comparisons (http://www.spss.com/complex_samples/data_analysis.htm).

The analysis of individual preference functions of respondents by gender, income category and level of education revealed no significant differences, which is consistent with previous results of Baker and Burnham (2001). However, some differences were noted with respect to age and marital status. Respondents' part-worth and relative factor importance scores by age group are presented in Table 6. Based on the ANOVA results, significant differences were found in the part-worth scores and relative factor importance scores of the method attribute among different age groups of respondents. Further *post hoc* tests indicated that respondents of age 65 and over show much stronger preferences for conventional apples than respondents of all other age groups, except of the age group of 50-64. The differences between part-worth scores of these groups were found to be significant at 10% probability level based on Tamhane test results. It was also found that respondents of age 65 and older value the importance of method of production significantly higher than all other age groups except the age group of 26-34 (Tamhane test results were significant at 5% probability level). Statistically significant differences

were also found in the relative factor importance scores of the price attribute between respondents of age of 35-49 and 65 and older. Respondents of age 35-49 were almost doubly influenced by price compared to respondents of age 65 and older (Tamhane test result was significant at 5% probability level).

Table 6: Part-worth and Importance Scores of Respondents by Age

	Age				
Attribute/Measure	**21-25**	**26-34**	**35-49**	**50-64**	**65 & Over**
Number of Cases	25	61	46	45	15
Constant	11.805	10.805	13.174	13.432	9.935
Place:					
Locally Grown	0.540	0.460	0.390	0.472	0.578
Non-locally Grown	-0.540	-0.460	-0.390	-0.472	-0.578
Importance Score,%	29.33	22.74	19.65	28.23	16.54
Method:					
Conventional**	0.193	0.179	0.111	0.294	1.522
GM**	-0.193	-0.179	-0.111	-0.294	-1.522
Importance Score, %*	30.59	42.61	36.71	37.04	60.28
Price:					
Coefficient	-3.550	-2.992	-4.484	-4.444	-3.125
Importance Score, %**	40.08	34.65	43.64	37.04	23.18

* Tamhane test result is significant at 5% probability level
**Tamhane test result is significant at 10% probability level

Table 7: Part-worth and Importance Scores of Respondents by Marital Status

	Part-Worth Score		
Attribute/Measure	**Married**	**Unmarried**	**Difference**
Constant	12.566	11.255	
Place			
Locally Grown	0.517	0.410	0.107
Non-locally Grown	-0.517	-0.410	-0.107
Importance Score, %	24.53	22.40	2.13
Method			
Conventional	0.128	0.546	-0.418*
GM	-0.128	-0.546	0.418*
Importance Score, %	37.12	42.42	5.30
Price			
Coefficient	-4.085	-3.305	-0.780
Importance Score, %	38.35	35.17	3.18
Number of Cases	110	80	

* Significant at 5% probability level

The comparisons of part-worth scores and relative factor importance scores based on the respondent's marital status resulted in some significant differences between married and unmarried respondents, as shown in Tables 7. The part-worth scores for conventional and GM apples were found to be significantly different between married and unmarried respondents at the 5% of probability level (t =4.458, p = 0.036). This implies that unmarried respondents would pay a higher penalty to avoid GM method of production compared to married respondents. According to their preference function, unmarried respondents would pay a penalty of $0.17 per pound (-0.546 divided by -3.305) to avoid GM method of production compared to only the $0.03 (0.108 divided by -3.691) penalty by married respondents. It is interesting to note that a $0.13 premium that married respondents would be willing to pay for locally grown apples (0.517 divided by -4.085= $0.13) was sufficient enough to cover the penalty for the GM method ($0.13 - $0.03 = $0.10). However, it would not be sufficient for unmarried respondents ($0.12 - $0.17 = -$0.05).

Consumer Segmentation

The results of the conjoint analysis on the individual level were also used to determine the existence of groups of respondents who were different from each other based on their relative factor importance scores. Cluster analysis was performed to classify consumers into homogeneous groups based on their relative factor importance scores. The data were analyzed in SPSS 15.0 using the K-means clustering algorithm. In this study, three-cluster and four-cluster solutions were evaluated. It revealed that there were many respondents in the sample (73 out of 192) to whom all three attributes were roughly equally important. Therefore, it was important to group these respondents into a separate market segment so that their preference functions and socio-demographic characteristics can be analyzed separately. As a result, a four-cluster solution with 36 respondents in the first cluster, 44 respondents in the second cluster, 39 respondents in the third cluster, and 73 respondents in the forth cluster was chosen for further examination.

The first market segment, referred to as "Place-oriented", was defined by consumers who consider place as the most important attribute. The second and third segments were labeled as "Method-oriented" and "Price-oriented", since consumers of these segments were influenced the most by method of production and price, respectively. The forth segment was represented by consumers who show relatively the same importance scores across all three attributes and was labeled as "Balanced." The results of the segment analysis are presented in Table 8.

To identify if there were any statistically significant differences in the preference functions and socio-demographic characteristics of respondents among the segments, the appropriate statistical tests were performed and are reported in Table 9. Statistically significant differences were found in the age (p=0.033) and apple consumption (p=0.053) of respondents among the market segments based on

the ANOVA test results. Further analysis implies that statistically significant differences in respondent's age were only confirmed between the Price-oriented segment and the Balanced segment (Bonferroni test was significant at 10% probability level with p=0.058). It appears that, on average, the Price-oriented consumer is older than the Balanced consumer. The Balanced consumer also consumes more apples per week than the Price-oriented consumer (Bonferroni test was significant at 10% probability level, p=0.099).

Table 8: Average Utility Scores, Importance Scores, and Socio-Demographic Characteristics of Respondents by Market Segment

Variable/Measure	Segment 1 Place-Oriented (N=36)[a]	Segment 2 Method-Oriented (N=44)	Segment 3 Price-Oriented (N=39)	Segment 4 Balanced (N=73)
Constant	8.08 (4.21) [b]	7.16 (3.31)	20.56(10.67)	12.41(6.16)
Place:				
Locally Grown	1.23 (1.10)	0.28 (0.40)	0.20 (0.38)	0.34 (0.44)
Non-locally Grown	-1.23 (1.10)	-0.28 (0.40)	-0.20 (0.38)	-0.34(0.44)
Importance Score, %	62.78	10.38	10.70	19.30
Method:				
Conventional	0.25 (0.77)	1.13 (2.11)	-0.03 (0.36)	-0.01(0.13)
GM	-0.25 (0.77)	-1.13 (2.11)	0.03 (0.36)	0.01 (0.13)
Importance Score, %	22.98	77.93	9.00	39.90
Price:				
Coefficient	-1.27 (2.46)	-0.91 (1.96)	-8.86 (6.90)	-4.02 (3.90)
Importance Score, %	14.25	11.69	80.30	40.80
Socio-Demographics:				
Age	39.14	43.52	45.26	37.90
Females, %	63.89	59.09	53.85	45.21
Married, %	61.11	47.73	60.53	61.11
Income Category	2.32	2.79	2.41	2.57
Education Level	2.42	2.57	2.49	2.66
Per Household:				
Number of Adults	1.97	2.02	1.92	1.97
Number of Children	0.94	0.76	0.64	0.81
Weekly Apple Consumption	5.46	7.16	4.08	6.90

[a] N is the number of respondents in the segment
[b] Standard deviations are shown in parentheses

Table 9: ANOVA and Chi-Square Test Results of Utility Scores and Socio-Demographic Characteristics of Respondents among Market Segments

Variables/Measure	*F-values*	*p-values*
Attribute's Part-Worth Score:		
Place	24.124	0.000
Method	8.517	0.000
Price	30.559	0.000
Age	2.973	0.033
Per Household:		
Number of Adults	0.115	0.951
Number of Children	0.459	0.711
Weekly Apple Consumption	2.605	0.053
	Pearson χ^2	*p (2- tailed)*
Gender	4.135	0.247
Marital Status	2.409	0.492
Income Category	13.749	0.317
Education Level	11.025	0.274

The Place-Oriented Segment

The apple preferences of the Place-oriented consumers were mainly determined by the place attribute, with an average importance score for place of 62.78%.The second most important attribute for these consumers was method of production (22.97%) followed by price (14.25%). The results (Table 8) indicate that there is a high premium associated with marketing apples as locally grown to the Place-oriented consumer segment. On average, the Place-oriented consumer would pay a $0.97 premium per pound for locally grown apples (1.23 / -1.27). This amount compares to a $0.20 penalty these consumers would place on GM versus conventional (-0.25/ -1.27 = $0.20). This 60% to 70% premium (over $1.59 or $1.39, respectively) should be attractive to marketers of locally grown produce.

The Method-Oriented Segment

The preferences of the Method-oriented respondents were primarily determined by the method attribute, with an average importance score of 77.93%. Place and price attributes were almost equally important for this market segment (10.38% and 11.69%, respectively). The results indicate that there was a strong penalty associated with genetic modification. The average part-worth score of the method attribute for this segment was -1.13 resulting in a relative factor importance score of 77.93%. The Method-oriented respondents would impose a $1.24 penalty on GM apples (1.13/ -0.91). In this case, a premium of $0.31 (0.28/ -0.91) associated with marketing apples as locally grown would not be enough to cover the penalty

associated with GM method. It suggests that these consumers would not buy GM apples at any reasonable market price.

The Price-Oriented Segment

The Price-oriented respondents were consumers who were more influenced by the price attribute. As a result, the price attribute accounted for about 80% of variation in their preference function. Place was the second most important attribute (10.70%) followed by method (9%). It is interesting to note that the Price-oriented consumers place almost no penalty ($0.003) to avoid GM apples, meaning that they would most likely purchase GM apples if these apples are priced low.

The Balanced Segment

The Balanced consumers do not exhibit strong preferences for any single product attribute. They placed almost equal (about 40%) values on the relative factor importance of price and method attributes, and 20% on place. On average, the part-worth score for GM apples was close to zero (-0.01), indicating that there was almost no penalty for GM method of production among Balanced consumers.

In spite of the fact that most of the differences in personal consumers' characteristics among the market segments were found to be not statistically significant, it can be suggested for the future research to identify what other factors might influence consumer behavior so that they value the attribute with such difference.

Simulation Analysis Results

As a final stage of the conjoint analysis, the part-worth scores were used as an input for predicting expected preference shares of commercially feasible products. To compute expected preference shares for apple profiles, the conjoint procedure in SPSS 15.0 was used with application of the following three methods: maximum utility, Bradley-Terry-Luce, and logit. The results of all three simulation models have shown a high consumer preference share for locally grown GM apples priced at the low price level. Based on the maximum utility model, the highest expected preference shares were given to locally grown conventionally produced apples priced at the low price (product profile 1) and locally grown GM apples priced at the low price (product profile 4), as shown in Figure 2 (profiles are described in Table 4). As expected, conventional apples were given a little higher preference share compared to GM apples (about 34% compared to 30%). It is important to point out that the results of all three simulation models have reported a high consumer preference share for locally grown GM apples priced at the low price. Thus, it can be concluded that there is a good potential for this hypothetical new product to succeed in the market place if it carries a low price.

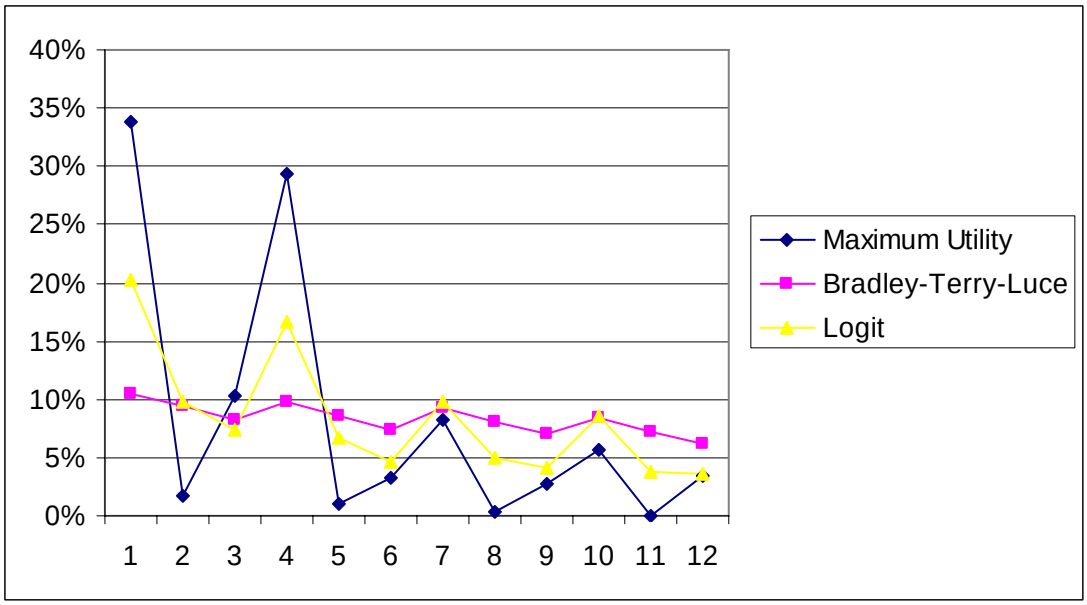


Figure 2: Expected Preference Shares of Apple Profiles (See Table 4)

Conclusions and Implications

This study complements and extends previous studies' results by analyzing consumer preferences and purchasing decisions specifically toward genetically modified products that are locally grown. The study results show that consumer preferences for apples are influenced by place and method of production attributes. Respondents were willing to make trade-offs between these attributes. While price is still one of the most important attributes, it may play a lesser role for consumers who are willing to pay a premium for locally grown apples with the combination of environmental benefits provided by genetic modification.

The high consumer preferences for locally grown products combined with the benefits of genetic modification provide a great opportunity for Illinois producers, as well as for other producers, to expand their production. Apple producers could take advantage of planting and growing new GM apple varieties resistant to the scab disease to increase production, to reduce labor and pesticides application costs, and to expand market potential.

The results also clearly indicated the need for a targeted approach to consumer markets. Although the differences in socio-demographic characteristics of respondents among the market segments were found to be not statistically significant, segmenting consumers into four well-defined market segments on the basis of product attribute importance is a valuable contribution of this research. Results indicate there is potential growth in local production by aligning product offerings with targeted segments.

Limitations and Directions for Future Research

The conclusions developed herein must be considered in light of the limitations of the study. The nature of the hypothetical products used to evaluate consumer preferences is one such limitation. Another limitation is that only one product (apples) was used in this research. Thus, it is possible that influence of method of production and place of production on consumer preference for GM foods might not be generalizable to a broad array of products. It is also important to consider that although the conjoint analysis method is a useful and effective method to assess consumer preferences for GM foods, this research approach has some limitations. One such limitation, which is typical for all stated preference research approaches, is to decide which attributes to include in the study design. In this study, the levels of unobserved attributes were fixed by describing hypothetical apples as brightly colored, firm, fresh, appropriately sized, and blemish free. However, it is still possible that there are other attributes of apples that are important to some consumers beyond those considered in this study.

Nonetheless, this study expands on the limited research relating to the combination of place and method of production as product attributes. Identifying the socio-demographic or other markers indicating segment membership can have significant value for managers pursuing markets. Factors to consider may include consumer knowledge, beliefs, and attitudes, such as trust.

Acknowledgements

The authors express their thanks to anonymous reviewers for their helpful suggestions. This research was funded in part by the Illinois Council on Food and Agricultural Research.

References

Baker, G.A. "Consumer Preferences for Food Safety Attributes in Fresh Apples: Market Segments, Consumer Characteristics, and Marketing Opportunities." *Journal of Agricultural and Resource Economics*, 24(July 1999): 80-97.

Baker, G.A. and T.A. Burnham. "Consumer Response to Genetically Modified Foods: Market Segment Analysis and Implications for Producers and Policy Makers." *Journal of Agricultural and Resource Economics*, 26(July 2001): 387-403.

Baker, G.A. and P.J. Crosbie. "Consumer Preferences for Food Safety Attributes: A Market Segment Approach." *Agribusiness,* 10(April 1994): 319-324.

Baker, G.A. and M.A. Mazzocco. "Consumer Response to GMO Foods: Branding Versus Government Certification." *International Food and Agribusiness Management Review*, 8(2005): 1-20.

Burton, M., & Pearse, D. (2002). "Consumer Attitudes towards Genetic Modification, Functional Foods, and microorganisms: a Choice Modeling Experiment for Beer." *AgBioForum*, 5: 51-58.

Brown, C. "Consumers' preferences for locally produced food: A study in southeast Missouri." *American Journal of Alternative Agriculture,* 18(2003): 213-224.

Curtis, K.R., J.J. McCluskey, and T.I. Wahl. "Consumer Acceptance of Genetically Modified Food Products in the Developing World." *AgBioForum,* 7(2004): 70-75.

Engel, J.F., Blackwell R.D., & Miniard P.W. "Consumer Behavior." Fort Worth TX: The Dryden Press (1995).

Frewer, L., D. Hedderley, C. Howard, and R. Shepherd. "Reactions to information about genetic engineering: Impact of source characteristics, perceived personal relevance, and persuasiveness content." *Public Understanding of Science*, 8(1999): 35-50.

Gallons, J., U.C Toensmeyer, J.R. Bacon, and C.L. German. "An Analysis of Consumer Characteristics Concerning Direct Marketing of Fresh Produce in Delaware: A Case Study." *Journal of Food Distribution Research,* 28(1997): 98-106.

Gamble, J., and A. Gunson. "The New Zealand Public's Attitudes regarding Genetically-modified Foods: May and October 2001- Full Report." *HortResearch*, (2002).

Green, P.E., and V. Srinivasan. "Conjoint Analysis in Consumer Research: Issues and Outlook." *The Journal of Consumer Research*, 5(1978): 103-123.

Hair, J.F., R.E. Anderson, R.L Tatham, and W.C. Black. "Multivariate Data Analysis." 3rd Ed., New York: Macmillan Publishing Co., 1992.

Hossain, F., and B. Onyango. "Product Attributes and Consumer Acceptance of Nutritionally Enhanced Genetically Modified Foods." *International Journal of Consumer Studies,* 28(2004): 255- 268.

Kassardjian, E., J. Gamble, and A. Gunson. "A New Approach to Elicit Consumers' Willingness to Purchase Genetically Modified Apples." *British Food Journal,* 107(2005): 541-555.

Kaye-Blake, W. K. Bicknell, and C. Saunders. "Process versus Product: Which Determines Consumer Demand for Genetically Modified Apples?" *The Australian Journal of Agricultural and Consumer Economics*, 49(2005): 413-427.

Lancaster, K. "Consumer Demand: A New Approach." New York: Columbia University Press, 1971.

Loureiro, M.L., and M. Bugbee. "Enhanced GM Foods: Are Consumer Ready to Pay for the Potential Benefits of Biotechnology?" *The Journal of Consumer Affairs,* 39(2005): 52-70.

Loureiro, M.L., and S. Hine. "Discovering Niche Markets: A Comparison of Consumer Willingness to Pay for a Local (Colorado-Grown), Organic, and GMO-free product." *Selected Paper, American Agricultural Economics Association Meetings,* (2001).

Lusk, J.L. "Effect of Cheap Talk on Consumer Willingness-to-Pay for Golden Rice." *American Journal of Agricultural Economics,* 85(2003): 840-856.

Lusk, J.L., M. Moore, L. House, and B. Morrow. "Influence of Brand Name and Type of Modification on Consumer Acceptance of Genetically Engineered Corn Chips: A Preliminary Analysis." *International Food and Agribusiness Management Review*, 4(2002): 373-383.

Moskowitz, H., J. Beckley, T. Mascuch, J. Adams, J., A. Sendors, and C. Keeling. "Establishing Data Validity in Conjoint: Experiences with Internet-Based Mega-Studies." *Journal of Online Research*, (2002): 1-11.

Orme, B. "Getting Started with Conjoint Analysis: Strategies for Product Design and Pricing Research." *Madison, WI: Research Publishers LLC*, (2006): 49-57.

Quester, P.G., and J. Smart. "The Influence of Consumption Situation and Product Involvement over Consumers' Use of Product Attribute." *Journal of Consumer Marketing,* 15(1998): 220-238.

Richardson-Harman, N., T. Phelps, P. Mooney, and R. Ball. "Consumer Perceptions of Fruit Production Technologies." *New Zealand Journal of Crop and Horticultural Science,* 26(1998): 181-192.

Sethuraman, Raj, Roger A. Kerin, and William L. Cron. "A Field Study Comparing Online and Offline Data Collection Methods for Identifying Product Attribute Preferences Using Conjoint Analysis." *Journal of Business Research*, 58(2005): 602-610.

Schaffner, D.J., Schroder, W.R., & Earle, M.D. *Food Marketing: An International Perspective.* New York: The McGraw-Hill Companies, Inc. (1998).

Schneider, M.L., and C.A. Francis. "Marketing locally produced foods: Consumer and farmer opinions in Washington County, Nebraska." *Renewable Agriculture and Food Systems*, 20(2005): 252-269.

SPSS Complex Samples: http://www.spss.com/complex_samples/data_analysis.htm

U.S. Census Bureau, 2005 American Community Survey.

Xu, G., and Y. Yuan. "Conjoint Analysis in Pharmaceutical Marketing Research." *Quirk's Marketing Research Review,* June (2001): 1-10.

International Food and Agribusiness Management Review
Volume 11, Issue 4, 2008

Competing in a Mature Market: The Case of Super AM Food Markets

Kenneth Harling [a]ⓘ

[a] *Professor, School of Business and Economics, Wilfrid Laurier University, 75 University Ave. W., Waterloo, Ontario, N2L 3C5, Canada.*

Abstract

The EXPO-AM supermarket entered the Rochester, Massachusetts food market using a retailing format that its parent company had used successfully in England where it went under the store banner "Super EU." This case describes how the concept was developed and implemented in Rochester over a three year period, 2000-2003. At the time of the case, 2003, Ted Edwards, the general manager of Super AM Food Markets, has been asked to prepare a turnaround plan for the banner after it has shown poor performance.

Keywords: supermarket, competitive advantage, competitive rivalry, strategy implementation, organizational structure

ⓘCorresponding author: Tel: + 519-884-0710, Email: kharling@wlu.ca

IAMA Agribusiness Case 11.4.A

This case was prepared for class discussion rather than to illustrate either effective or ineffective handling of an agribusiness management situation. The author(s) may have disguised names and other identifying information presented in the case in order to protect confidentiality. IAMA prohibits any form of reproduction, storage or transmittal without its written permission. To order copies or to request permission to reproduce, contact the IAMA Business Office. Interested instructors at educational institutions may request the teaching note by contacting the Business Office of IAMA.

Introduction

Ted Edwards, General Manager of a supermarket banner called "Super AM," was leaving his office on March 14, 2003 when the phone rang. He picked up the receiver and heard Brian Davis, his superior and the President of EXPO AM say:

> Ted, I just met with Mr. Schuh. In the meeting we reviewed Super AM's performance. As you know, your two stores have cost over $5 million in development costs and operating losses since the banner started. Last year alone they lost nearly $3 million on operations in fiscal 2002.
>
> Mr. Schuh wants Super AM profitable within the six months. He said, "Either Edwards fixes the problem or we will." He wants a turnaround plan on his desk first thing Friday, March 21st. That gives you a week. Let's discuss your draft plan at 8:00 AM on Tuesday morning. We'll go through it to make sure that it will satisfy Mr. Schuh. I don't need to tell you how important this is to your career.

As a banner, Super AM had several stores operating under a common name and a common merchandising mix. By the end of 2002 it consisted of two supermarkets in Rochester, Massachusetts. Another store was to open in July 2003, followed by three more. By the end of 2005 the banner's sales were budgeted to be $39 million per year.

The Rochester Market

Rochester, a town of 182,000 people, was an hour's drive from Boston, Massachusetts which had 600,000 people. Six million people lived within an hour of Rochester. Its population was growing at a rate of four percent per year while Boston's population was declining due to out-migration.

Rochester was divided culturally. The east side had a large German and Dutch population which valued their traditional, conservative city atmosphere and patronized retailers providing traditional products at good prices. The west side had a more cosmopolitan population, the result of the university and the financial industry located there. The disposable income on the east side of Rochester was ten percent lower and its residents spent 17 percent less on food prepared outside the home. All customers in Rochester shared similar interests with other US food shoppers when choosing their supermarket.

Competitors

The competition in Rochester had evolved. In 1990 Rochester was well served by two independent grocers, Alberts and Shop Smart. Massachusetts's largest

supermarket chains entered the Rochester market in the 1980s but all left after finding that their competitive offers were insufficient to attract business away from the independents.

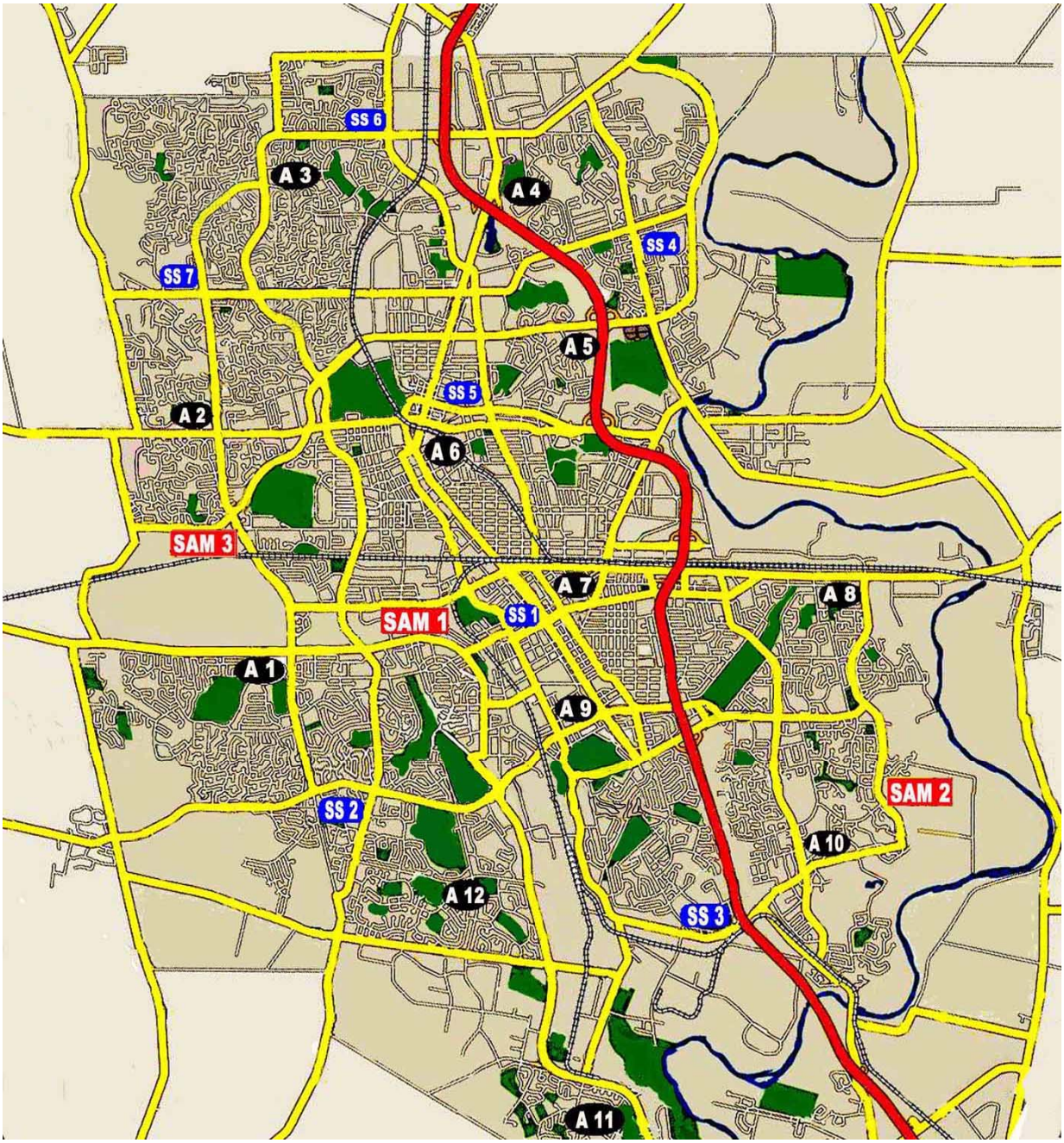
In the mid 1990s the independent chains were purchased by food chains: National purchased Alberts and Franklins purchased Shop Smart. Both were large chains that incorporated the former independents in their organizations as separate divisions with their own management and merchandising. Rivalry between the two chains resulted in one of the lowest-cost food baskets in the state and high levels of service. Workers bagging groceries at checkouts were common in Rochester but rare elsewhere in the state. Also, shoppers in Rochester spent 15-20 percent less time in waiting checkout lines than in Boston. Shoppers in Rochester had very few complaints about their choice of supermarkets.

Of the 20 supermarkets in Rochester in 2002 (See Exhibit 1 for store locations), Alberts had twelve stores. Seven were large conventional stores (55,000 square feet) and five were smaller stores (25,000 square feet). All had high sales volumes relative to their size. Their unionized workers received pay slightly below average for the state and there were few union work rules. All stores were well-located and provided good customer service throughout. Shoppers occasionally complained about cleanliness, lighting, and shortages of advertised products. Alberts' long-term strategy was to develop much larger stores (95,000 square feet) that could provide shoppers with one stop shopping for food, nonfoods and services. Less successful stores would be closed as the larger stores opened.

EXPO-AM had opened a Super Center on Liberty Road in 1998. It was the largest store in the market at 155,000 square feet and carried an extensive selection of food and non-food products. This banner was owned by National but operated independently from Alberts. National opened it to dissuade Wal-Mart from entering the market. Although Super Center stores were successful elsewhere in the United States, this store had little success in Rochester. National closed it in 2000 and reopened it in 2001 as a large Alberts supermarket selling food and drugs (Store A1 in Exhibit 1) and a Discounter's store selling non-food products.

Shop Smart's seven food stores varied considerably in size and sales volume. They were staffed by non-unionized workers. Shoppers appreciated the friendly, helpful customer service reflected in part by the many baggers at the checkouts. Shop Smart maintained its profitability in recent years by minimizing new investment and devoting 35 percent of its selling floor space to non-food items. Its stores needed large capital expenditures to make then as attractive as Alberts but it was unclear whether the new owner would make these investment.

Exhibit 1: A Map of Supermarket Locations in Rochester, 2002



Where: A is an Alberts supermarket
SS is a Shop Smart supermarket
SAM is a Super-AM supermarket

EXPO-AM

EXPO-AM was the U.S. operating division of EXPO-EU, a European supermarket chain which had 686 supermarkets operating under various banners across Europe

including ASBN, EXPO, Gluveld Markts, and Super EU. In 2000 EXPO-AM had sales of $3.5 billion which produced before-tax-profits of $66 million. The company was headquartered in Boston and had 197 stores. EXPO-AM's workers had been unionized 50 years earlier. They received full union rates and management considered the work rules restrictive. In a typical EXPO-AM store full time workers accounted for 50 percent of total hours and 67 percent of the labor cost.

Evolving Strategy

Before 1995 EXPO-AM focused on opening new food stores in suburban areas. It was never the price or service leader. Instead it offered weekly specials at low prices in neat, clean stores. It maintained its profitability through excellent merchandising and strict control of costs.

By 1995 urban growth was slower and customers were more selective. Management recognized that different merchandising, pricing and identities were needed to appeal to different market segments. To offer this management started acquiring regional chains with good locations and strong consumer franchises. The chain's name was maintained but store operations were consolidated under one management and all merchandising was centralized at head office so that costs were kept low.

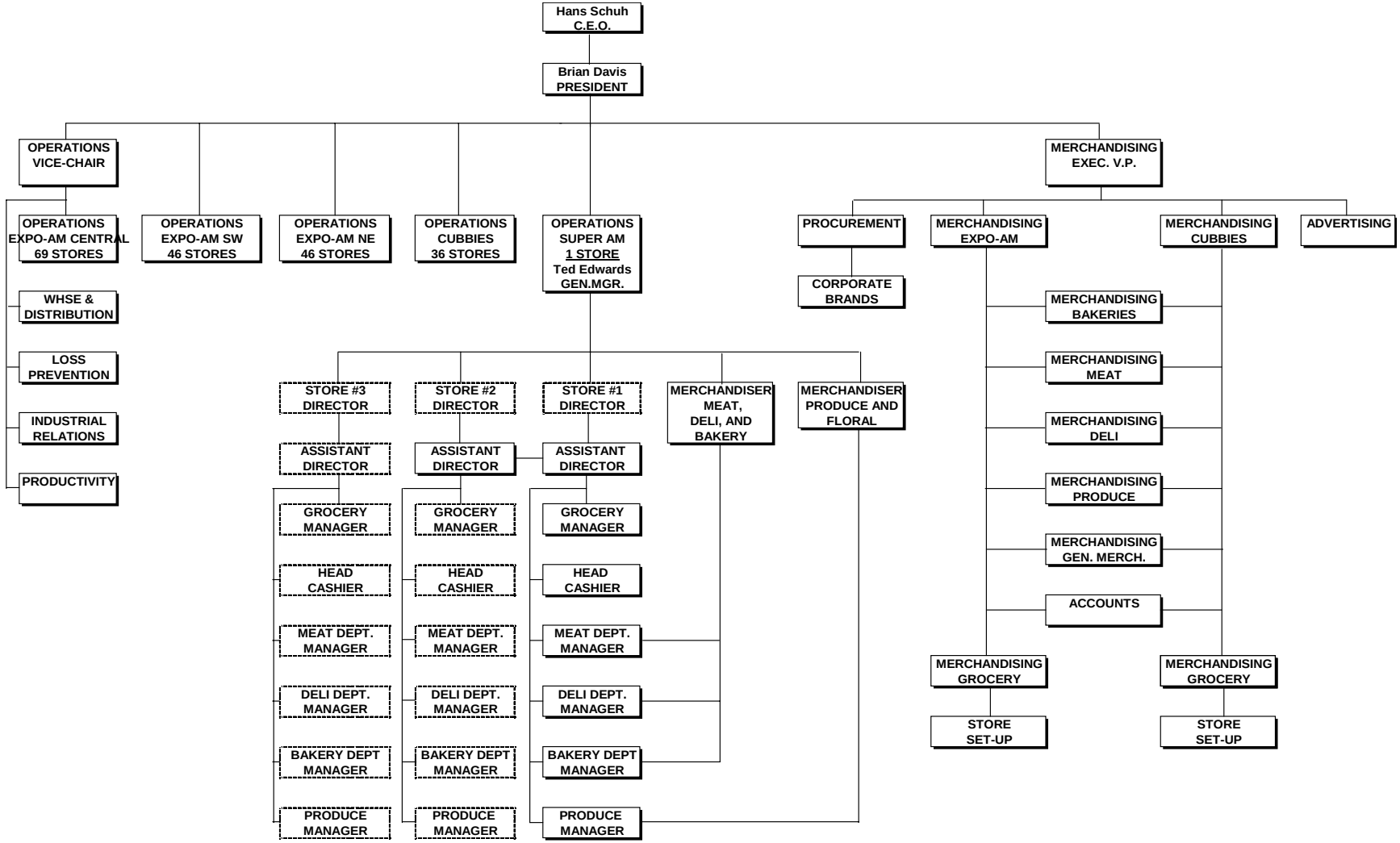
By 2002 the share of total supermarket sales in the state held by food chains had declined by 0.2 percent each year for the previous five years. Each one percent drop in market share represented a loss of $200 million in sales. Independently-owned supermarkets were successfully challenging many of chains because they operated with low cost, non-unionized labor. They provided superior customer service, competitive pricing and a pleasant store environment.

EXPO-AM had the highest share of supermarket sales in Massachusetts in 2002 at 64 percent. Management had been able to mask the continuing decline in sales of 1.5 percent per year in its original stores through acquisitions but top management realized it had to address its declining competitiveness.

Top Management

The management team at EXPO-AM was lead by Hans Schuh, 48. He became the Chairman and Chief Executive Officer at the end of 2002. For five years before that he had been Senior Vice President of Operations with Mammoth Food Markets, a very successful food retailer in the southeastern US. On his appointment, EXPO's headquarters in Europe gave him a dual mandate. First he had to ensure the smooth and effective integration of the recently acquired Cubbies Food Mart operations into EXPO-AM operations. Second, he had to correct the erosion of sales and profits at the existing EXPO-AM stores. Schuh was assisted

Exhibit 2: Organizational Structure of EXPO-AM, 2001



Source: Company record

by Brian Davis, 45, who became President of EXPO-AM in mid 2001. He replaced Ingo Perez who was recognized throughout the organization as a talented merchandiser.

Organizational Structure

The organizational structure of EXPO-AM had three main parts: administrative management, merchandizing management and operations management (Exhibit 2). Administrative management looked after the strategy of the business, including the retail formats (banners) used and the markets served. It also looked after the management of human resources and finance of the business.

Merchandising management was responsible for buying the merchandise sold in the stores, controlling its space allocation in the stores, and setting the pricing and promotion of it. It also advised stores how to retail products effectively. Merchandising was centralized at headquarters in Boston. It was a profit center which made money by buying groceries and transferring these at cost-plus to store operations. Merchandising bolstered its total profit by purchasing large volumes so it got greater discounts. It furthered enhanced its profit by collecting allowances from food product manufacturers for a variety of reasons.

Operations management was responsible for handling products, including warehousing and distribution of products and all activities in the stores. Regional managers had individual store managers and maintenance services reporting to them. Individual store managers, called directors, were responsible for the profitability of the stores they managed. The profitability of stores was strongly influenced by the competitive situation each faced. The largest cost the directors controlled was labor which accounted for 65 percent of variable cost of a store.

Developing Super AM

In 1999 top management of EXPO-AM was looking for a new merchandising approach that would allow its traditional stores to become more profitable. Following the suggestion of top management in EXPO-EU, it looked at a recently proven model used in England—Super EU.

The European Model

The Super EU banner was developed by a division operating 65 supermarkets, a warehouse, and a central office in London. The division closed in 1996 after losing money for many years. Its management then worked out a new store layout and negotiated a unique labor/management agreement with its unionized labor. Under the new agreement which was known as the Gain Sharing Program (GSP), unionized employees were called "associates" and given a voice in how the stores

were run. Their wages were 15 percent lower than before but they received an additional incentive bonus based on the relationship between the total wages of the store and the store's sales revenue. With successful execution, associates could earn slightly more than they had previously.

In 1997, the division restarted operations under the Super EU banner. Starting with 23 stores, by year end it was operating 35 stores. By 2001 it was EXPO's most profitable divisions and had 140 stores across England. EXPO's Annual Report stated: "The Gain Sharing Program in an entrepreneurial environment translates into high morale, outstanding customer service, and an atmosphere of neighborliness." All Super EU stores qualified for bonuses and 28 percent exceeded expected savings between 1997 and 2001, providing employees with above standard bonuses.

The American Version

Ingo Perez gave Dave Philips, Executive Vice President of Merchandising at EXPO-AM, responsibility for testing whether the Super EU model would make sense in the U.S. The model was attractive because it could reduce store labor costs significantly. Management estimated that the Super EU approach in Massachusetts would save it over $500,000 per year in direct labor costs and fringe benefits for the average EXPO-AM store (Exhibit 3). Moreover, a new store banner

Exhibit 3: Comparison of Head and Wages Costs: Using Different Approaches to Labor, 2000

	EXPO-AM	Super-AM
Weekly Store Sales	$258,000.00	$258,000.00
Wage Cost Calculation		
Breakdown of Weekly Labor Hours		
Total store hours	2,150	2,150
EXPO-AM Full Time Hours (28 X 37)	1,036	
Super-AM Full Time Hours (10 X 37)		370
Part Time Hours (Total less Full Time Hours)	1,114	1,780
Hourly Labor Costs Including Fringes		
EXPO-AM Full Time $18.40/hour	$19,062.	
EXPO-AM Part Time $10.25/hour	$11,419.	
Super AM Full Time $14.70/hour		$5,439.
Super AM Part Time $7.75/hour		$13,795.
Total Weekly Wage Cost	$30,481.	$19,234.
Annual Savings in Using Super-AM Approach to Wages		$584,839.

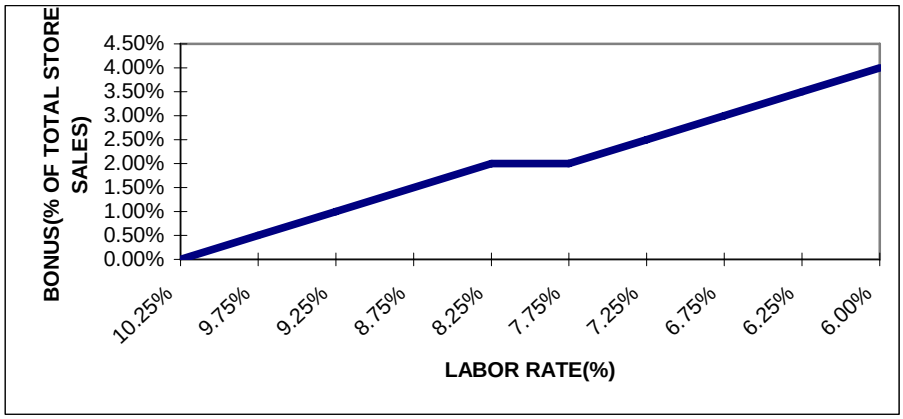
would give EXPO-AM greater ability to match the local competition. Management decided to adopt the Super EU approach under the banner name "Super AM Food Markets." It anticipated that five or six stores would be needed for the banner to break even.

Exhibit 4: Calculating the Incentive under the Gain Sharing Plan

Definitions:

Total Wages	= Hourly Rate + Fringe Rate for All Employees
Total Productive Wages	= Total Wages - Management Wages
Labor Rate	= Total Productive Wages / Total Store Sales

The bonus pool is calculated on the basis of a sliding scale as illustrated below:



An Example:

1.) Store 1 finishes the year with:
- Sales = $13,416,000
- Wages = $1,000,168
- Labor Rate = 7.45 percent
- Bonus Pool = $13,416,000* 2.3 percent = $308,568.

2.) A Full Time employee's wages at Store 1 are:
$34,000/yr **or** 3.40 percent of the store's Total Wages

3.) Employee's bonus is:
$308,568* 0.0340 = $10,491

The first and necessary step for the model to work was to get a new labor agreement with EXPO-AM's unionized work force. Philips, working with EXPO-AM's Industrial Relations department, negotiated an agreement with the Food Workers' Union. The new agreement was signed in June 0f 2000. The conditions were as follow:

1. Full Time store employees would become "associates" because they would contribute ideas on the management of stores.
2. For each $25,000 in weekly sales, the Super AM store was required to have one full time associate—in EXPO-AM stores one was required for every $10,000 in weekly sales.
3. Each Super AM store would have its own seniority system, eliminating transfer of associates from other EXPO-AM banners except for promotional reasons.
4. Super AM pay rates for associates would be 20 percent under those scheduled in EXPO-AM's labor agreements.
5. A GSP process would be in place in each Super AM store.
6. All associates in each Super AM store would share in an annual bonus. The size of the bonus pool would be based on a store's total annual labor cost relative to sales revenue. (Exhibit 4 presents more detail).

The new approach reduced each store's labor complement to 10 full time employees. EXPO-AM had never operated a store with so few full time employees but this was the only way to decrease full time hours to 25 percent of total hours.

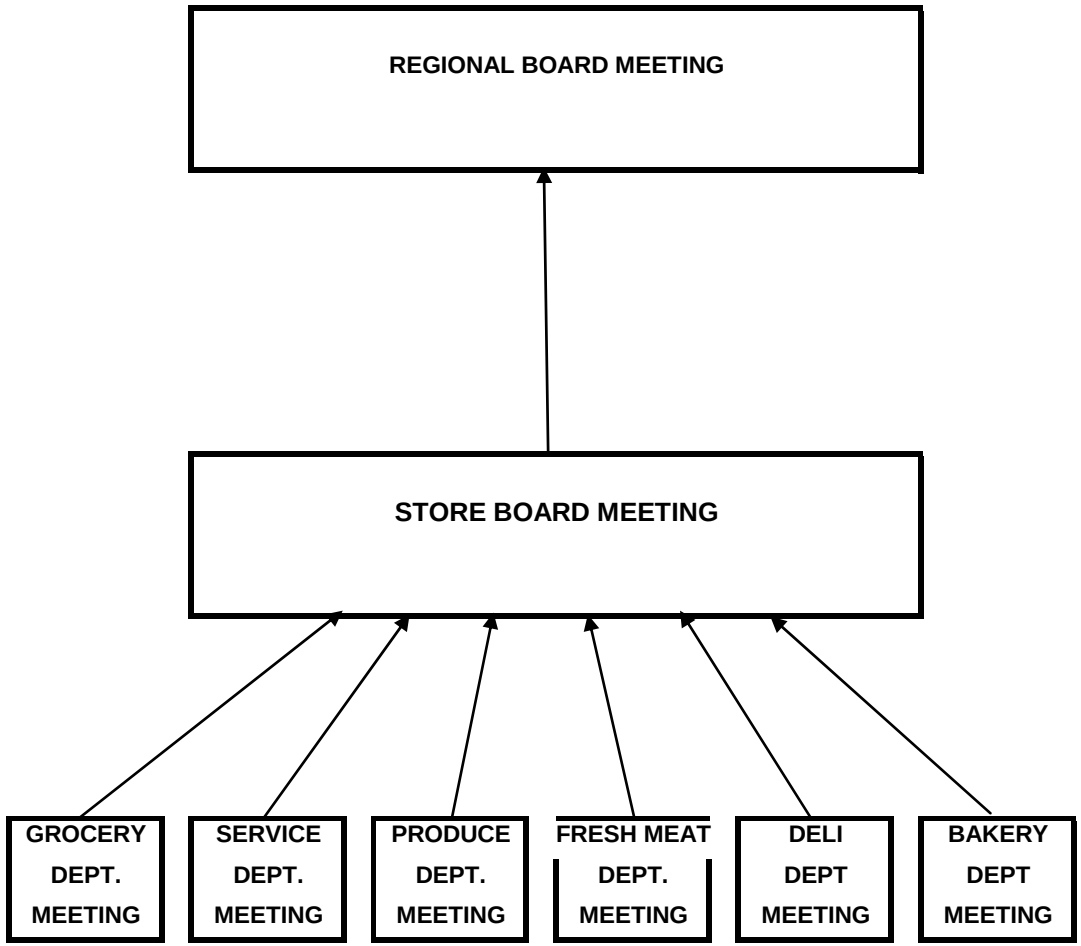
Under the GSP process associates were encouraged to contribute ideas for better managing the business. These ideas and issues were discussed and acted upon at the lowest possible organizational level. Matters only went higher when solutions affected or required agreement from those outside the group involved. The forum for discussing ideas and issues was a series of meetings was held on a regular basis (Exhibit 5). The first and lowest level meeting was at the departmental level in the store. The second level was at the store level. The third level of meeting was at the regional level and results were to be known at the store level within two weeks of this meeting. The fourth meeting was at the head office of EXPO-AM.

Super AM's Fit in Rochester

EXPO-AM's management chose to first use the Super AM model in Rochester for several reasons. First, it had no stores in Rochester—its closest EXPO-AM stores were in Ridgemount (7 miles away), Plymouth (15 miles away), and Peru (24 miles away). Second, management reasoned if this approach could compete in this highly competitive market, it would work in any market. Third, Rochester was less well served than other markets with one supermarket per 10,0050 residents while Boston had one per 8,970 residents and Worcester had one per 7,810 residents. Management calculated the Rochester had the potential for at least four additional supermarkets based on the number of stores per capita and projected population growth.

EXPO-AM's management reasoned that Super AM would have a tactical pricing advantage over established competitors in Rochester. Competitors with more

Exhibit 5: The GSP Meeting Structure



REGIONAL BOARD MEETINGS

Chair: General Manager

Attendees: Exec.V.P. Merchandising
V.P. Human Resources
General Manager - Super-AM
All Store Directors
One rep. from each store.

Frequency: Every 2 Months.

Duration: Usually less than 4 hours.

STORE BOARD MEETINGS

Chair: Store Director

Attendees: Store Director
All Department Managers.
One rep. from each Dept.

Frequency: Monthly

Duration: Usually less than 2 hours.

DEPARTMENT BOARD MEETINGS

Chair: Department manager.

Attendees: All Department associates.

Frequency: Monthly

Duration: Usually less than an hour.

stores would find it expensive to match its low prices and many price promotions because they sold much greater volumes.

Sizing up the Market

Philips had Edwards, then an employee in Merchandising, survey shoppers and examine competitors' stores in Rochester. His surveys showed that shoppers wanted more variety in goods, especially perishable products such as bakery goods and fresh fish, and better quality groceries. Shoppers saw Alberts as Rochester's quality leader and Shop Smart as its price leader. Edwards' surveys of store prices showed that Alberts was the lowest priced but that Shop Smart had a far more intense and visual in-store promotion using in-store price specials. These specials represented additional savings for regular customers but they were not large enough to be advertised in newspapers. Shoppers at each chain expressed tremendous consumer loyalty.

EXPO-AM needed sites for stores but established competitors already had the best sites. So it worked with a land developer which provided sites under ten year leases. The site for Store 1 (SAM 1 in Exhibit 1) was created by assembling land in a developed part of town. This made it an expensive site. The site for Store 2 was on the east side of town in an "immature" market but management concluded that new home construction would soon produce the population needed to support a store. It would face competition from a mid-sized Alberts' store approximately 1.5 miles closer to the center of town. The site for Store 3 on Liberty road on the west side of Rochester where population density was sufficient to support a store and more housing was being constructed nearby. The challenge with the site was that it was on a major road which made it expensive. Also, Alberts' two most successful stores in Rochester were also located along this road. Site development still had to find sites for two additional stores.

Developing the Merchandising Format

Edwards picked up a recent article from his desk and scanned through a quote he had highlighted in it. Gary Primus, president of the Boston-based Distribution Northeast Inc., a buying group for 3,000 independent food retailers across New England, was quoted as saying

> The Rochester area is a very select market, different from anywhere else in the country. Anybody that's not local has a very difficult time... If you're a little better than the next guy, if you give your people a reason to shop at your place more often, you're going to make some money. But anybody who tells you there's big money to be made in the region is just whistling Dixie.

Exhibit 6: Comparison of Competitive Conditions in Rochester, July 2000*

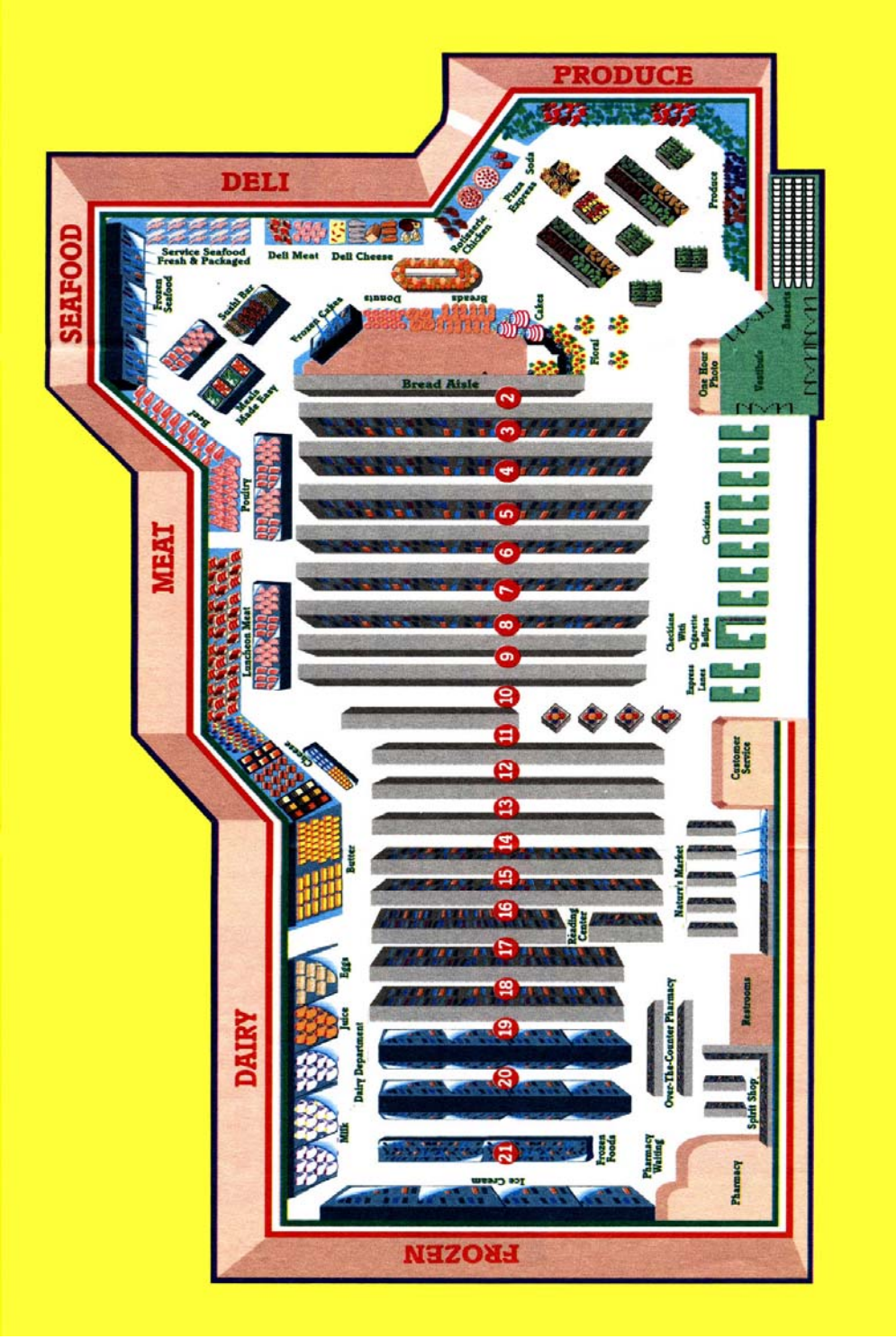
	Alberts	Shop Smart	Super AM	Comments regarding Super AM's strategy
Consumer Base Advantages				
Advertising	++	+	++	Same allotment to newspapers as Alberts
Customer Service	+	++	++	Friendly and fast
Every-day pricing	+	++	++	In store specials and matching Albert's pricing
Environment	+	-	++	Attractive since the newest store
Hours of operation	-	-	+	Only store open 24 hours a day
Location	++	++	-	Only one store
Quality of perishables	+	+	++	Generous reduction and refund policy
Variety	++	+	++	Many ethnic and few private label products
Weekly features	+	-	++	Lots of specials, signifying "More for less"
Total Consumer Advantages	11	9	15	
Operational Based Advantages				
Advertising cost	++	+	-	No synergistic advantages since only one store
Department margins	++	++	-	Need better sales mix and more experience
Occupancy costs	+	++	-	High rent
Wage costs				
Wage rate	-	+	++	Contractual advantages
Productivity	++	+	-	New store = New help = SLOW
Total Operational Advantages	7	7	2	
Overall Advantages	**18**	**16**	**17**	**Difficult opening position**

* Where + indicates a favorable situation, and ++ a very favorable situation.
Source: Prepared by Ted Edwards

Edwards designed a marketing mix for Super AM that looked attractive when compared with competitors (Exhibit 6). The store's layout was based on a store of 65,000 square feet (Exhibit 7). The layout would project an image of freshness and variety. Its produce counters would be the largest in the EXPO-AM chain, occupying over 15,000 square feet of the sales floor. The meat department of 4,500 square feet and the deli of 2,000 square feet would carry unique ethnic products. A complete in-store bakery department would occupy another 2,000 square feet and offer fresh baked goods daily. The dry grocery department, with 27,500 square feet, would include over 300 ethnic items not found in EXPO-AM stores. And the dairy department of 2,000 square feet would sell cheese from a local cheese factory in addition to regular brands. The rest of the square footage would be devoted to floral, frozen foods, health and beauty aids, pharmacy and service.

The pricing strategy was complex. Super AM tried to maintain comparable prices on produce and meat. To avoid price competition with Alberts, Super AM matched competitors' advertised special prices on basic grocery staples, bread, butter, cigarettes, eggs, milk, sugar, and tobacco. It maintained comparable prices on other items by checking competitors' prices a minimum of twice weekly.

Exhibit 7: The layout of Super AM's Store 1, 2001



To attract shoppers' attention, weekly advertised specials were priced below the advertised special prices of competitors. Promotions were printed in the local Rochester newspaper. This allowed Super AM to create its advertising two weeks before the printing date, and alter its copy up to 24 hours before the newspaper was printed. This allowed Super AM to keep its price promotions for meat and produce in line with cost fluctuations and to match competitors' advertising. In addition each store had a constant selection of at least 300 in-store (non-advertised) specials. These were well signed, creating the impression of extra value for shoppers.

Super AM also offered more service. There were more baggers at check out counters who were trained to be friendly, courteous and helpful. This included showing the customers where a product was, and handling refunds quickly and courteously. "Competitors might increase their workers at the checkouts but copying the workers' attitude will be difficult," said Edwards. The store demonstrated further its interest in customers by providing free coffee at the courtesy desk and a suggestion box near the checkouts.

For the shoppers' convenience, the store was open 24 hours a day six days a week instead of the 90 hours a week of the competitors.

Building the Organizational Infrastructure

The Super AM format required changes in EXPO-AM's approach to both merchandising and store management. Super AM was given two merchandisers of its own to buy specialty and local products offered in its stores. These were shipped directly from suppliers to Super AM stores. Super AM's merchandisers could also draw product from EXPO-AM's merchandising operations, capturing the low cost due to high volume purchases. Super AM's merchandisers alone decided pricing and advertised weekly promotions. They were also given the authority to hire and fire store associates—in EXPO-AM this was the responsibility of the store manager. This meant that the store's department managers and associates were very attentive to what the merchandisers said.

Super-AM's store management was kept separate from that of other stores because the union agreement and the GSP process required a very different approach to management. As part of this approach, only Super AM's employees were allowed in its stores.

Staffing Super AM

Philips was so pleased with Edwards work that he strongly encouraged Perez to appoint Edwards as general manager of Super AM. Although Edwards was only 32 year old, he had a wealth of experience at EXPO-AM, having worked for the company since he was 16. He had moved into store management upon graduation

from university. Within three years he was managing one of its busiest stores in Ridgemount. Edwards was then promoted to the head office in Boston where he ran the productivity department which managed store labor usage and performed time and motion studies. Edwards then spent two years in the merchandising department assembling weekly newspaper advertisements and flyers for EXPO-AM. A manager in EXPO-AM's headquarters commented, "Moving up this organization is very slow and it you make one mistake, you are gone. Edwards is one of the few successful fast trackers."

Perez made Edwards manager of Super AM in 2000. Edwards decided that three individuals could handle the merchandising responsibilities. He took charge of dry groceries, dairy and frozen food and all store promotions and weekly advertisements. The two other merchandisers were experienced merchandisers from EXPO-AM. He put one in charge of specialty products for the meat, deli, and bakery departments and the other in charge of special items for the produce and floral departments.

Edwards then developed the processes required to open and operate new stores. He tested the processes when he opened the first store, of which he became its director. He then he hired directors for each new stores as needed and worked with them to staff their stores.

Staffing the stores posed a challenge for several reasons. First employees had to manage more part time employees than was typical at EXPO-AM. And second, employees were developing the new store format, all the while serving demanding shoppers and competing against aggressive competitors. Edwards personally recruited 10 full-time associates for the first store: 2 assistant store directors, 5 department managers, and 3 others. Edwards commented on his approach:

> With so few employees in the store, I had to get the best I could find. I was able to attract a core group from the store I had managed in Ridgemount. They were young, aggressive types who had not been infected with EXPO-AM's culture. Being young, they lacked the seniority needed for promotion in EXPO-AM. I was able to offer them department manager positions in which they had the potential to make more money than at present. But I also had to appeal to their egos to get them, telling them that I needed them to make it a success. My track record in the company gave me credibility. Many who joined me at Super AM were personal friends.
>
> The Part time staff were recruited through job placement advertisements in state employment offices. Over 800 people responded and were interviewed 200 for part time jobs in the first store. We tested all of those selected for team and personality skills and checked their credentials carefully.

All employees were trained for Super AM. Full time associates were given 30-40 hours in customer service and 20 hours of training in the concept of GSP. This compared with total training of 15-20 hours a new hire would receive in an EXPO-AM store. Part time workers were given 37 hours of training. This included training in the GSP procedures, how to handle fresh and value-added products, and customer service techniques.

The General Manager of EXPO-AM's Region 2 which included Ridgemount commented "I am sick of seeing Edwards around here. First I'm excluded from participating in the development the Super AM stores, then he recruits my best workers. I have pointed out to top management that they are making a big mistake but most are not listening."

Events in 2000

The first Super AM store opened on Constitution Road in the center of Rochester at the end of November, 2000. Its total sales in the first week surpassed the sales of the grand opening of any prior EXPO-AM store.

Events in 2001

Sales were nearly $15 million and, though Super AM's first store had an operating loss of $670,000, an incentive bonus pool of over $60,000 was paid out to an enthusiastic group of associates at a banquet paid for by EXPO AM's headquarters.

Labor issues dogged the store over the year. First, twenty percent of Super AM's operating loss was attributed to inexperience employees. This problem was considered "solved" by year-end. A more serious problem was a result of the limited number of full time workers. It meant that the store was short of management when anyone was ill or went on vacation. And when employees were in the store, they were so busy training new part-time workers that they did not have enough time to perform ongoing maintenance. The time spent training part timers was especially onerous because of the high turnover of staff—on average part-timer workers only stayed for eight months. Exit interviews indicated that they were leaving because their starting wages were low. This problem could not be resolved by raising wages through merit increases because of restrictions in the labor agreement. Ironically, the first store had more employees than planned during the first year because some were being trained for the second store.

The GSP process worked well within the store, but personnel at the regional level had trouble adjusting to questions and suggestions from people at the store. For example, shoppers at Store 1 were often greeted with the smell of rotten fish. This happened because the prevailing winds blew the exhaust from fans in the seafood department across the roof of the building to the store entrance where the odor was

sucked back into the store by the fans. The regional people responsible for buildings made the necessary physical adjustment to solve the problem only after three months of shoppers' complaints and associates' suggestions.

Other employees in the EXPO-AM started telling stories suggesting that Super AM was a "problem child." Once while in head office, Edwards overheard one vice president say to another executive "Super AM's departmental margins are so low, some weeks they could save money by just giving merchandise away."

Each of the major competitors responded in its own way to the entry of Super AM. Shop Smart reacted immediately by matching every one of Super AM's advertised prices—a very costly tactic for it. Alberts did not react until April, when it re-opened the Super Center on Liberty Avenue as an Alberts Food and Drug combination store. Management at Alberts had been critical of the Super Center, its sister chain, for invading its hometown and now had a political and financial need to make the newly renovated site successful. It increased advertising, offered additional specials, and lowered prices. This brought back many previously disappointed customers, putting pressure on store margins at Super AM. Edwards lowered prices to maintain sales. Surveys conducted by Super AM indicated that it was having trouble attracting customers from Alberts, but good success attracting them from Shop Smart.

Edwards expressed disappointment when Perez left EXPO-AM to take a more senior position at Franklins. Perez was replaced by Davis, a more conservative executive from the senior ranks of EXPO-AM.

Events in 2002

During 2002, Store 1 came under greater competitive pressure. Edwards knew from new requests for store loyalty cards that Store 1 was still attracting a great number of new customers from Shop Smart. Shop Smart's management responded to lost shoppers by renovating its nearby store and introducing a sales program that attracted back the shoppers it had lost.

In April Store 2 on the east side of Rochester was opened. The area around Store 2 had not developed as hoped because a local recession, which started the previous year, had stopped the construction of new homes. This meant that Store 2 had to attract shoppers from the mid-sized Alberts' store (A10 in Exhibit 1) approximately 0.5 miles away.

Edwards bolstered Super AM's overall sales by developing an extensive advertising campaign that blanketed Rochester with advertising. The same grand-opening specials were available at both the first and second stores. The opening sales of Store 2 were over $500,000 in the first week—only slightly less than sales of Store

1's grand opening. However sales at Store 2 quickly began to falter and, because of the heavy promotions, the two stores had combined losses of $250,000 for the first period following the grand opening. For 2002 sales at Store 1 were 18 percent lower than the previous year and Super-AM had losses of $2.7 million. No bonus incentive was paid to the associates at either store at the end of that year.

Developing the Plan

Davis called Edwards on March 14th to ask him to develop a turnaround plan given the poor performance of the banner (See Exhibit 8). Davis said that there had been talk at headquarters of putting Super AM under an EXPO-AM supervisory team consisting of a District Manager and four EXPO-AM merchandisers. Head office would take over control of advertising, pricing, and revert to EXPO-AM's labor contract. Super AM's two merchandisers would be re-assigned to other positions within the company.

Exhibit 8: Consolidated performance of Super-AM, 2000-2003

	Actual 2000 (1 period*) ($000'S)	(%)	Actual 2001 (13 periods-FY) ($000'S)	(%)	Actual 2002 (13 periods-FY) ($000'S)	(%)	Actual 2003 (Periods 1-2) ($000'S)	(%)	Aggregate to date (29 periods) ($000'S)	(%)
Store Sales										
Grocery	1,631	65.6%	14,390	67.1%	20,585	68.0%	4,103	67.5%	40,709	67.5%
Meat	388	15.6%	3,314	15.4%	4,636	15.3%	914	15.0%	9,252	15.3%
Deli	100	4.0%	797	3.7%	1,042	3.4%	193	3.2%	2,133	3.5%
Bakery	73	2.9%	561	2.6%	722	2.4%	126	2.1%	1,483	2.5%
Produce	293	11.8%	2,397	11.2%	3,293	10.9%	740	12.2%	6,724	11.2%
Total Sales	2,485	100.0%	21,460	100.0%	30,279	100.0%	6,076	100.0%	60,300	100.0%
Store Margins										
Grocery	301	18.4%	2,251	15.6%	2,951	14.3%	524	12.8%	6,027	14.8%
Meat	48	12.2%	522	15.7%	574	12.4%	139	15.2%	1,282	13.9%
Deli	40	40.1%	290	36.3%	322	30.9%	58	30.1%	710	33.3%
Bakery	29	39.8%	204	36.4%	267	37.0%	45	35.7%	545	36.8%
Produce	79	27.0%	633	26.4%	728	22.1%	154	20.8%	1,594	23.7%
Total Store Margins	497	20.0%	3,900	18.2%	4,842	16.0%	920	15.1%	10,159	16.8%
LESS Adjustments	160	6.4%	1,490	6.9%	1,940	6.4%	188	3.1%	3,778	6.3%
Net Total Store Margins	337	13.6%	2,410	11.2%	2,902	9.6%	732	12.0%	6,381	10.6%
Total Store Income**	760	30.6%	4,326	20.2%	6,009	19.8%	1,319	21.7%	12,415	20.6%
Total Labor	255	10.3%	2,134	9.9%	3,427	11.3%	695	11.4%	6,510	10.8%
Total Advertising	152	6.1%	605	2.8%	698	2.3%	159	2.6%	1,614	2.7%
Total Supplies	25	1.0%	239	1.1%	296	1.0%	58	1.0%	618	1.0%
Total Variable Expense	432	17.4%	2,978	13.9%	4,421	14.6%	912	15.0%	8,742	14.5%
Selling Profit	329	13.2%	1,349	6.3%	1,588	5.2%	422	6.9%	-3,687	6.1%
Operating Expense	194	7.8%	392	1.8%	722	2.4%	153	2.5%	1,460	2.4%
Occupancy Expense	88	3.5%	1,573	7.3%	2,972	9.8%	614	10.1%	5,247	8.7%
Opening Expense	743	29.9%	54	0.3%	599	2.0%	31	0.5%	1,427	2.4%
Total Fixed Expenses	1,025		2,019		4,292		798		8,134	
Store Contribution***	(696)	-28.0%	(670)	-3.1%	(2,704)	-8.9%	(376)	-6.2%	(4,447)	-7.4%

* 1 period = 4 weeks

** Total Store Income = Total Sales - Cost of Merchandise - Total Store Margins

*** Store Contribution is not final profit. Divisional and Group Administration must still be subtracted as well as taxes.

Edwards knew that standard EXPO-AM merchandising practices would eliminate the specialty products and local products brought in to cater to the local population. Store prices would also be increased to raise margins to match those of EXPO-AM's stores. Operations in the store would also change. Personnel bagging customers' orders would be eliminated because time studies showed that two cashiers were more productive because a "bagger" only speeded up the checkout by 50 percent. Wage costs would be reduced by eliminating some departments and collapsing others so that employees worked several different departments. Employee hours would be reduced. This would mean cutting back the hours of specialized employees like meat cutters. GSP meetings would be minimized or ignored. Store hours would be reduced from 24 hours a day to the EXPO-AM's standard of 8 AM to 10 PM. Edwards summarized the impact of such changes in a chart like the one he had created when planning Super AM's offer (See Exhibit 9).

Edwards said to his wife, "I feel terrible about what will happen. Management has little appreciation for gain sharing—none of them have been trained in GSP. Associates bring forward good suggestions but I know they aren't going to be

Exhibit 9: Comparison of Competitive Conditions in Rochester, March 2003*

	Alberts	Shop Smart	Super AM	Comments regarding Super AM's strategy
Consumer Base Advantages				
Advertising	++	+	-	Ad space cut back
Customer Service	+	+	-	Insufficient hours allotted by headquarters
Every-day pricing	++	+	-	Limited in store specials and no matching Albert's pricing
Environment	+	-	+	Have the newest store, but Alberts has been upgrading
Hours of operation	-	-	-	Standard hours of operation
Location	++	++	+	Has three stores
Quality of perishables	++	+	-	Tight reduction and refund policy
Variety	++	+	+	Few ethnic and many EXPO AM private label products
Weekly features	+	-	+	Fewer specials with smaller reductions
Total Consumer Advantages	13	7	4	
Operational Based Advantages				
Advertising cost	++	+	-	Fewer sales = fewer ads = fewer sales and so on
Department margins	++	+	-	Low sales producing low margins
Occupancy costs	+	++	-	Highest rent
Wage costs				
Wage rate	-	-	+	Wage rates maturing
Productivity	++	+	-	Low sales → low productivity
Total Operational Advantages	7	5	1	
Overall Advantages	**20**	**12**	**5**	**Alberts dominates**

* Where + indicates a favorable situation, and ++ a very favorable situation.
Source: Prepared by Ted Edwards

accepted, or even considered by management. Morale will fall. And I will have let down many of the people I recruited for the business."

Under an advisory team, Edwards' duties would become typical of a regular store manager. He would have little voice in the operations of the stores as EXPO-AM's policies being implemented and enforced from head office. Furthermore, head office only wanted the information it requested.

As he worked on developing a turnaround plan, Edwards considered the present situation. In April 2003, Store 3 on the west side of Rochester was scheduled to open. Competition had changed since the first store opened. Alberts had become a company "running on all eight cylinders." It was making no mistakes overall and had improved the quality of its perishables and in store specials. Shop Smart had lost strength in the areas which had traditionally made it more attractive to customers. Similar to Super AM at this point in customer attractiveness, it still had considerable operational advantages over Super AM.

Edwards also realized that EXPO-AM's options were constrained. Each site that Super-AM occupied was under a 10 year leases. And in July 2003 the labor contract that Super AM operated under would ended. The union was saying it saw GSP of no future use.

International Food and Agribusiness Management Review
Volume 11, Issue 4, 2008

The Clustering of Organizational Innovation: Developing Governance Models for Vertical Integration

Molly J. Burress [a], Michael L. Cook [b]Ⓘ and Peter G. Klein [c]

[a] *Program Director, Division of Applied Social Sciences, College of Agriculture, Food and Natural Resources, University of Missouri, 125D Mumford Hall, Columbia, Missouri, 65211, USA.*
[b] *Professor & Robert D. Partridge Chair, Division of Applied Social Sciences, College of Agriculture, Food and Natural Resources, University of Missouri, 125 Mumford Hall, Columbia, Missouri, 65211, USA.*
[c] *Associate Professor, Division of Applied Social Sciences, College of Agriculture, Food and Natural Resources, University of Missouri, 135 Mumford Hall, Columbia, Missouri, 65211, USA.*

Abstract

This case explores a cluster of firms that emerged sharing a particular ownership structure. Typically, clusters are thought of as interrelated firms that produce similar products and services. However, we document the emergence and evolution of a cluster of entrepreneurial ventures that developed using a unique governance structure. We explore the deviant case of Renville, MN because of its notable success in developing a series of entrepreneurial ventures that provided producers with the opportunity to vertically integrate.

Keywords: collective entrepreneurship, organizational innovation, joint vertical innovation, cluster

Ⓘ Corresponding author: Tel: + 573-882-0140
Email: cookml@missouri.edu
Other contact information: M. Burress:burressm@missouri.edu; P. Klein: kleinp@missouri.edu

IAMA Agribusiness Case 11.4.B

Introduction

As farmers began expanding production and buying-up land throughout the 1970s, Renville area farmers realized horizontal expansion of their farming operation through the acquisition of additional acreage would not allow their community to prosper. Expanding farm size meant a dwindling number of farm families, making it difficult to maintain adequate infrastructure. For many communities across the Midwest, agricultural prosperity led to the demise of Main Street. But one rural community sought a revival.

While some rural communities attempt to lure factories and industry to locate in their area, this strategy failed to work for Renville. Undaunted, Renville area farmers began to develop a unique model of producer ownership. Producers have consistently chosen to pursue this collective entrepreneurial strategy rooted in joint vertical integration and organizational innovation. Farmers began to develop their joint vertical integration strategy by chance when a local processor shut down. Over the next 25 years, these local producers developed business experience, professional contacts, and a well-seasoned network of fellow investors to support investments in processing and marketing facilities.

To minimize high levels of investment and risk inherent in their ventures, these entrepreneurs developed an innovative organizational form: the New Generation Cooperative (NGC). This organizational form attracted many investors through the creation of investment incentives inaccessible to traditional forms of producer group action. After two well-publicized, profitable NGC ventures, farmers decided to pursue a similar strategy for several of the crops in their rotation. They joined together to identify opportunities to add value to a variety of their crops—primarily sugarbeets, corn, and soybeans. What began by chance after the closing of a sugarbeet processing facility, evolved into an interconnected agglomeration of local agribusinesses with a similar governance structure.

Clustering of an Organizational Innovation

Clustering of economic activity is widely recognized as resulting in economies of agglomeration. The great Alfred Marshall, in his classic text on economics, transformed the economic way of thinking by suggesting the existence of economies external to the firm that may be captured as a result of co-location. Due to proximity, firms may capture benefits from their industrial environment. Whether positing that firms co-locate for consumer convenience, from the sharing of a pool of laborers with specialized skills, or by borrowing innovative ideas, economists have long recognized the benefits of clustering (Marshall, 1890; Porter, 1998; Fujita, Krugman and Venables, 2001).

Economists often focus on clusters as "geographic concentrations of interconnected companies and institutions in a particular field" (Porter, 1998). In doing so, interrelated firms that produce similar products and services capture their attention. Recently, however, there has been a growing interest in the economic benefits derived from the clustering of certain organizational forms (Thompson, 2003). What agglomeration economies are available to groups of firms sharing key organizational or managerial characteristics though producing a variety of products? How do organizational clusters develop?

A Cluster of New Generation Cooperatives in Renville

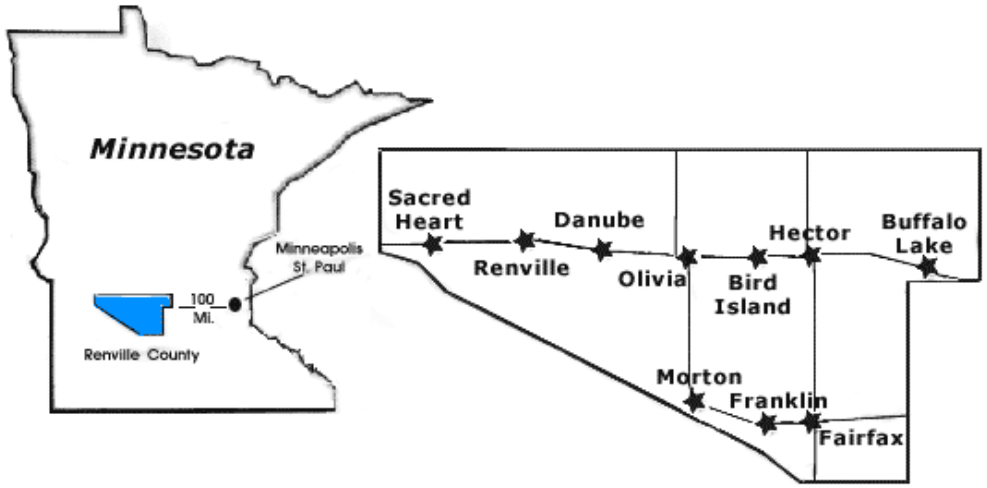
This case explores the adoption and diffusion of a unique organizational innovation that led to the development of a cluster of firms sharing a common governance structure, the NGC. It is a story of a rural community, a set of complementary agricultural resources, and an innovative and industrious people. These entrepreneurs leveraged their resources and social capital to form a "cluster" of NGCs, a process widely described as the "Renville Phenomenon." Unlike the typical industry cluster, this cluster is based not on a product, market segment, or technology, but on a particular set of organizational arrangements. Renville's unique model of producer ownership became so popular that the town of Renville began charging observers – coming from as far away as Brazil, Japan, Australia, and several European countries – $25 per person to observe Renville's business and community structure.

We begin by describing Renville County, Minnesota, presenting a snapshot of its success. To understand the roots and development of this phenomenon, we then trace this organizational innovation from its inception. We follow with a description of the unique aspects of the NGC governance model developed. Finally, we describe the proliferation of a series of interconnected NGCs developed in the Renville area and question what key elements led to the development of this organizational cluster.

Renville County, Minnesota

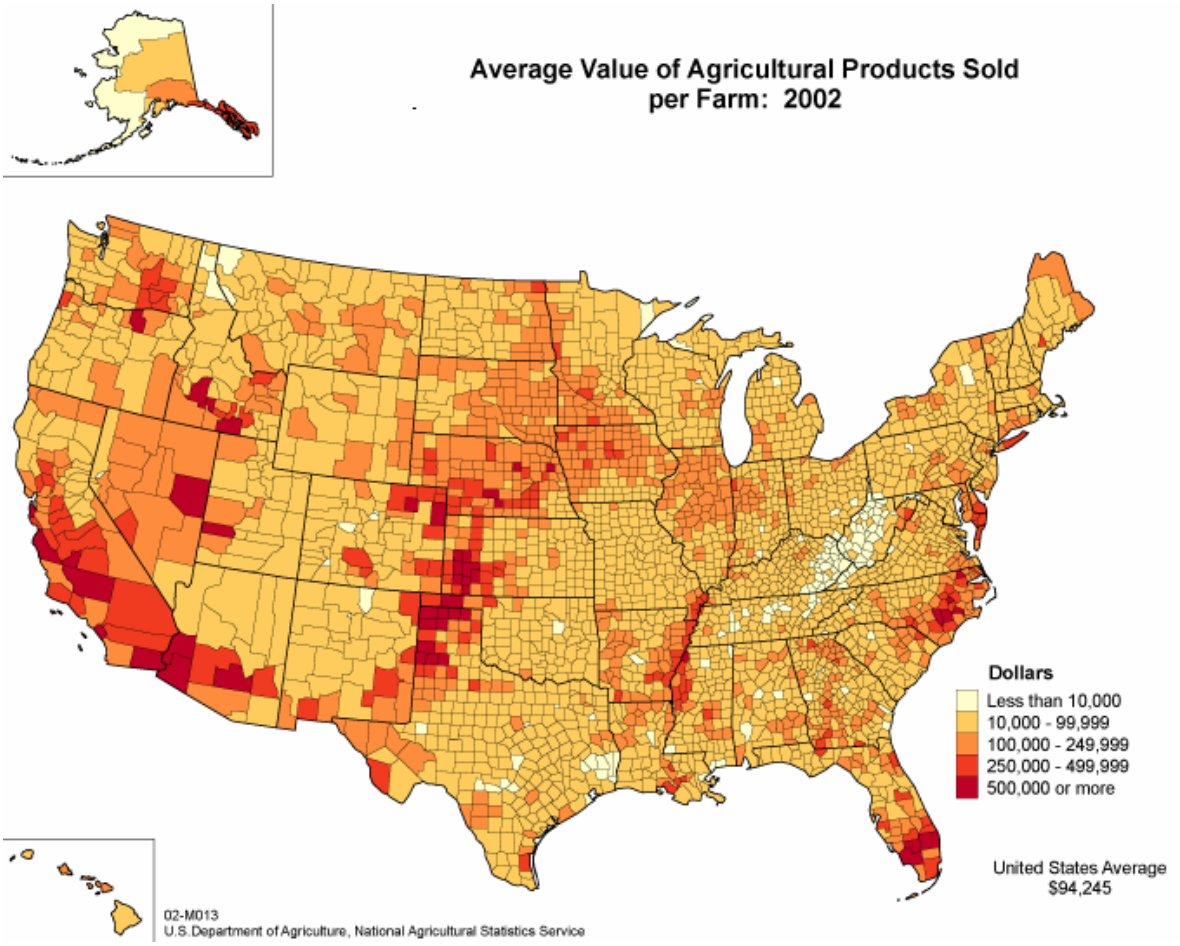
Located in Minnesota's western Corn Belt, Renville County is home to more than 1,500 family farms (Exhibit 1). Average farm size is 570 acres. The average market value of products sold per farm is over $270,000 (Exhibit 2). In 2002, Renville ranked number one in Minnesota in acres of corn for grain and soybeans with 247,053 and 245,244 acres, respectively. Renville County also ranked third in the state in acres of sugarbeets harvested with slightly more than 48,000 acres (National Agricultural Statistics Service, 2002).

Exhibit 1: Map of Renville



Source: http://www.co.renville.mn.us/index.asp?Type=B_BASIC&SEC={19D19153-9853-4F0E-AD69-F7179CDB1241}

Exhibit 2: Average Value of Agricultural Products Sold per Farm: 2002



The State of Minnesota leads the nation in acres of sugarbeets planted, with approximately 486,000 acres planted in 2004. Minnesota is also a top producer of corn and soybeans, ranking fourth in the nation in acres of corn and third in the nation in acres of soybeans planted. Average farm size in Minnesota is about 340 acres, compared to the U.S. average of 441 acres. The average value of agricultural products sold per farm is $106,083, above the U.S. average of $94,245 (National Agricultural Statistics Service, 2002).

Renville's land is productive. However, transportation costs often put area farmers at a commodity trading or marketing disadvantage. Barge terminals on the Mississippi River and processing mills in the Twin Cities are some 100 miles away. Rail service is relatively expensive and unreliable. Therefore, "farmers pay close attention when there is talk of increasing the value of their corn and reducing the costs of transportation" (Gerber, 1996). Nonetheless, Renville is widely recognized as a highly innovative community, one where producers experiment with the latest technologies and business arrangements. Starting in the early 1990s, Renville County became known for numerous progressive and innovative producer owned and controlled cooperatives. Seven of these were of the configuration called the NGC. The NGCs included Southern Minnesota Beet Sugar Cooperative (SMBSC), Minnesota Corn Processors (MCP), ValAdCo, Golden Oval Eggs (GOE), Churchill Cooperative, Phenix Biocomposites, and MinAqua Fisheries Cooperative. The City of Renville, home to four NGCs, bills itself as America's "Cooperative Capital."

With 841 cooperatives and 185 credit unions, Minnesota is one of the nation's leaders in terms of the number of organizations in the state using the cooperative form of governance. About half of these cooperatives are agricultural cooperatives. Studies indicate Minnesota is home to 311 cooperatives, generating $6.07 billion in revenues and 79,363 jobs. The economic impact of these cooperatives organizations is estimated at $10.89 billion (Folsom, 2003).

Minnesota also leads the nation in NGCs as the home of at least 42 organizations with this unique governance structure (North Dakota is second, with 33, and Iowa ranks third, with 31.) (Merrett, et al., 2003). Minnesota became a hotbed for NGC investment in the 1990s, but the roots of this collective entrepreneurial movement began decades before, with a collective investment in sugarbeets. We delve into the historic development of this organizational form to uncover the origin of what would become a cluster of organizational innovation.

Renville's First NGC: Southern Minnesota Beet Sugar Cooperative

Renville's first NGC was a sugarbeet processing facility built on the edge of town in 1974. The "new generation" governance structure was a little known concept. And, Minnesota was a relatively small player in the sugarbeet industry. So, how and why did this new generation sugarbeet cooperative emerge in the small town of Renville?

Part of the answer lies in the hands of a few farmers who had added a profitable, alternative crop to their rotation years before and in a series of investments that would leave farmers with equipment of little value if sugarbeets were to be pulled from their rotation. In the next few paragraphs, we explore the roots of Minnesotan producers' investment in sugarbeets, the specific nature of those investments, and the process by which producers chose the NGC model. Understanding these elements of Renville's history and the success of early NGC pioneers allows us to begin to describe the process by which a cluster of NGCs developed in midwest Minnesota.

In 1906, a sugar processing plant opened in Chaska, Minnesota, near Minneapolis (Exhibit 3). Growers who delivered to the plant were primarily from southern Minnesota (Minnesota Historical Society). However, in 1918, a farmer from northwestern Minnesota, in the Red River Valley, sent sugarbeets to the Chaska factory. Within a few years, other farmers from the Red River Valley were also producing small crops of sugarbeets to be sent to Chaska (University Archives). In the early 1920s, Red River Valley growers convinced the Minnesota Sugar Company to build a plant in their area on the condition area farmers help finance the project (Kotov, 2001).

In 1925, Minnesota Sugar was purchased by an investor-owned firm that would later become American Crystal Sugar Company (Kotov, 2001). Farmers came together to organize a bargaining association, Southern Minnesota Beet Growers Association (SMBGA), to represent sugarbeet growers in negotiations with American Crystal Sugar (ACS) (Trucano, 1997). Southern Minnesota growers continued to deliver their beets to the ACS facility in Chaska.

As processing capacity grew, growers began to increase sugarbeet production. Local processing capacity was crucial to the economic success of sugarbeet farms. To achieve greater production efficiency, farmers invested in specialized equipment such as defoliators and harvesters. This equipment was not used in other crop rotations, including corn and soybean. The absence of a processing facility in the area would leave farmers owning equipment of little alternative value. Proximity was also crucial to sugarbeet growers. Long hauls usually reduce grower returns, not only in terms of transportation costs but also in terms of lost sucrose content. Grower payments are generally based on the "extractable sucrose content of their beets" (Cattanach, Dexter and Oplinger, 1991). And, sucrose content declines quickly after harvesting, depending upon piling and temperature conditions (Brester and Boland., 2004).

Domestic agricultural policy played an important role in sugarbeet industry growth during the Post World War II period. The Sugar Act of 1948 supported domestic sugar prices and, consequently, production. This act, which remained in effect until 1974, established domestic and import quotas (Minnesota Historical Society).

Exhibit 3: Timeline of the Early Years: Southern Minnesota Beet Sugar Cooperative

Year	Event
1906	Sugarbeet plant opens in Chaska, MN
1941	Southern Minnesota Beet Growers Association formed to represent sugarbeet growers in southern Minnesota in negotiations with American Crystal Sugar
1960	Sugarbeets continue to be an important crop in the region, despite growing concern that government support for the sugar industry may be waning
1971	Chaska Plant Closes
1972	Growers in southern Minnesota begin organizing to build their own processing facility in Renville, MN to be named Southern Minnesota Beet Sugar Cooperative
1973	Growers in Red River Valley buy remaining American Crystal Sugar facilities and convert the company to a cooperative Southern Minnesota Beet Sugar Cooperative signs a joint management agreement with American Crystal Sugar
1974	Southern Minnesota Beet Sugar Cooperative must delay plans to open their factory due to construction delays and the uncertainty of financing arrangements
1975	Southern Minnesota Beet Sugar Cooperative begins processing sugarbeets, but their success was fraught with management and technical problems
1976	Southern Minnesota Beet Sugar Cooperative and American Crystal Sugar consider a merger Merger proposal fails to receive 2/3 vote among American Crystal Sugar shareholders
1977	Proposed merger with American Crystal Sugar is defeated again Southern Minnesota Beet Sugar Cooperative's financial backers fought to "cut their losses" and withdraw from the Renville processing facility Some growers decided not to plant their contracted acreage
1978	Southern Minnesota Beet Sugar Cooperative hires their own management team and amends bylaws to penalize growers who did not plant their full 1977 crop Southern Minnesota Beet Sugar Cooperative finally signs a long-term loan agreement that was achieved with the help of a loss-sharing agreement between construction lenders and the contractor
1980	Second year of successful operations at Southern Minnesota Beet Sugar Cooperative

Foreign policy also played a role in sugar production decisions. While sugar is produced in almost every country, cane producers have a cost of production advantage. When trade ceased between the United States and Cuba in the early 1960s, the US sugar industry hoped they would see a boost in their production quotas (Minnesota Historical Society). However, sugar imports from other nations made up the shortfall. American Crystal Sugar's strategic reaction was retrenchment, selling off what assets they could and closing plants that were too unattractive to be purchased. This is the volatile, excess capacity, low-margin environment in which the domestic industry found itself in the late 1960s.

By the early 1970s, Renville area growers had a substantial investment in sugarbeet equipment. Nevertheless, the Chaska plant, to which southern Minnesotan growers delivered, was an aging facility. Citing "small size, obsolescence, high cost of freighting beets, and the cost of renovating and adding pollution controls," ACS announced its decision to close the Chaska plant in 1971 (Southern Minnesota Sugar Cooperative). Sugarbeet growers in southern Minnesota were left without a market for their sugarbeets (Exhibit 4 and 5).

The SMBGA began the search for a sugar-manufacturing firm willing to build a processing facility in southern Minnesota. SMBGA approached several established companies including Michigan Sugar Company, Utah and Idaho Sugar Company, Amalgamated Sugar, C&H, Cargill, General Mills, Pillsbury, and International Multifoods. The companies' responses were generally consistent: returns on

Exhibit 4: Acres of Sugarbeets Planted in Select States as a percent of US Total Acres Planted, 1924-2004

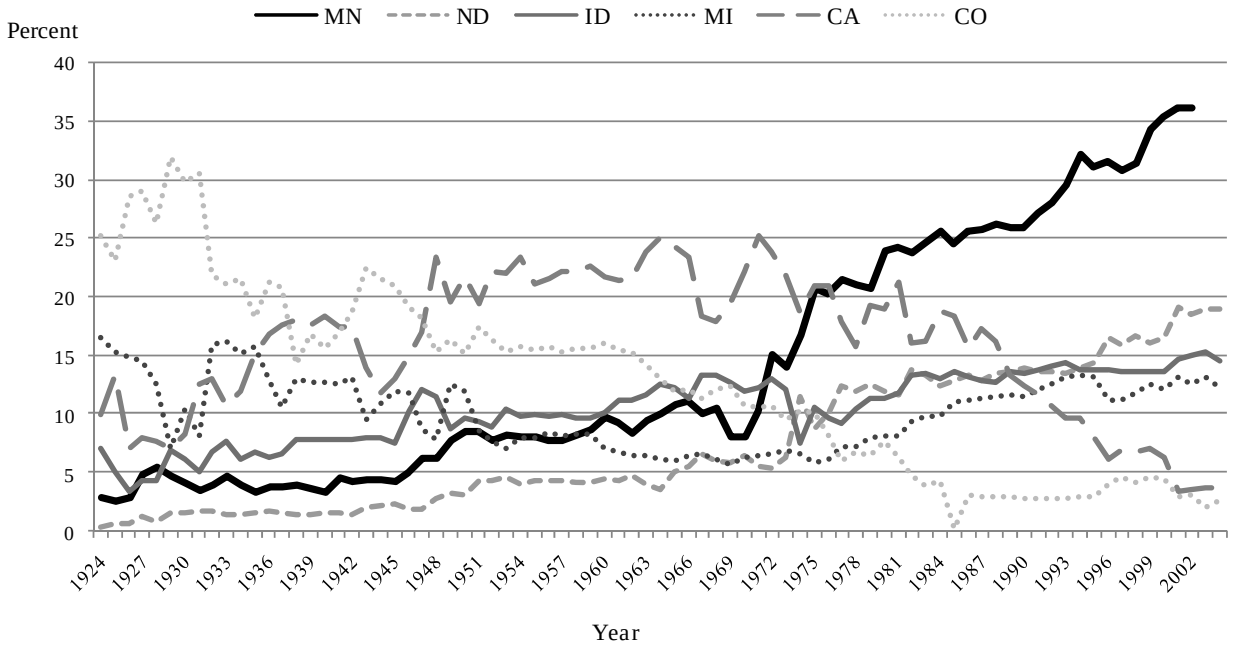
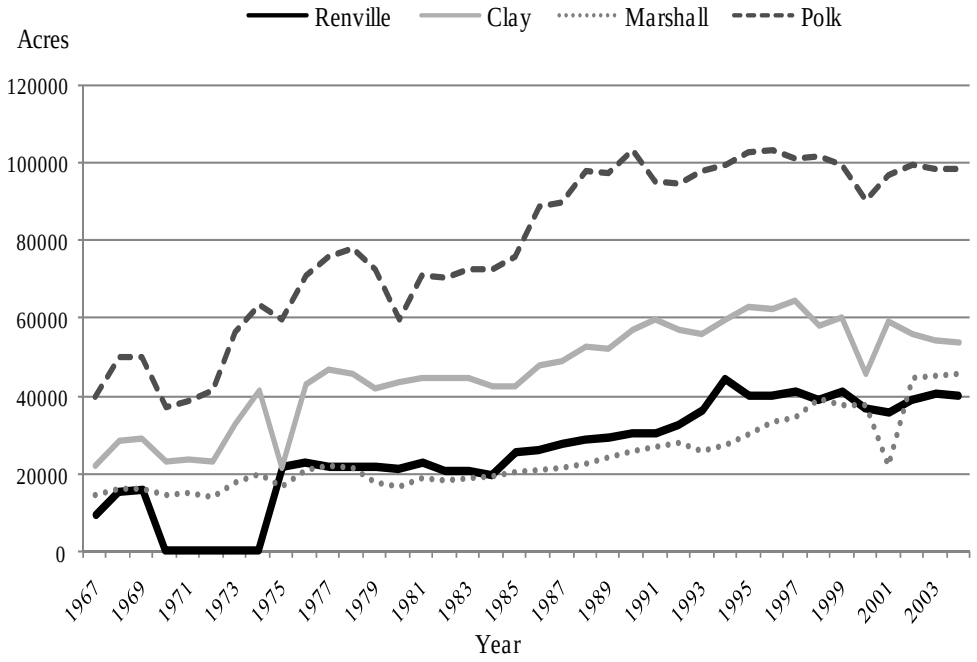


Exhibit 5: Acres of Sugarbeets Harvested in Select MN Counties, 1967-2004



investment in processing were not large enough to warrant building a new factory. Area growers concluded "if a factory were to be built," they would "have to do it themselves" (Trucano, 1997). But no single producer could afford an investment in a processing facility with efficient scale.

Similar problems faced growers north of Renville, in the Red River Valley. Producers were uneasy with the prospect of ACS plant closings. They noted that remaining ACS facilities were not being maintained properly. Therefore, the Red River Valley Growers Association (RRVGA) sought representation on American Crystal's board of directors (Volkin and Bradford, 1975). Members of the association decided to begin raising capital to purchase 100,000 ACS shares to ensure growers could "exert sufficient growing power to influence" corporate decisions. In the process, however, RRVGA decided to see if ACS would be willing to sell the organization outright. After almost two years of negotiations, antitrust hearings, and complex legal and financial arrangements, ACS, a New Jersey corporation, converted to a cooperative on June 14, 1973 (Volkin and Bradford, 1975).

The Red River Valley Growers, their experience and their decision to convert an investor-owned firm into a New Generation Cooperative encouraged and challenged Renville area growers to pursue a similar strategy. While Red River Valley growers organized to the north, a core group of growers in southwest Minnesota grew determined to own a local processing facility as well. The Southern Minnesota Beet Growers Association spent much of 1972 holding exploratory meetings with

growers. Their grand plans started with a small commitment from would be producer-investors. Plans to build their own processing facility began with SMBGA board members initially asking growers to put up only $5 per acre "to use as seed money" (Trucano, 1997).

In order to choose the optimal site for construction of a new processing facility, SMBGA set the following location decision criteria:

1) a central location was of critical importance because of the need to minimize freight problems (the Growers Association vowed not to repeat the freight problems experienced at Chaska);
2) adequate space (at least 600 acres) to permit the construction of waste water holding ponds and to serve as a buffer against neighboring landowners;
3) access to good highways and a financially-sound railroad;
4) availability of electricity; and
5) availability of a good water supply. (Trucano, 1997)

A section of land bordering Highway 212, just east of Renville, was selected as the best location. While producer-owned organizations can be vulnerable to influence activities among their members to affect the location chosen for building, SMBGA leaders took a Marshallian approach to deciding location: they attempted to co-locate their processing facilities with existing assets and infrastructure to capture any present external economies (Tong, 1997).

As growers' attempts to arrange financing, construction, and management of the sugarbeet processing facility ensued, their resolve was continually challenged by complex financing arrangements, construction design problems, poor initial operational efficiency, and low levels of commitment on the part of some producers. Growers contributed equity capital to the venture in proportion to the acres of sugarbeets they were contracted to deliver. Much of this equity capital was financed through a series of individual loans and guaranty funds. In other words, funds not contributed upfront, in cash, were made available by lenders only after (1) promissory notes were signed with each individual producer, (2) a guaranty fund was set up by the Cooperative to fund any defaults, and (3) producers agreed to make annual contributions to the guaranty fund to cover any potential defaults by fellow growers (Trucano, 1997).

The complexity and uncertainty of long-term debt financing agreements left the venture with little working capital and little ability to afford the high salaries of upper management. When managerial or construction problems ensued, delays were inevitable. Delayed construction combined with design problems, mechanical breakdowns, unresponsive management, and ill-prepared workers led to poor operating and financial results. Consequently, some growers did not fulfill delivery

contracts, further exacerbating the problem of operating efficiencies. Non-delivery of sugarbeets was a serious threat to the cooperative. The success of the sugarbeet processing facility would depend upon the producers' ability and willingness to maintain the supply of input factors while the facility worked to optimize operations. Producers began to realize they would only receive payment for their sugarbeet deliveries if the cooperative was profitable. Tensions ran high because growers had put their farms and their future at risk to invest in this venture.

While processing facilities opened and slicing began in 1975, it wasn't until 1978 that the cooperative was able to resolve many of its operating challenges. In 1978, the cooperative's board of directors amended their bylaws to give the ability to recover stock or penalty payments from growers who failed to honor their delivery contracts. The cooperative learned to appreciate the value of strict supply contracts. SMBSC also hired new management and finalized long-term financing agreements.

The cooperative's financial health depended on a settlement with construction lenders. Facing significant losses if the cooperative were to close its doors, construction lenders reached an agreement with SMBSC that would allow the processing facility to remain open. Fifteen percent of the loan amount was to be paid immediately. Profit-sharing mechanisms were also put in place with construction lenders for a fifteen-year period.

Today "Southern Minn," the area's first NGC, processes and markets sugarbeets and their co-products for the producer-owners. As farmers across the midwest were hit by an agricultural crisis in the late 1970s and early 1980s, sugarbeet farmers in Renville were entering into a new era of prosperity. Sugarbeet processing income provided an additional source of revenue and helped to stabilize the agricultural economy in the area while traditional corn and soybean crop farms suffered.

The NGC: Promoting Collective Investment through Organizational Innovation

Subsequently, grower groups from many states in the US and numerous countries have adopted variations of the investment and governance model developed by the sugarbeet growers in the Red River Valley and southern Minnesota. This governance, or organizational, structure has come to be known as the NGC. Governance structure, in this context, refers to the institutional framework and method of organizing producer-investors utilized to order their transactions, reduce potential conflict, and realize potential gains (Williamson, 1996).

Vaguely Defined Property Rights

When compared with the traditional agricultural cooperative model, numerous organizational design, internal incentive, decision authority, and property rights

attributes emerge as distinguishing characteristics of the NGC (Exhibit 6). The organizational innovations adapted in this model are hypothesized to ameliorate certain vaguely defined property rights associated with the traditional cooperative model. Vaguely defined property rights in an organization can exacerbate common cooperative dilemmas such as free-rider, horizon, portfolio, influence and control problems (Cook, 1995).

Exhibit 6: The Structure of Ownership and Control Rights in Cooperatives

Traditional Cooperative	New Generation Cooperative
Open membership	Defined membership
Growth capital from retained earnings	Growth capital from up-front equity investments and pooled retains
No obligation to deliver raw materials	Binding delivery contracts: right and obligation to deliver
No investment liquidity	Investment liquidity through limited transferable equity shares
No appreciation of investment	Capital appreciation through limited secondary market valuation

All organizations may be affected, to some degree, by vaguely defined property rights. The term vaguely defined property rights stems from the notion of incomplete contracting—the claim that all contracts inevitably contain gaps or loopholes. Why can't we develop contracts to cover all possible contingencies? Researchers generally look to three main arguments when explaining the incompleteness of contracts 1) unforeseen circumstances, 2) high costs of exhausting contingencies and 3) imprecision of language (Milgrom and Roberts, 1992).

Because contracts are incomplete, non-contracted or residual control rights and residual claimant rights must be assigned to one or more parties. Residual control rights are defined as the "right to make any decisions concerning the asset's use that are not explicitly controlled by law or assigned to another by contract" (Milgrom and Roberts, 1992). Similarly, residual claimant rights are the rights to receive any net income the firm produces after all contractual obligations have been met. The coupling of these rights ensures that actors bear the full financial risk of their actions. Decoupling of claimant and control rights creates the potential for agency costs and cooperative dilemmas, as those actors possessing residual control rights can make decisions that affect the net income available to claim without bearing the full wealth effects of their decision.

Decoupling of Residual Claimant and Residual Control Rights in the Traditional Cooperative

Cook and Iliopoulos argue that, in the traditional cooperative, claimant and control rights are slowly decoupled, resulting in an inefficient organization (Cook and Iliopoulos, 1999). Overtime, residual claimant and control rights are redistributed resulting in significant costs to the organization in terms of collective decision-making and agency costs. While this topic is as complex as the variety of cooperatives that exist, a few general examples can be given. In traditional cooperatives, membership is generally open to anyone choosing to deliver to the cooperative. A small fee, ranging from $25-$100 dollars may be assessed, but membership and voting rights are granted to any person meeting membership qualifications. Members may choose to deliver goods to or purchase goods from the cooperative, but are not obligated to do so. Depending on the market conditions, this often translates into fluctuations in supply and demand that are difficult to predict and manage, impacting the operational efficiency of the organization.

If the cooperative's payment method is a "cost of goods sold" (COGS) approach, earnings are allocated to members. To maintain certain tax advantages, twenty percent of the earnings must be paid in cash. Usually, marketing COGS cooperatives will distribute a greater percentage in the form of cash. The remaining allocated equity is kept within the cooperative as working capital. After a few years, allocated equity is returned at book value to the member in proportion to patronage. Before this allocated capital is returned to the member, however, cooperatives may have already experienced a decoupling of ownership and control rights. Those members maintaining a significant proportion of allocated equity may no longer be maintaining equivalent proportions of patronage.

In a pooled cooperative, which is the case in many NGCs, a portion of net revenue is retained for working capital use while the rest is distributed to members in proportion to patronage as "net proceeds." The allocated, but undistributed, capital is considered equity capital. Since this equity is redeemed at book value, there is little or no incentive to trade it and no opportunity for appreciation in value. In traditional marketing cooperatives, this equity capital is acquired in a passive or quasi-passive manner whereas, in NGCs, the original risk capital is invested "up-front." This up-front investment is called a delivery right (or share), is treated as a tradable and appreciable asset, and is non-redeemable. The amount of delivery rights is finite in number, thus decreasing some of the free-riding problems associated with open-membership cooperatives.

Membership, Investment and Contractual Characteristics of the NGC

Cooperatives that began in the early part of the twentieth century may have been able to borrow up to ninety percent in order to build their facilities. However, as

sugarbeet growers discovered in 1972, the cooperative banks were reluctant to lend more than sixty percent of project costs (Trucano, 1997). Therefore, if growers wanted to build a processing facility, it was necessary to capitalize the organization up-front, with significant initial grower investment. Up-front risk capital investments, processing efficiency, and quotas on sugar rendered a policy of open membership and voluntary delivery economically infeasible.

The NGC model builds on characteristics embodied in the sugarbeet model. These characteristics begin to ameliorate some of the "efficiency-robbing effects of vaguely defined property rights" in the traditional cooperative model (Cook and Iliopoulos, 1999). Non-redeemable equity investments provide both user and investor benefits. As a user, shares provide the farmer the contractual right and obligation to deliver a specified raw material. Shares are also appreciable and transferable, providing the farmer potential returns on the initial investment as well as limited liquidity. An initial share offering may be open to qualified producers as defined in the cooperative bylaws. However, after share offerings, membership is closed. Future user-investors must wait for another offering or purchase existing shares from a current NGC member to acquire delivery rights.

NGCs are a hybrid: a complex organizational structure subject to intricate state and federal tax codes. Cooperative organizers often note the substantial time and money spent with specialized legal teams and accountants. Organizers in other states, attempting to recreate the Renville model, have learned the importance of collaboration with organizers, accountants, and lawyers having expertise in these unique cooperative structures when beginning a new venture of this nature.

Producers Fighting to Survive Are Met with Opposition

Conditions were not favorable for adopting the traditional cooperative model in the 1980s. Traditional cooperatives had systematically relied heavily on debt to finance their infrastructure investments. But, cooperatives organizing in the 1980s were met with high interest rates and banks reluctant to lend to organizations with less than a fifty percent equity position. Banks were simply not in a position to take on the level of risk they held even a few years before with the development of SMBSC. Many farmers were convinced they needed to invest in processing facilities, adding value to their crops, in order to survive rapid consolidation in the agricultural industry. They decided to utilize the radically different organizational design pioneered by SMBSC.

Radical changes in governance structure, however, meant that cooperatives were created with defined membership: delivery of commodities was neither open nor voluntary. The proliferation of this new governance structure brought about strong reactions among local farmers. Many farmers were opposed to the notion of defined membership. They contended that the spirit of cooperation involved open

membership. And yet, the open membership model provided no incentive or mechanism for investors to provide risk capital to cooperative ventures, especially for capital-intensive processing entities. Growers were not unanimous in their views regarding this new governance structure. While farmers in the area debated over whether the innovative idea of defined membership was aligned with their view of cooperative principles, an eager subset continued a vertical investment strategy based on the NGC model despite debate.

Cooperative Fever: A Wave of NGCs in Renville and the Surrounding Area

The Minnesotan sugarbeet governance model was developed in part by following an organizational strategy borrowed from Suiker Unie in the Netherlands, another producer-owned sugarbeet cooperative. In consultation with Minnesotan growers, Suiker Unie leaders posed an important question: why were American new generation sugarbeet cooperatives only working with sugar when "most beets are grown in three year crop rotation schemes" (Egerstrom, 1994). Renville area growers took this line of questioning to heart. They began a quest to utilize the NGC model to add value to their corn and soybean crops (Exhibit 8). What happened next has come to be known as "cooperative fever" (Harris, Stefanson and Fulton, 1996; Patrie, 1999) .

Farmers began developing cooperative enterprises, applying the "sugarbeet model" to other crops (Exhibit 7). The 1980s and 1990s saw a wave of cooperatives develop in southern Minnesota and North Dakota. The sugar cooperatives in Renville and the Red River Valley served as generic models to growers of other commodities. As producers observed the success and challenges of the NGC structure, they began to modify organizational practices, policies, and bylaws to fit their membership preferences. Producers who developed leadership and organizational management experience serving on one cooperative board would subsequently share their expertise with other organizations by serving on multiple boards. Often, bylaws from a previous organization were consulted when forming a new entity. Familiarity with the model, its advantages and disadvantages, proved valuable as growers continued to tinker with organizational arrangements in an effort improve the sugarbeet model. This tacit knowledge, gained by leadership or investment roles in previous cooperatives, supplemented the emergence of NGCs in the area. Tacit knowledge is difficult to measure because it is generally acquired through experience or learning by doing (Arrow, 1962; Polanyi, 1966). Despite measurement difficulties, however, this concept enhances our understanding of the creation of new firms and cooperative development (Zook, 2004; Goldsmith and Gow, 2005).

The disadvantages of producing agricultural commodities including low per unit prices and volatile markets, spurred farmers to search for better strategies. From their experience with sugarbeets, farmers "understood the value" of their crops and

Exhibit 7: Renville Phenomena Timeline

Year	Event
1972	Growers in Southern Minnesota begin organizing to build their own processing facility
1973	Growers in Red River Valley buy remaining American Crystal Sugar facilities and convert company to a cooperative
1975	Southern Minnesota Beet Sugar Cooperative begins processing sugarbeets
1978	Southern Minnesota Beet Sugar Cooperative resolves management problems and amends bylaws to penalize growers who did not plant their full 1977 crop
1980	Minnesota Corn Processors forms
1989	Co-op Country explores investments to resolve equity redemption problems
1991	ValAdCo forms in order to pursue opportunities in the hog industry that had been identified by Co-op Country
1992	Phenix forms, exploring environmentally friendly building materials that utilize soy flour and wheat
1993	United Mills is developed by Co-op Country, ValAdCo and Golden Oval Eggs to meet local feed milling needs
	Churchill forms
1994	Golden Oval Eggs legally forms, producing liquid egg, as a strategy for adding value to members' corn.
1996	MinAqua forms utilizing soy pellets for tilapia feed
1999	Golden Oval Eggs expands to Thompson, Iowa
2004	Golden Oval Eggs converts to a Limited Liability Company

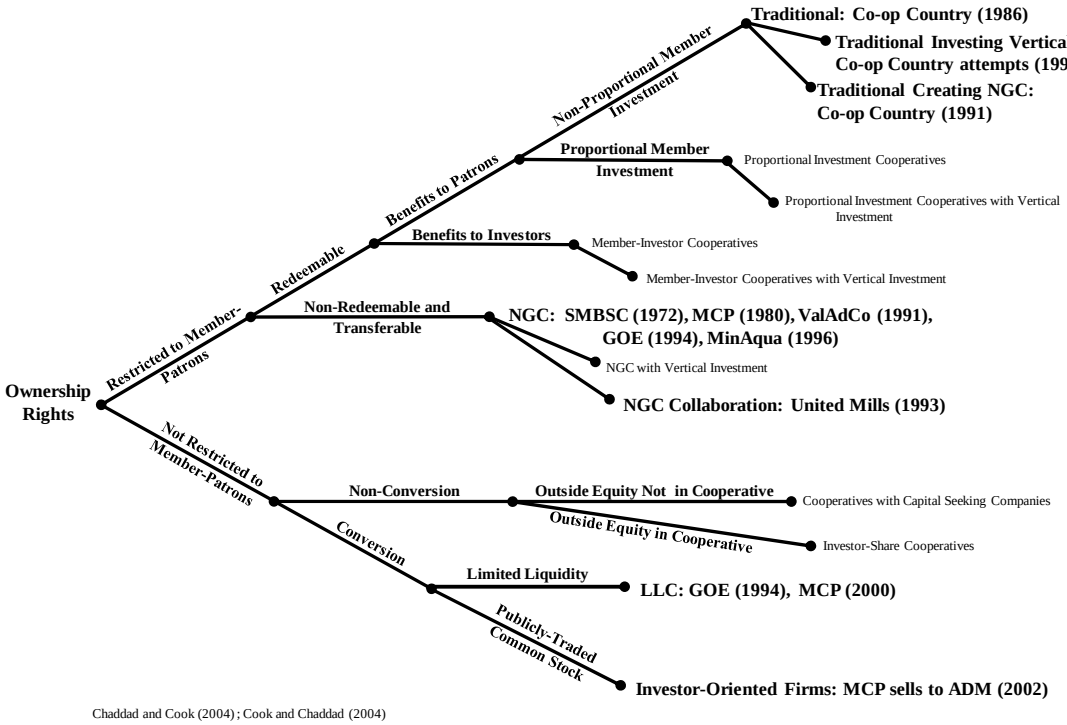
were no longer satisfied to deliver commodities "to the local elevator, with future profits enjoyed by those who refined and processed farm commodities" (Buschette, 2001). These farmers created an organizational structure that provided incentives to invest and the ability to gain necessary scale economies to compete with large agribusinesses (Exhibit 9). By expanding vertically, these producers were able to "profit" by utilizing their low cost commodities as inputs into their "value-added" cooperatives. Within a short period of time, a number of these models emerged in the Renville area. A brief description of a few of the organizations active in the development of this organizational cluster, as well as the way in which they were interconnected, follows.

Exhibit 8: Acres of Corn for Grain Planted in Minnesota Counties (Top 4 in 2004), 1972-2004

Year	Renville	Redwood	Martin	Stearns
1972	198,200	187,300	164,200	144,400
1973	224,000	211,700	167,500	164,600
1974	246,500	223,900	199,300	184,600
1975	242,700	225,700	211,600	179,100
1976	222,000	215,500	226,000	200,000
1977	166,700	182,000	195,000	217,500
1978	186,500	199,900	189,900	218,900
1979	186,300	192,700	188,400	223,700
1980	184,900	203,300	199,400	227,000
1981	190,700	208,400	196,400	251,400
1982	182,500	201,800	188,600	245,200
1983	129,200	146,800	136,700	164,100
1984	203,200	206,500	187,700	226,500
1985	203,400	200,100	183,900	226,200
1986	181,200	169,400	157,500	192,600
1987	152,000	155,600	155,500	193,200
1988	162,000	165,000	163,000	178,000
1989	180,900	190,800	182,100	184,900
1990	210,000	212,200	206,900	194,600
1991	209,300	208,800	161,900	234,600
1992	226,400	218,300	213,100	246,300
1993	222,400	194,100	188,500	188,800
1994	238,800	226,200	222,500	201,600
1995	221,100	208,700	201,600	231,500
1996	245,500	238,200	228,500	240,800
1997	232,900	221,600	207,600	215,500
1998	242,200	232,600	215,800	212,100
1999	239,900	233,600	217,600	206,700
2000	244,200	231,500	218,300	199,000
2001	239,500	231,000	207,700	200,000
2002	249,500	233,300	217,500	204,300
2003	246,600	233,300	216,200	208,300
2004	258,000	240,400	218,700	214,700

Source: U.S. Department of Agriculture

Exhibit 9: Ownership Rights Framework



Chaddad and Cook (2004); Cook and Chaddad (2004)

Key Stakeholders in the Development of a Cluster of Organizational Innovation

Minnesota Corn Processors

In 1980, farmers "disillusioned with corn prices" decided to pursue a strategy of processing their own products (Gerber, 1996). They formed Minnesota Corn Processors (MCP) in order to process corn into "ethanol, starches, syrups, dextrose, feed, and corn oil" (Buschette, 2001). Aided by, $1.86 million in tax-increment financing from the city, MCP's $55 million plant opened in 1983. While their success was not immediate, MCP's eventual prosperity led them to expand three times in the early 1990s.

The MCP plant is located in Marshall, Minnesota, approximately fifty miles from Renville. While the plant was built outside their county, Renville farmers were instrumental in soliciting equity capital contributions and designing the governance structure. Several farmers who had a wait-and-see attitude with respect to SMBSC were determined not to miss out on this investment opportunity. As sugarbeet processors turned a profit on their investment, those producers solely involved in corn and soybeans clamored to enter a successful processing venture (University of

Manitoba). Due to their closed nature, it would result difficult to buy shares of a successful NGC after the initial offering.

Co-op Country Farmers Elevator

Co-op Country is a traditional cooperative headquartered in Renville, MN. In early 1990, Co-op Country recognized that a "large number of their patrons would reach retirement age within a few years," causing the cooperative to suffer financial constraints in redeeming member equity (Buschette, 2001). This was a pressing issue for many traditional cooperatives. Originally, Co-op Country board members explored potential investments that would serve as an additional source of income to solve this equity bubble problem. The value-added projects considered included swine, turkey, and egg production. Ethanol was ruled out because, they felt, MCP was already available to their members as an investment opportunity. The hog industry was chosen as the most viable venture.

However, the discussion over potential investments in swine or sow multiplier units became emotionally charged. An investment in sow multiplier units was eventually rejected by a majority of Co-op Country members due to concerns that the cooperative's involvement in the industry would drive local farmers out of the hog business. Board members were disheartened after the vote – and concerned that their plan to resolve their equity redemption problem would not come to fruition. Within days, however, board members began receiving phone calls from members, urging them to develop alternative business plans and offering to support ventures that allowed farmers to invest "alongside" Co-op Country. They urged the Co-op Country board to explore a cooperative similar to SMBSC in structure, with Co-op Country acting as a major investor. Co-op Country management continued to explore alternative business opportunities.

ValAdCo

One group of farmers decided to pursue the swine production idea rejected by Co-op Country's membership (Buschette, 2001). Co-op Country was a large organization with a diverse membership. A smaller subset of Co-op Country farmers was better able to organize their interests as a separate entity. ValAdCo's intent was to add value to members' corn, utilizing corn for feed in sow multiplier units. Having received a mandate from their members not to pursue investments in the swine industry, Co-op Country shared their industry research and business plan with ValAdCo founders. ValAdCo, then, worked from the bylaws of MCP, SMBSC, and Dakota Growers Pasta, (a NGC in North Dakota) to develop their governance structure. Bylaws from each of these organizations were readily available to ValAdCo leaders, as many of them were members of these NGCs as well. ValAdCo leaders also chose rely on the same legal representation as SMBSC, a firm that had become well-versed in this distinct ownership structure over the years.

Churchill Cooperative

Another Renville corn marketing NGC, Churchill Cooperative, also chose to invest in sow multiplier operations. ValAdCo and Churchill "built two of the biggest and most controversial hog farms in the state" (Losure, 1999). For a number of years these two NGCs were considered pioneers in a growing producer-owned livestock sector. They pioneered a new technology that involved storing manure in open lagoons. This technology, now characterized as "failed" and "outdated," caused Churchill and ValAdCo to suffer from problems involving environmental regulation, legal fees, and community opposition (Losure, 1999). Churchill leaders gained their familiarity with the NGC structure through more than proximity: the majority of leaders were investor-members, Board members, and core organizers of SMBSC.

Golden Oval Eggs

After failing to gain the membership's approval to invest in the hog industry, Co-op Country searched for new opportunities that met their members' investment and growth preferences. The egg industry was their next venture. In 1994, a business venture planned and initiated by Co-op Country established the NGC Golden Oval Eggs. Co-op Country invested twenty-five percent of the necessary equity for Golden Oval Eggs. The remaining equity investments came from grain producers in the Renville area.

The founders of Golden Oval developed a plan to add value to members' corn by using it as feed in layer operations. And, they chose to produce raw, liquid egg "in part because of ease and savings in transportation" (Buschette, 2001). Golden Oval developed a strategy called the "Totally Integrated Food System" (Golden Oval Eggs). This system began with high quality grains produced by shareholders, relied on a single local supplier for pullets, and linked laying barns with breaking and cooling systems – allowing Golden Oval to control all aspects of production from the feed to the final liquid product. The integrated system provided significant levels of quality and consistency (Buschette, 2001).

Through delivery requirements and marketing agreements, NGCs have the potential to exercise greater control over supply and production process than investor-owned firms purchasing inputs from independent producers. Ability to control inputs, as well as the entire production process, can improve quality. This provides producer organizations with significant advantages over non-cooperative businesses.

United Mills

Recognizing the need to meet increased feed milling requirements, the boards of Co-op Country, Golden Oval, and ValAdCo decided to negotiate the construction of United Mills. A "collaborative venture between a value-added co-op and a traditional co-op was a new idea….Such a project had simply not been considered before" (Buschette, 2001). Organized as a cooperative in 1993 and built in 1994, the equity investment of $750,000 was divided equally among the three founding members.

United Mills had a joint management agreement with Co-op Country. Treated as a cost center, United Mills charged members a standardized price allocated on a per-ton basis; variable delivery fees and future capitalization allotments were also included. During the first three years, production efficiencies and increased volumes lowered the per ton charges from $20 to $6. Within three and one half years the members recuperated their original investment. The NGCs were able to meet their milling needs for rations while Co-op Country generated direct profits from selling the milled product.

Phenix Biocomposites

In 1992, Phenix Biocomposites was formed as a NGC. Located in Mankato, MN, about 100 miles southeast of the City of Renville, Phenix had a new technology to make biocomposites for the construction, furniture, and design industries. Their products, which are environmentally friendly alternatives to wood or marble, utilize agricultural materials including soy flour and wheat (Environ Biocomposites). Again, Renville area farmers were active investors, anxious to develop a value-added NGC for yet another crop in their rotation.

MinAqua Fisheries Cooperative

MinAqua processes producers' soybeans to soy pellets for use as tilapia feed. Generating enough warm water to raise tilapia in Minnesota would never have been possible, however, without SMBSC. The beet processing facility produces six to ten thousand gallons of nutrient-rich, 95-125 degree water per minute as a by-product of beet processing. Since the SMBSC plant was dedicated, city officials talked of utilizing its excess hot water for commercial purposes. After receiving a $500,000 federal economic development grant in 1997, the City of Renville developed a heat recovery plant. Cost savings estimated at one to three and a half dollars per million BTUs (British Thermal Units) were enough for MinAqua to be a feasible project. MinAqua utilizes only ten percent of the available heat energy. Therefore, Renville is looking to take advantage of industrial symbiosis opportunities by developing additional local businesses around this low cost heat energy.

Understanding the Renville Phenomena

As discussed above, Renville NGCs share many characteristics. All are producer-owned, pursue "value-added" strategies, are run by demanding, active investors, and – most importantly – have adopted the "new generation" organizational structure. The geographic concentration of such firms can hardly be coincidence. As in any cluster, the firms derive benefits resulting from their strategic relationships and their proximity. Indeed, Renville's cooperatives have a lengthy history of inter-organizational collaboration – not just in terms of co-investment, but also in terms of overlapping board appointments and working together to utilize co-products.

MinAqua utilizes wastewater from SMSBC, turning the warm, nutrient-rich water into a valuable input. Other co-products have proven to be profitable and resulted in high local demand. For example, Co-op Country has developed a manure management program to help area livestock producers comply with environmental regulations (Stefanson, Fulton and Harris, 1995). The program removes manure from local livestock or aquaculture cooperatives and incorporates it into a fertilizer mix to sell to their members (City of Renville; Stefanson, et al., 1995). This program serves local farmers' demand for fertilizer. In the case of chicken litter, demand is high enough that there is "a waiting list for the litter" (City of Renville).

Buschette reports that some farmers' only regret is that "they cannot sell more corn to the co-op," suggesting that local demand for the development of additional NGCs is still high. Farmers perceive the NGC as an opportunity to invest in ventures that generate a market for their agricultural goods, benefit the local community, and preserve the family farm. The brisk wave of cooperative development did, however, leave some pockets too thin to invest in later ventures such as MinAqua. Many individuals or families that invested in one NGC, invested in several ventures (Looker, 1999).

An investment in an NGC is now seen as a "proven investment." And, some young producers are able to borrow from banks to invest in a large, cooperative venture whereas they would not qualify for funds for such risky endeavors on their own. Cooperation and collaboration, in itself, may also be an investment. Does a long history of cooperation serve as an investment in social capital, increasing the community's capability of pursuing collective entrepreneurial strategies? Can successful attempts at cooperation be seen as an investment upon which subsequent cooperative endeavors, familiar with local successes, are able to capitalize? Studying communities such as Renville may inform this question.

Continuing Innovation: Success or Failure?

Clusters of organizations sharing similar characteristics provide a rich setting for research on networks, alliances, clusters, and other forms of inter-firm

collaboration. Many of the factors cited in existing research on clusters – knowledge spillovers, scale economies, learning by doing, and path dependence – are important elements of the Renville story. Moreover, Renville's experience allows us to analyze several layers of changes in governance structure over time.

After a steep rise in corn prices, a glut of corn syrup in the market, and weak delivery contracts, MCP was forced to look beyond their members for capital investment. MCP converted to a Limited Liability Company (LLC) in 2000, appearing to begin a successful turnaround. However, in 2002, MCP members voted to sell to Archer Daniels Midland Corporation for $756 million (Powell, 2003). While some sellers viewed MCP as a success due to high levels of returns on their initial investment, many producer-members were disheartened at the loss of local ownership and control of the facility.

Golden Oval Eggs has also converted to a primarily producer-owned LLC as a means to access additional equity capital. Considering these conversions, several questions arise. Is the NGC a stable form of organization, or merely a transitional form between the cooperative and the investor-owned corporation? Indeed, both Golden Oval and Minnesota Corn Processors, despite success as NGCs, converted to LLCs. Is this the future for the remaining NGCs as well? If so, does conversion to an investor-owned entity constitute further innovation? Or, does it constitute cooperative failure? Opinions differ among academics and investors[2].

Organizational Innovation, Local Clusters, and Secure Markets for Production

The experience of producers in Renville, MN suggests that organizational innovation, in addition to technological innovation, plays an important role in enabling farmers to remain competitive in the global marketplace. Organizational innovation that promotes local ownership allows residual profits to return to the producer's community. This is an exciting alternative to industrial park development which often generates employment, but transfers profits to investors outside the local area.

We look back over Renville's history of collective action among producers in an effort to understand the key factors that led to their success. What specialized knowledge, distinctive attributes, or unique resources led to the emergence of this cluster of organizational innovation? Can similar clusters of producer-ownership be replicated in other areas? If so, what spurs multiple producers to investment in locally-owned and controlled organizations? By answering these questions, today's

[2] Please refer to LeVay (1983) for a discussion of cooperative objectives. By understanding a cooperatives objectives, we may begin to define success, innovation, and failure. LeVay, C. "Agricultural Co-operative Theory: A Review." *Journal of Agricultural Economics* 34, no. 1 June (1983): 1-44.

farmers can develop mechanisms for vertical investment and integration, allowing them to secure sustainable markets and higher returns for their production.

References

Arrow, K. J. "The Economic Implications of Learning by Doing." *Review of Economic Studies* 29, no. 3 June (1962): 155-73.

Brester, G., and M. Boland. "The Rocky Mountain Sugar Growers' Cooperative: 'Sweet' or 'Sugar-Coated' Visions of the Future?" *Review of Agricultural Economics* 26, no. 2 (2004): 287-302.

Buschette, P. (2001) Golden Oval. Macomb, IL, Illinois Institute for Rural Affairs, pp. 33-42.

Cattanach, A., A. Dexter, and E. Oplinger. "Sugarbeets." *University of Wisconsin-Madison Extension Service* July (1991).

City of Renville. "Co-op Capital of The USA." City Webpage.

Cook, M., and C. Iliopoulos. "Beginning to Inform the Theory of the Cooperative Firm: Emergence of the New Generation Cooperative." *The Finnish Journal of Business Economics* April (1999): 525-535.

Cook, M. L. "The Future of U.S. Agricultural Cooperatives: A Neo-Institutional Approach." *American Journal of Agricultural Economics* 77, no. 5 December (1995): 1153-59.

Egerstrom, L. *Make No Small Plans: A Cooperative Revival for Rural America*. Rochester, MN: Lone Oak Press, Ltd, 1994.

Environ Biocomposites. "Environ Company Background." http://www.environbiocomposites.com/background.php.

Folsom, J. "Measuring the Economic Impact of Cooperatives in Minnesota." Rep. 200 December (2003).

Fujita, M., P. Krugman, and A. J. Venables. *The Spatial Economy: Cities, Regions, and International Trade*. Cambridge, MA: MIT Press, 2001.

Gerber, A. (1996) The Practical Approach to New Generation Cooperatives: An Exchange of Cooperative Experience from Renville, Minnesota. St. Paul, MN, Minnesota Association of Cooperatives.

Golden Oval Eggs. "Mission." http://goldenovaleggs.com/sections/company/mission.htm.

Goldsmith, P., and H. Gow. "Strategic Positioning Under Agricultural Structural Change: A Critique of Long Jump Co-operative Ventures." *International Food and Agricusiness Management Review* 8, no. 2 (2005): 41-61.

Gompers, P., J. Lerner, and D. Scharfstein. "Entrepreneurial Spawning: Public Corporations and the Genesis of New Ventures, 1986 to 1999." *The Journal of Finance* 60, no. 2 (2005).

Harris, A., B. Stefanson, and M. Fulton. "New Generation Cooperatives and Cooperative Theory." *Journal of Cooperatives* 11 (1996): 15-29.

Kotov, I. (2001) New Generation Cooperatives: A Short History of the Idea and the Enterprise. Macomb, IL, Illinois Institute for Rural Affairs, pp. 19-32.

LeVay, C. "Agricultural Co-operative Theory: A Review." *Journal of Agricultural Economics* 34, no. 1 June (1983): 1-44.

Looker, D. "Unite for success: Value-added co-ops help families capture greater margin in the food chain." *Successful Farming Online* (1999): http://www.agriculture.com/sfonline/sf/1999/special/hope/coop.html.

Losure, M. (1999) Renville County's Lagoon Blues, Minnesota Public Radio.

Marshall, A. *Principles of Economics*. London: Macmillan and Co., Ltd., 1890.

Merrett, C., et al. *Directory of Closed-Membership Producer Cooperatives: New Generation Cooperatives and Limited Liability Companies in the United States and Canada*. Macomb, IL: Illinois Institute for Rural Affairs, 2003.

Milgrom, P., and J. Roberts. *Economics, Organization and Management*. Englewood Cliffs, N.J: Prentice Hall, 1992.

Minnesota Historical Society. "American Crystal Sugar Company: An Inventory of Its Records at the Minnesota Historical Society." Inventory available at http://www.mnhs.org/library/findaids/00341.html.

National Agricultural Statistics Service. *2002 Census of Agriculture: County Profile; Renville, Minnesota*. Washington, D.C.: United States Department of Agriculture, 2002.

Patrie, W. "Cloverdale Growers Alliance Cooperative: Creating a Bright Future by Connecting With the Past." *Journal of Cooperative Development* 1, no. 4 (1999).

Polanyi, M. *The Tacit Dimension*. New York: Doubleday, 1966.

Porter, M. "Clusters and the New Economics of Competition." *Harvard Business Review* November/December (1998): 77-90.

Powell, J. *Fields of Controversy*. Marshall, MN: Star Tribune, January 26 2003.

Southern Minnesota Sugar Cooperative. "Facts about…Sugarbeets and Beet Sugar." http://www.sbreb.org/brochures/SugarCoop/index.htm.

Stefanson, B., M. Fulton, and A. Harris. "New Generation Co-operatives: Rebuilding Rural Economies." *Centre for the Study of Co-operatives, University of Saskatchewan* September (1995).

Thompson, D. J. "Italy's Emilia Romagna, Clustering Co-op Development." *Cooperative Grocer* 109 November-December (2003).

Tong, L. "The Property Rights Fundamentals of a New Form of Agricultural Collective Action: The New Generation Cooperative." MA, University of Missouri-Columbia, 1997.

Trucano, M. *Southern Minnesota Beet Sugar Cooperative: A History of The Early Years*. Renville, MN: Southern Minnesota Beet Sugar Cooperative, 1997.

University Archives. *A Guide to the Collections of the Red River Valley Sugarbeet Growers Association*. Moorhead, MN: Minnesota State University, Northwest Minnesota Historical Center Revised December 2002.

University of Manitoba. *New Generation Cooperative on the Northern Plains*. Winnipeg, Manitoba, CA: Department of Agricultural Economics and Farm Management.

Volkin, D., and H. Bradford. *American Crystal Sugar: Its Rebirth as a Cooperative*: Farmer Cooperative Service, United States Department of Agriculture,98, June 1975.

Williamson, O. E. *The Mechanisms of Governance*. New York: Oxford University Press, 1996.

Zook, M. A. "The Knowledge Brokers: Venture Capitalists, Tacit Knowledge and Regional Development." *International Journal of Urban and Regional Research* 28, no. 3 September (2004): 621-41.

International Food and Agribusiness Management Review
Volume 11, Issue 4, 2008

Farming Fish in a Transitional Economy: A Case for East Timor

Toby Ryan Wood [a] and Catherine Chan-Halbrendt [b]Ⓘ

[a] *Graduate Assistant, Natural Resource and Environmental Management Department, University of Hawaii at Manoa, 1910 East West Road, Sherman 101, Honolulu, Hawaii 96822, USA.*
[b] *Professor, Natural Resource and Environmental Management Department, University of Hawaii at Manoa, 1910 East West Road, Sherman 101, Honolulu, Hawaii 96822, USA.*

Abstract

This case study evaluates the economic potential for a grow-out mariculture enterprise in East Timor while highlighting how such a business venture could help engage a transitional nation in foreign trade, increase employment opportunities and encourage community based projects that promote sustainable resource use.

Keywords: aquaculture, mariculture, grouper, East Timor, transitional economy

Ⓘ Corresponding author: Tel: + 1-808-956-4976
Email: chanhalb@hawaii.edu
Other contact information: T. Wood: tobywood@hawaii.edu

Introduction

East Timor's transitional status has been defined by its horrific and costly struggle for independence. In general, countries or territories are defined as having a transitional economy while shifting from a controlled (planned, closed) economy to a market (free, open) economy. Gaining transitional status often stems from the collapse of a centralized government, an overthrown dictatorship, post-colonial development, decolonization, or simply from being in a severely underdeveloped or poor state and seeking economic improvement.

The United Nation's recognition of East Timor as an independent nation in May of 2002 set the stage for social and economic reforms that often accompany the advent of decentralized ideologies. As East Timor continues to define its national identity to the rest of the world it becomes imperative that investment monies and development aid be used to build the nation's socioeconomic infrastructure from the bottom-up. One way to do this is by developing the confidence and potential of individuals at the community level through the utilization of available resources in a productive and sustainable way, and for this case, to do so while taking advantage of domestic investment laws and enhancing foreign trade relations.

The following case study considers the transitional and impoverished status of East Timor as an order to explore the potential of introducing an offshore mariculture enterprise as an income generating and capacity building development opportunity. To accomplish this task, university researchers funded through USAID conducted a scoping study to collect information pertaining to the development of an offshore mariculture enterprise in East Timor. Interviews were conducted and data was collected to assess site-specific variables pertaining to national and international business climates, community and market infrastructures, demand and supply chains, geographic and oceanographic conditions, along with the availability of scientific and technical support related to the emerging mariculture industry (Ako & Chan-Halbrendt 2005).

As one could imagine, several unique limitations have emerged as a result of investigating the economic potential of a transitional economy. Apart from mainstream risks associated with growing fish in open ocean cages (pollution, disease, security, natural disasters, transshipment etc), a few of the more prevalent conditions that can limit the development of a sustainable mariculture industry is the looming threat of political instability and the dependence on foreign aid needed to kick-start the industry. As a result, a risk averse investor or development bank interested in issuing aid money might be inclined to take out political risk insurance as a buffer to such instability. However, as the confidence of the social structure can be restored in time through strong leadership and well informed decision-makers, there are many positive attributes that can be assessed as well, particularly for relatively small and developing island nations rich in marine

resources. To better understand East Timor's economic potential this research highlights various strategic costs and benefits of economic development afforded by the nation's investment climate, the availability of feasible markets and the regions overall production capacity with regard to the prevailing environmental, social, economic and political atmosphere. Objectives of the following case study include exploring the economic potential of farming fish in East Timor, defining a feasible and sustainable investment opportunity and providing a blueprint for conducting a market analysis intended for developing a mariculture enterprise in a transitional nation. The overall goal of this case study is to provide a basic framework that can be used to address important variables and considerations while conducting a formal economic feasibility study in a developing nation. Readers are encouraged to consider alternative parameters for development of a mariculture enterprise and formulate alternative strategies that might play an important role in enhancing a transitional nation's economy.

Economic Potential in East Timor

Ranked as one of the poorest countries in the world, East Timor's access to a productive marine ecosystem makes the prospect of mariculture worth considering as a poverty reducing economic development strategy. East Timor, otherwise known as the Democratic Republic of Timor-Leste (or simply Timor-Leste), occupies a land area of approximately 15,000 square kilometers that includes over 700 kilometers of coastline. The country is situated at the eastern end of the Indonesian archipelago and is estimated to have a population of just over one million[2]. East Timor's climate is tropical with distinct wet and dry seasons that can lead to inconsistent agriculture production throughout the year (UNDP 2006). East Timor's rise to independence in 2002 secured it as the newest nation of the second millennia although it has continued to struggle politically and economically. To lessen the struggle for East Timor, the road ahead must be bridged with a solution that encompasses pro-poor strategies that act to empower the economic potential of local communities in order to restore confidence back to society as a whole. One way to underwrite such an endeavor is to develop economic opportunities that the communities themselves can grow, learn and work with each other. To do this, development projects need to be economically viable and at the same time be oriented towards improving the social sector while encouraging the sustainable use of resources afforded by the natural environment. Looking at the feasibility of a mariculture enterprise provides such an opportunity.

Around 75% of East Timor's residents live in rural areas, thus agriculture is heavily relied upon for subsistence and potential income (e.g. coffee, vanilla, maize, cassava, sweet potato, etc.). Unfortunately, the chaos that followed East Timor's

[2] U.S. Department of State online resource: http://www.state.gov/r/pa/ei/bgn/35878.htm (accessed 10.31.06)

transition to independence not only eliminated entire townships, but farms and farmlands were incapacitated as well; many have yet to recover. Likewise, 90% of East Timor's seafood industry was reportedly destroyed during the same time, leaving fishermen gearless and the few hatcheries[3] that did exist, annihilated beyond repair (Da Fonseca 2001). International aid was sent to East Timor following the 1999 crisis to help in the post-independence reconstruction of the region. In 2002 foreign workers began to leave East Timor following the fulfillment of two and three year contracts. As a result of losing foreign business, the bottom fell out from under East Timor's economy and the gross domestic product (GDP) per capita fell from $466 with an estimated annual GDP growth of 16.5% in 2001 to $366 in 2004, which is indicative of a *negative* growth of 6.7% in the GDP during 2003[4]. The annual growth of the GDP in 2004 was 1.8% based on national output statistics for East Timor[5].

Investment Climate

Two specific and prominent goals were set forth in East Timor's 2001 National Development Plan (NDP):

1. To reduce poverty in all sectors and regions of the nation, and
2. To promote economic growth that is equitable and sustainable, improving the health, education, and well being of everyone in East Timor.

Despite obvious risks and uncertainties associated with investment opportunities in East Timor, the prospectus for a mariculture enterprise is ideal for consideration. Development projects that encourage capacity building potential by promising to increase the skill level of local workers are of high priority in East Timor. The UNDP (2006) recognizes that encouraging private sectors to invest in East Timor is a primary goal to address poverty. One positive step forward can be found within the NDP that has been administered in response to reducing poverty and soliciting economic prosperity in East Timor.

The business climate in East Timor favors the foreign investor under a new investment law that was approved in July 2005, which ultimately stemmed from the NDP. Policies have been incorporated within the infrastructure of the East Timor government that considers fiscal incentives with a minimum investment of $100,000. These include tax breaks of up to $300 for each hired Timorese worker, rent incentives for rural projects and custom tax exemptions when minimum

[3] De Fonsecas (2001) reported that 6 inland fish hatcheries were in operation in East Timor prior to 1999, all of which supplied fingerling carp to the domestic market. Once these hatcheries were destroyed the supply of fingerlings stopped as well.
[4] Sources: ADB. 2006. *Basic Statistics* 2006. Manila. & UNDP. 2006. *Timor-Leste HDR 2006: Path Out of Poverty*
[5]Source: ADB Statistical Database System. http://www.adb.org/statistics/ (accessed 11/07/2006).

standards are met. This investment law also complements the UN's Millennium Development Goals (MDG) that has been set forth as a strategy to address national priorities for East Timor and for developing countries in general (UNDP 2006).

Furthermore, in January 2006, the governments of Australia and East Timor signed the Treaty on Certain Maritime Arrangements in the Timor Sea (CMATS). This highly disputed agreement evolved from an earlier treaty signed in 2003 (Timor Sea Treaty) and promises East Timor a multi-billion dollar economic boost through real and potential profits made from oilfields positioned in the Joint Petroleum Development Area (JPDA) which is conveniently located halfway between Darwin, Australia and the south shores of East Timor. Consequently, JPDA straddles both Australia and East Timor's exclusive economic zones (EEZ) giving way to intense maritime disagreements between the two countries from which the CMATS developed. Anticipated profits resulting from the CMATS could very well be East Timor's ticket out of poverty if funds generated from the JPDA are managed responsibly and allocated efficiently to rebuild and develop East Timor once and for all[6]. This case study provides one way in which revenues from national and international endeavors could be reinvested into East Timor's communities for development purposes – ideally in a sustainable fashion.

Defining a Feasible Investment Opportunity

Environmental, Cultural and Economic Considerations

In addition to valuable natural resources found beneath the seabed, East Timor is geographically situated within a region recognized by scientists as the center of marine biodiversity (Roberts *et al* 2002). Referred to as the Coral Triangle, this distinct ecoregion is characterized by more than 500 species of coral and possesses high biodiversity of fishes and other invertebrates (IUCN 2004). As a result, individuals and nations profiting from the lucrative aquarium and live fish trade often target the seas surrounding East Timor in search for these and other valuable resources. Grouper is just one of many reef species targeted in the live fish trade and its value is poised on the freshness of keeping the fish alive until the moment of consumption, much like the reverence of live lobster in the United States. For example, a humpback grouper (*Cromilepte altivelis)* captured in the wild and kept alive in a tank until sold at a Hong Kong market during the Chinese New Year can earn a wholesale market price of $93 per kilogram (2006 est.)[8]. The

[6] The CMATS Treaty includes setting aside Timor Sea maritime boundary claims for 50 years; increasing East Timor's share of Greater Sunrise oil revenues from 18 per cent to 50 per cent. Once ratified by both countries, the CMATS Treaty and IUA will together offer a framework that will provide investors with the certainty needed for large-scale resource projects to proceed. (http://www.industry.gov.au/content/itrinternet/cmscontent.cfm?objectID=C0FB82FC-9AA9-4A97-8F3ECEB317A6119D)

Food and Agriculture Organization (FAO) of the United Nations attributes the increase in the trade of live fish to technological advances within the competing seafood industries while consumer demand is fueled by a growing appetite for live seafood afforded by Chinese and Asian communities with high disposable incomes (FAO 2004; Sadovy *et al* 2003; Johannes & Riepen 1995). A live reef fish review in 2005 reported that 'as incomes in Asia rise over the next decade and aquaculture products become more readily available, there is an expectation that consumer demand for live reef fish will likewise increase (Muldoon *et al* 2005) '. It has been estimated that live fish represent almost 30% of total grouper production in Southeast Asia whereas most of the yield comes from a relatively small portion of the region, or more specifically, from within the Coral Triangle (Sadovy et al. 2003). Due to the high-value and consistent demand for live reef fish in Hong Kong, the live reef fish trade is currently expanding into the South Pacific where conditions are also favorable for the capture (and mariculture) of target species despite a greater travel distances to demand centers (Sadovy *et al* 2003). Since wild caught grouper currently supply the majority of live grouper demand centers in Southeast Asia there has been considerable attention given to the culture of grouper and the future sustainability of this trade. For example, in a technical report by Pomeroy et al. (2003) aquaculture is cited as being a priority solution for reducing the pressures on coral reefs arising from over-and destructive fishing associated with the trade of wild caught live reef organisms.

Scientific and Technical Support

The Gondol Research Institute for Mariculture (GRIM) located in nearby Bali, Indonesia, is the leading research and extension program in the region and promotes innovative mariculture practices while providing logistical support and on-site training for managers and fish farmers alike. Following consultations with experts from GRIM, it was decided to analyze two specific species of grouper: a lower valued *Epinephelus coioides* (commonly known as the green or orange-spotted grouper) and the higher valued *Cromilepte altivelis* (humpback or high-finned grouper). This decision was based on the availability of hatchery-reared stock of these species and successful track records using similar grow-out culture methods adopted in Malaysia, Indonesia, Vietnam, Philippines, Taiwan, Thailand, and Hong Kong (GRIM 2005: *personal communication* and Pomeroy *et al* 2002). Hence, the resulting analysis is dependent upon the regional availability of information such as the supply of hatchery-reared fingerlings, type of feed used, variation of grow-out cycles, transportation costs, demand of farmed live grouper as well as the business climate with respect to East Timor's geo-strategic location and transitional economy.

Conducting a Market Analysis

Assessing the feasibility of growing out grouper in the Indo-Pacific region was crucial for determining what species to target for production in East Timor. In order to provide a detailed financial analysis that can be assessed objectively it is first important to understand the local demand for grouper with respect to current consumption preferences while recognizing potential effects of an increase in grouper supply to the domestic sector (e.g. fish markets and restaurants). Secondly, the international demand for grouper, specifically live grouper, needs to be assessed to understand the opportunities, risks and profitability in relation to the overall success of a grouper mariculture enterprise based in East Timor. Once a demand for grouper is apparent, marketing scenarios can be established and incorporated into the financial model. Such demands are explored below as exemplified by research conducted for East Timor.

Both domestic and international demands for grouper were explored in East Timor. To better assess the domestic demand for grouper a survey was carried out in East Timor addressing the local fish trading infrastructures. Communities were surveyed as to their willingness to participate in a grouper industry and relevant opinions were solicited. The data was gathered using a face-to-face technique. Open marketplaces and restaurants were surveyed as potential buyers for cultured grouper in East Timor. Export markets for grouper were assessed using current and historical wholesale market prices for grouper at Hong Kong markets. Weekly and monthly wholesale market prices were obtained from online databases that provide updated price information from select Hong Kong markets. Hong Kong was selected as the exporting target based on the availability of information and its role as a hub in the international trade for live reef fish. Prospective transporters were also identified who are willing to transport the fish to Hong Kong markets. Other major importers of live reef fish (i.e. grouper) would be Japan and Singapore if a significant infrastructure for transportation to these destinations could be established in the future. An excellent review highlighting the dynamics of the live reef trade, particularly the value of grouper to the industry, can be found in Maclean & Sadovy's (eds.) *While Stocks Last: the live reef food fish trade*[7].

Domestic Demand for Grouper

East Timor's domestic demand for grouper was identified through a survey of various restaurants and markets that would be impacted as a result of an increased supply of grouper. Market and menu prices were surveyed to help develop a pricing structure for domestically traded grouper. There was no apparent demand for *live* grouper in the areas surveyed throughout East Timor,

[7] http://www.adb.org/Documents/Books/Live_Reef_Food_Fish_Trade/live_reef_complete.pdf (first accessed on 9/1/2005)

although it was recognized that fresh or frozen grouper were served in 43% of the restaurants surveyed; Spanish mackerel and tuna were the other top sellers (Chan-Halbrendt *et al* 2006:28). The average menu price for grouper sold in the restaurants was $8/kg while the restaurants' purchase price (from fishers or middlemen) was found to be around $2.50/kg (Ako & Chan-Halbrendt 2005:29). This means that the added value to domestically supplied grouper benefits the restaurant owners and not necessarily the fishers or fish growers. Therefore, if farmers were to maximize profits from their portion of the cultured stock then they would need an aggressive marketing strategy geared towards the restaurant and tourism industries rather than trying to sell their product to local fish markets. In East Timor, the cultural phenomenon of eating live fish has yet to catch on as it has in Hong Kong or other Asian communities. Furthermore, there was no evidence of a preferred demand for any particular species of grouper in East Timor. This implies that domestic grouper prices would probably be affected more by an increase in supply rather than the value of specific grouper species. Once development in East Timor is such that the civil unrest and unstable governance can be tamed, the tourism industry may be able to influence a slightly higher demand for fresh, frozen, processed or even live grouper to the region.

International Demand for Live Grouper

The live reef food fish (LRFF) trade presently includes a wide variety of fish, but is dominated by several different species of groupers (Sadovy et al. 2003). The majority of live reef fish are imported into Hong Kong either for local consumption or for transshipment to Mainland China. It has been reported that Hong Kong exports between 20 – 60% of its total imports of live reef fish through China in order to meet consumer demand (Johannes 1995 and Chan 2000). It has also been estimated that the declared imports of LRFF to Hong Kong has an annual volume of 13,000-14,000 tons, making LRFF worth approximately 350 million US dollars with recorded imports into Hong Kong remaining fairly stable since 1999 (Muldoon et al. 2005)[8]. Due to the lack of live reef fish reporting regulations in Hong Kong an estimate of 15,000-20,000 tons is believed to be more reflective of the market volume per year delivered to Hong Kong, although higher volumes (>30,000 tons) may not be unrealistic (Sadovy et al. 2003). Sadovy *et al* (2003) reported that between 15-40% of LRFF are supplied by wild-caught grow-out production units while only 10-15% of the LRFF are supplied by full-cycle hatcheries found throughout Southeast Asia. The same study found that during the 1990s high value species (e.g. humpback grouper) and low value species (e.g. orange-spotted grouper) accounted for less then 10% to 30%, respectively, of the total LRFF channeled through Hong Kong markets. In 2002 humpback and orange-spotted

[8] Prior to 1999 the Asian economic crisis affected market prices of live fish in particular due to more conservative motives of the consumers, demonstrating yet another risk that this type of enterprise, dependent on foreign markets, can exhibit.

grouper supplied from regional sources and imported into Hong Kong was estimated to be between 10,000-12,000 tons for each species (Sadovy et al. 2003). Since the enterprise introduced here would be relatively small there should be little effect on international market prices for grouper with the addition of an East Timor grouper industry. For example, if Hong Kong's annual international demand for live grouper is a conservative 12,000 tons, an enterprise supplying 50 tons of marketable grouper would make up only 0.4% of the market share for live grouper exported to Hong Kong. Assuming the quality of the produce delivered to Hong Kong markets from East Timor is comparable to other small scale grow-out fish farms in the region, the overall sustainability and stability of such a venture would ultimately depend on an efficient mode of transshipment to the market and the international consumer preference for live reef fish.

Developing the Economic Model

The minimal degree of technical difficulty, affordable cost structure and the ease of constructing and maintaining near-shore grow-out mariculture farms makes this an ideal pro-poor development project in East Timor. In collaboration with the GRIM it was determined to use open-ocean floating net cages to grow-out grouper. This model assumes all farms will begin and end production at the same time in order to optimize space available on a one-time per harvest pickup and delivery schedule. In pursuit of a sustainable mariculture enterprise, this financial feasibility study assumes that all grow-out inputs are purchased directly from full-cycle grouper hatcheries as opposed to relying on fry and juveniles that would otherwise be caught in the wild before being grown in hatcheries or net cages. Until the situation and infrastructure in East Timor improves enough to support a full-cycle hatchery, inputs such as fingerlings will need to be imported at an additional cost to enterprise. Likewise, dry food pellets will be used in place of trash fish (wild-caught, low-valued fish) as feed to nourish the grouper in the proposed grow-out farms. Experimental work at The Southeast Asian Fisheries Development Center (SEAFDEC) comparing several diets showed that fishmeal could be substituted with high-quality terrestrial meals. For example, studies have been conducted to examine fermented blood products, dehulled lupin meal and meat and bone meal as partial substitutes of fishmeal in practical diets for grouper grow-out[9]. In addition, new standards concerning the certification of aquaculture products are realizing the importance of developing a more sustainable feed for fish farming by suggesting that aquaculture operations should use feeds and feed ingredients that are void of unsafe levels of pesticides, biological, chemical and physical contaminants and or other adulterated substances[10].

[9] http://library.enaca.org/ACIAR/AnnualReport/Annual_Report_2000-2001.pdf
[10] http://library.enaca.org/certification/publications/aquaculture-certification-guidelines-final.pdf

Primary data was gathered on costs of grouper production in both GRIM (Bali, Indonesia) and East Timor. Surveys were used to collect baseline data to assess the communities' willingness to participate in an aquaculture project. Various income situations were assessed and used to evaluate opportunity costs. Secondary data was collected through extensive literature reviews and consultation with mariculture experts in various parts of the region (see Ako & Chan-Halbrendt 2005, Pomeroy *et al* 2004, Sutarmat *et al* 2003 and Sadovy *et al* 2003).

Technical Considerations for the Grow-out Production of Grouper

In this study a grow-out cycle is defined by the amount of time it takes to grow a 5-gram (5-10 cm) fingerling into a 500-gram marketable grouper. For the two species of grouper considered for this study the ideal market size was determined to be about 500 grams based on market trends; which ultimately mirror consumer taste preferences (e.g. texture, color, taste, type). It should be noted that different species of grouper have different growth cycles that will need to be carefully considered when working out a production schedule for planning and investment purposes since profits are solely dependent on the cash receipts obtained by selling the grouper immediately following a grow-out cycle (harvest). A typical grow-out cycle for orange-spotted grouper is 8 months while the higher valued humpback grouper takes a total of 18 months to grow-out. These are the production cycles used in this analysis. The analysis also assumes that there will be a 6-month initial start-up period that allows for the organization and construction of the infrastructures needed to culture grouper. It is assumed that the capital equipment (rafts, nets, boats) will be replaced every 3 years between grow-out cycles. Costs per cycle were calculated for each farm and then distributed into the annual cash flow analysis, adjusting for the discrepancy between production cycles and production years. As a result some years have more than one harvest while other years have none. In general, consideration should be taken to allow sufficient time to clean, inspect, repair and maintain the cages between all cycles regardless of reinvestment periods. A grow out period of 10 years was selected for the financial model due to East Timor's foreign investment law which provide incentives for projects that last longer than 5 years based on the region selected and the type of enterprise developed. For example, a condition of the 2005 foreign investment law in East Timor guarantees a tax deduction of $300 for each Timorese worker that is employed for the entire year according to the location and nature of the project[11]. Ten years equates to 12 production cycles when growing out orange-grouper and 6 cycles when growing out humpback grouper.

Based on production units in use by GRIM, each cage, or raft, is assumed to be 4m (W) x 4m (L) x 3m (D). Each raft is to be fabricated using local resources when

[11] Chan-Halbrendt 2005, personal communication

available (wood, bamboo, 55-gallon drums, etc) while other capital costs (hardware and motor boats) may need to be purchased abroad and imported taking advantage of East Timor's favorable investment climate with respect to tax exemptions on enterprise resources. For each farm there will be a shelter for feeding, maintenance, and storage of supplies. This shelter could also be used to house security personnel if needed. A key to successful grouper culture is to manage the proper stocking densities based on available space required. Sutarmat *et al* (2003:23) recommends stocking no more than 200 fish/m^3 for fish 5-10 grams in weight and less than 20 fish/m^3 for fish up to 500 grams; understanding that relative density increments in between should not be ignored. Hence, for this study 2 rafts will be required to support the initial stocking density for the grouper fingerlings while an additional 8 rafts will be needed to support 4 tons of groupers or roughly 8000 fish. This model assumes then that a total of 10 rafts (including nets) will be needed to grow-out approximately 4-tons of grouper. The shelter and the 10 rafts are collectively referred to hereafter as one farm. Cables are attached to each of the four corners and secured to moorings placed on the ocean floor to keep each farm securely anchored.

Two potential production sites were selected for this case study: Vemasse and Com. Both locations are on the protected northeastern shore of East Timor with access to the Wetar Strait and the Banda Sea. These sites were determined to be suitable for grow-out production based on the communities' willingness to participate, ideal marine conditions (e.g. water temperature, depth, currents, protection from storms, etc) and accessibility to transportation infrastructures (e.g. roads, airports, harbors, etc). These sites were selected through consultation with East Timor's Ministry of Agriculture, Forest and Fisheries (MAFF) along with mariculture experts and local planning agencies from GRIM and USAID. In this case study the sites were largely rural, pristine areas with little pollution. The exploration of alternative sites would warrant an investigation into other area-specific activities such as production industries, farming, tourism, housing and the potential for future development and their collective affect on water quality, security and competition for resources.

Marketing Scenarios

Using available data provided through GRIM, analyses were carried out in terms of assessing costs based on individual farms that would each have the potential to grow out approximately 4 tons of grouper per cycle. An estimate of at least 4 farm workers would be needed to maintain each farm on a daily basis. Time invested by each farm-worker is expected to be equivalent to the time (opportunity cost) that could otherwise be spent fishing. The entire grow-out enterprise is assessed in relation to 15 farms. At a production rate of 4 tons per farm, the enterprise would have the potential to culture 60 tons of marketable grouper during each production

cycle. Of the 60 tons, 80% of the total production, or 48 tons, would be marketed under the enterprise using one of the two following scenarios:

1. Grouper would be sold at farmgate prices in East Timor; or

2. Grouper would be shipped directly to Hong Kong and sold at wholesale market prices.

Live groupers can be shipped either by air or sea to the final markets although, since flights in and out of East Timor are costly and irregular, this study only considers shipping live grouper by sea. Accordingly, the second scenario requires the hiring of a tender boat to ship the fish to Hong Kong and thus, requires the enterprise to absorb the costs and risks associated with transporting fish (e.g. piracy and fish mortality). The size of the tender boat that may be available for hire in the event of a mariculture enterprise in East Timor can hold up to 60 tons of fish at a lease price of US$130,000[12]. This transportation cost to the enterprise is divided equally between the 15 farms and considered as the marketing cost per farm (see Table 2). The target production rate determined for the financial model is based on the carrying capacity of the particular tender boat identified by the authors. Furthermore, contracting an established tender boat to deliver the fish to the market will help to ensure the timeliness, freshness and technical personnel required to maintain a quality product following harvest.

The remaining 12 tons of cultured grouper will be allocated to the local communities responsible for managing and working the farms as in-kind compensation. Hence, the financial model will require that a grouper farming cooperative, or co-op, be organized in East Timor. It is assumed that such a co-op would be developed at rural sites where fishing was, or still is, practiced, thereby maximizing manpower and skill needed to establish a successful community-based organization. Wages assumed for each member of the co-op are provided in Table 3. The co-op will be responsible for managing production requirements, quality control measures, farm workers and cash flows associated with the grow-out of grouper. Thus, the co-op will be required to provide at least 48 tons of grouper to be marketed under the investment strategy allocated by the enterprise investor while the remainder, or up to 20% of the total harvest, will be available to the co-op as a production incentive. This gives the co-op an opportunity to sell its portion of the cultured grouper at wholesale prices in Hong Kong (with added shipping costs); sell the grouper domestically either at farmgate, market or restaurant prices; or the co-op could keep the grouper for consumptive value and distribute it throughout the local communities. Because East Timor uses US currency, all costs

[12] Contract would be inclusive of all costs required for transporting live fish (crew, fuel, maintenance, etc)
Personal communication, Hotung Institute (2005).

are in figured to the US dollars unless otherwise stated. An exchange rate of 7.75 was used to convert Hong Kong prices into US prices per kilogram for grouper. Based on 2005 estimates the farmgate prices for orange spotted and humpback grouper sold in East Timor were reported to be $8/kg and $25/kg respectively[13]. Average wholesale prices in Hong Kong for cultured orange-spotted and humpback grouper were found to be $10.73/kg and $63.02/kg respectively[14]. Baseline prices used to analyze the feasibility of scenario II (selling at wholesale market prices in Hong Kong) were $10 and $60 per kilogram for orange-spotted and humpback grouper respectively.

While the live reef fish trade has existed in neighboring countries such as Indonesia and the Philippines for decades now, such an endeavor would be new to East Timor. Unfortunately for the case of Indonesia and the Philippines the live fish trade in these regions has been highly uncontrolled and recently deemed illegal due to the destructive capacity in which these nations capture wild grouper for the LRFT. Fishers in these regions have destroyed entire reef ecosystems with unsustainable techniques developed such as the use of cyanide and dynamite to capture fish. Stocks of wild captured grouper in these regions have severely declined due to this type of 'fishing', which has forced the supply to be sought after in adjacent waters farther from the market centers (Hong Kong, mainland China, Taiwan and Singapore). This rapid decline of wild caught grouper has helped to shift interest in the market from a captured to a cultured product. Unfortunately the sustainability factor has not yet been promoted at the market level. The current market prices show that wild caught grouper are still more valuable than the cultured grouper. Wholesale prices at a Hong Kong fish market in July 2005 demonstrate this point by offering around US$58 for cultured humpback grouper (*Cromileptes altivelis*) and US$88 for the same species captured from the wild (http://www.hk-fish.net). Other markets show a weekly average price for live reef fish but are not as obvious to distinguish between captured or cultured fish.

Formulating a Financial Feasibility Analysis

In order to assess the financial feasibility of a grouper enterprise the reader is encouraged to develop an enterprise budget from the data obtained by primary and secondary sources as described in Tables 1-4. Enterprise budgets provide a representation of estimates of specific inputs and outflows associated with a business opportunity. These estimates most often include profits in the form of cash receipts (revenues) and costs associated with production cycles pertinent to the goals of the enterprise being considered. Enterprise budgets are used

[13] See Ako and Chan-Halbrendt 2005

[14] Prices were averaged from 2003-2006 estimates from Hong Kong Markets: Fisheries Enforcement Division, Agriculture, Fisheries and Conservation Department, HKSAR, China. http://www.hk-fish.net/eng/market_price/common_e_2006_sep.htm (HK Fish Net)

Table 1: Variable production parameters for a grouper grow-out production farm in East Timor[15]

Production Assumptions	Unit	Type	*Orange-spotted*	*Humpback*
Fingerlings	fish/farm	4 ton farm	10000	10000
Cost	US$/fish		0.85	0.95
Stocking size	gram/fish		5 -10	5 -10
Harvest size	gram/fish		<500	<500
Stocking density	fish/m^3	5 gram/fish	200	200
Harvest density	fish/m^3	500gram/fish	20	20
Feed	US$/kg		1.2	1.2
Feed Conversion Ratio (FCR)	per fish	dry pellet	1.4	1.6
Production Cycle	month		8	18
Survival Rate	% stock		70%	70%
Average prices used in baseline economic analyses	US$/kg		**$10**	**$60**

Table 2: Annual project costs for a grouper mariculture enterprise in East Timor[16]

Project (Co-op) Costs	Total (US$)
Car Lease	60000
Car mileage allowance	15000
Office equipment	2000
Supplies	12000
Office space	5000
Communication	6000
Utilities	6000
Political Risk Insurance to cover 15 farm	36050
Marketing Costs (<50 ton/cycle)	
Hiring of tender boat to transport fish to HK	130000

[15] Variable production parameters were figured based on personal consultations with industry specialists and researchers from GRIM, the University of Hawaii at Manoa and the Hotung Institute in Hong Kong. Production parameters are composed of both biological and technological data referring to survival rates, feed conversion ratios (FCR) and growth rates.

[16] Project and farm cost data were derived from GRIM's published information as well as through communications with mariculture experts and researchers in the region (Sutarmat *et al* 2003, Da Costa (2005) and Pomeroy (2005). Cost data was used to structure the baseline framework for the enterprise budget and cash flow analyses. Project costs that are built into the financial model include basic operation and management costs associated with running a grouper enterprise on a yearly basis. Co-op, insurance and marketing costs are shown.

Table 3: Payroll for a 10-year grow-out mariculture enterprise in East Timor (15 farms)[17]

Employees	Quantity	Monthly Wage	Period (Year)	Total Cost (US$)
Grouper Co-op				
Farmers	60	100	10	720000
Local Business Manager	2	800	10	192000
Local Technician	2	600	10	144000
Administrative Assistant	2	400	10	96000
Quality Control Officers	2	600	10	144000
Drivers	2	300	10	72000
General Labor	2	200	10	48000
Technology Transfer				
Expatriate Business Manager	1	8000	2	192000
Expatriate Technical Manager	1	8000	2	192000
Mariculture Consultants	1	2500	2	60000
Training	1	1000	2	24000
			Total Payroll/Enterprise	**1,884,000**
			Total Payroll/Farm/Year	**12,560**

[17] Local labor costs were based on average monthly incomes figured by surveys and personal communications as described in the data collection methods discussed earlier. This project allows for a stable monthly salary of $100 per farm worker. Fifteen farms would employ 60 local farm workers. A grouper co-op would include these farm workers plus employment for 12 local administrative workers (6 employees per site). Local administrative duties would require business managers, technicians, administrative assistants, quality control officers, drivers and general assistants. This model will assume a total of 72 local workers will be employed under the grouper co-op and would work jointly with enterprise investors, managers, trainers and consultants. Since grouper mariculture would be a new industry to East Timor this analysis allows for a technology transfer cost that includes the hiring of project managers, quality control technicians and training personnel that will oversee the project during the first two years of grow-out production.

Table 4: Fixed capital investment costs for each grow-out grouper farm in East Timor (US$)[18]

Equipment	# Units	Price/Unit	Cost/Farm
Raft	10	600	6000
Net-cage	10	500	5000
Shelter	1	1000	1000
Anchorage	4	200	800
Boat (w/motor)	1	3000	3000
Maintenance	1	3000	3000
Stock and Harvest	1	400	400
Quality Control	1	1000	1000
		Total	**20200**

extensively in assessing agriculture management options and in this case, will be used to develop and interpret the cash flow analysis with respect to culturing grouper in East Timor. The enterprise budget can also used by itself to determine the feasibility of one scenario over another. The cash flow, or annualized enterprise budget, provides a decision maker with an internal rate of return (IRR) that can then be used to quantify investment returns given a particular production scenario for a period of time.

A cash flow, or discounted cash flow (DCF), is a decision-making technique that aids project evaluators by setting up an investment project as a net benefit stream over the projected term of the enterprise (e.g. 10 years). The process of project appraisal and evaluation can be considered in terms of three aspects of cash flow analysis (Campbell 2003:37): (i) *identification* of costs and benefits; (ii) *valuation* of costs and benefits and; (iii) *comparison* of costs and benefits. When comparing a stream of costs and revenues over time for the project it is helpful to use discounted cash flows in order to obtain realistic and comparable data points that can be used to assess the future profitability of an investment. In general, the Asian Development Bank (ADB 1997:37) uses a minimum discount rate of 10-12 % for projects developed in member countries to compare with the internal rate of return (IRR) of those same projects. The analysis outlined here calculated the cash flow stream in terms of a 12% discount rate. An IRR can be defined as the discount rate at which the net present value (NPV) of the enterprise becomes zero (Campbell 2003:44). In other words, the IRRs evaluated in this financial analysis reflect a 12% discount rate incorporated into a 10-year cash flow stream for a mariculture

[18] Specific capital investment costs that were used for the financial analysis can be found in Table 3. A 3-year amortization period is assumed for capital equipment, meaning that these items will need to be replaced every 3 years while the expense is absorbed within the flow of funds over a 10-year enterprise.

enterprise in East Timor. Hence, all positive IRRs (IRR>0) are representative of the percent of return an investor could expect on a particular initial investment under the assumed financial parameters.

Lastly, a sensitivity analysis should be performed to analyze the effects that select variables have on the profitability, or IRR, of the enterprise. Two variables that carry considerable uncertainty for the grow-out production of grouper in net cages are survival rates (SR) and the wholesale prices paid for cultured grouper. Survival rates largely correspond to keeping the fish alive during production cycles, and as is the case for Scenario II, keeping the fish alive during transportation. Variations in fish survival rates (50%-90%) were compared with changing wholesale market prices for humpback grouper ($40-$80), which collectively helps to highlight levels of profitability associated with grow-out production. Using the data obtained was found that positive internal rates of return ranging from 13% to 67% could be obtained if the higher valued humpback grouper were transported directly to Hong Kong and sold at an average wholesale market prices of US$60/kg (see Table 5).

Table 5: Internal Rates of Returns (IRR) using survival rates (SR) and Price variances for humpback grouper sold in East Timor at farmgate prices (Farm$) or marketed to Hong Kong (HK$) *

Farm$	***SR 50%***	***60%***	***70%***	***80%***	***90%***
15	-	-	-	-	-
25	-	-	-4	3	9
35	-3	7	15	23	31
HK$	***SR 50%***	***60%***	***70%***	***80%***	***90%***
40	-	-2	7	16	24
60	13	26	38	53	67
80	36	55	74	95	117

*IRRs are in bold. Negative values are assumed to be not feasible and are represented by an (-).

In conclusion, the overall purpose of this study has been to encourage the sustainable development of grouper mariculture and its potential as a specific social development project in East Timor, and for transitional economies in general. It is recommended that if such an enterprise is to be developed in East Timor, then a proactive marketing strategy must be implemented to ensure buyers and investors that a sustainable and quality product can be delivered to an already flourishing live grouper trade. Eco-labeling, product certifications and environmentally friendly practices are a few additional concepts that would need to be explored in more detail if the culture of grouper were to become a successful venture in East Timor. Furthermore, with supporting institutions such as GRIM there could be opportunities for committed business entrepreneurs to promote a strong research oriented mariculture industry within East Timor. The productive

marine environment endemic to the region would ideally accentuate this type of endeavor.

References

Ako, H., and Chan-Halbrendt, C. 2005. Market analysis of an open-ocean aquaculture enterprise for yellowfin tuna and grouper in East Timor. Technical report for the University of Hawaii at Manoa. 54 pages.

APEC. 2005. Bali Plan of Action: Asia-Pacific Economic Cooperation.

Bell, J. 1999. Aquaculture: a development opportunity for Pacific islands. Secretariat of the Pacific Community. 1st SPC Heads of Fisheries Meeting. Noumea, New Caledonia. 10 pages.

Campbell, H.F. and P.C. Brown. 2003. *Benefit-Cost Analysis: financial and economic appraisal using spreadsheets*. Cambridge University Press. 345 pages.

Cesar, H., Warren, K, Sadovy, Y., Lau, P., Maeijer, S., and.Van Ierland, E. 2000. Marine Market Transformation of the Live Reef Fish Food Trade in Southeast Asia: Collected Essays on the Economics of Coral Reefs. Cesar, H.S.J. (ed). CORDIO: Kalmar. Sweden. pp 137-157.

Chan, P.S.W. 2000. *The industry perspective: wholesale and retail marketing aspects of the Hong Kong live reef food fish trade*. SPC Live Reef Fish Information Bulletin 7:3–7.

Da Fonseca, Abilio. 2001. Economic & Environmental Effects of Small Scale Fishers and Fish Farmers Conference on Sustainable Development in East Timor (25th - 31st January 2001) Fisheries and Marine Environment Service (FMES). ETTA.

FAO 2004. State of World Fisheries and Aquaculture. Food and Agriculture Organization of the United Nations. Rome, 2004. 150 pages.

Graham, T. R. 2001. *A collaborative strategy to address the live reef food fish trade*. Asia Pacific Coastal Marine Program, Report # 0101. The Nature Conservancy. Honolulu, HI. USA. June 2001. 48 pages.

Halim, A. 2001. *Grouper culture: an option for grouper management in Indonesia*. Coastal Management. Taylor and Francis. No. 29. pp 319-326.

IUCN 2003 *Delineating the Coral Triangle, its ecoregions and functional seascapes*. Report on an expert workshop, held at the Southeast Asia Center for Marine Protected Areas, Bali, Indonesia (April 30 - May 2, 2003) Version 1.1 (June 2004)

Johannes, R.E. & Riepen, M. 1995. *Environmental, economic, and social implications of the live reef fish trade in Asia and the Western Pacific*. R.E. Johannes Pty. Ltd. Tasmania, Australia.

NDP 2001. National Development Plan in East Timor. United Nations development report.

Johnston, B., Petersen, L., Muldoon, G. 2005. Economic and marketing of live reef fish for food in Asia Pacific. Asia Pacific School of Economics and Government. Australia National University. ACIAR. Available at: http://apseg.anu.edu.au/staff/jb_live_reef_fish.php

Muldoon, G., Peterson, L., Johnston, B. 2005. Economic and market analysis of the live reef food fish trade in the Asia-Pacific region. *South Pacific Commission Live Reef Fish Information Bulletin* #13. January 2005. Secretariat of the Pacific Community, Noumea, New Caledonia.

Pomeroy, R. S., Agbayani, R., Duray, M., Toledo, J., Quinitio, G. 2004. The financial feasibility of small-scale grouper aquaculture in the Philippines. *Aquaculture Economics and Management*. V. 8 no 1-2. 2004. pp. 61-83.

Pomeroy, R.S., Agbayani, R. 2003. *The Financial Feasibility of Small-Scale Coral Reef Fish Aquaculture in the Indo-Pacific as an Alternative to Wild Stock Harvest for the International Live Reef Food Fish Trade*. Technical Report FTR1. The World Resources Institute. Washington DC, USA. 74 pages.

Pomeroy, R.S., Agbayani., R., Toledo, J.,. Sugama, K, Slamet, B.and Tridjoko. 2002. The status of grouper culture in Southeast Asia. *South Pacific Commission Live Reef Fish Information Bulletin* #10. 10-7. Secretariat of the Pacific Community, Noumea Cedex, New Caledonia.

Roberts, C.M., McClean, C.J, Veron, J.E.N., Hawkins, J.P., Allen, G.R., McAllister, D.E.,
Mittermeier, C.G., Schueler, F.W., Spalding, M., Wells, F., Vynne, C., and Werner, T.B. 2002. Marine biodiversity hotspots and conservation priorities for tropical reefs. Science, 295: 1380-1284.

Sadovy, Y. 2004. Marketing and monitoring live reef fishes in Hong Kong, an update. *South Pacific Commission Live Reef Fish Information Bulletin*.

Secretariat of the Pacific Community, Noumea Cedex, New Caledonia. http://www.spc.org.nc/coastfish/News/lrf/4/SadovyHK.htm

Sadovy, Y.J., Donaldson, T.J., Graham, T.R., McGilvray, F., Muldoon, G.J., Phillips, M.J., Rimmer, M.A., Smith, A., Yeeting, B. 2003. *While Stocks Last: The Live Reef Food Fish Trade,* Asian Development Bank, Manila, Philippines, 169 pages.

Sutarmat, T., S. Ismi, A. Hanafi, S. Kawahara. 2003. Manual for humpback grouper culture (Cromileptes altivelis) in floating net cages. Gondol Research Institute for Mariculture. 55 pages.

UNPD. 2006. *The path out of poverty; integrated rural development*: Timor Leste Human Development Report, A report of the United Nations Development Program, 87 pages.

UN. 2002. Johannesburg Summit. United Nations World Summit on Sustainable Development. Johannesburg, South Africa. August 26-Sept 4, 2002.

International Food and Agribusiness Management Review
Volume 11, Issue 4, 2008

Industry Speaks

Reflections on the Irrational

José Gobbée [1]

Director of GOAGRO and ZEA GLOBAL
Tucuman, 141 6A, Buenos Aires, BA,1341, Argentina.

Abstract

This article analyzes the various components of the current financial crisis and its implications for agriculture. While financial markets have been overrun by steep losses, violent price movements, and irrationality associated with a classic bubble, agricultural markets still have sound fundamentals and their underlying real assets may prove to be a safe haven during these trying times.

Keywords: global recession, commodities, demand, financial crisis.

ⓘCorresponding author: Tel: + 11.54.4312.3494
Email: jgobbee@goagro.com.ar

[1] José Gobbée is a recognized expert in global food markets and has published in several leading journals and newspapers. He has an interesting mix of expertise drawing from both private and academic research set within his commercial business interests.

José is currently Director at Agrifood Think Tank and at GOAGRO, a leading company in consulting and investments with clients such as Fonterra, Ospraie and Soros AgFunds. He is also member of the Board at ZEA Global and GSS main companies where they develop nursery and trait conversion services for seed firms such as Monsanto, Syngenta and others.

It is difficult to insert a dose of logic while in the midst of irrationality. Irrational is what prevails in almost all markets at this time.

The flight to quality by investing in U.S. Treasury Bonds is odd since they have the same incredible quality as ever but still pay nothing more or less than before. The fight to cover deficit positions of Index and Hedge explains much of the fall in agricultural commodities prices during the last weeks. Funds withdrew in the third quarter approximately USD 50B investment in commodities index funds tied to its own holdings according to Barclays Bank. Positions decreased from USD 175B to USD120B.

Strong fears of how the global recession will negatively impact food consumption also prevail in the market. Are these fears real? In the short run world GDP forecasters believe that the slowdown will decelerate the global economy ending in 2009 from 1.5 to 3%. Developed countries will not grow in 2009 more than 0.5 to 1%. Hence, the bulk of the growth forecasted for 2009 should come from emerging countries.

Even with slowdowns resulting from the financial crisis, analysts forecast GDP growths of 3.5 and 7 to 8% respectively for countries such as Brazil and China. The demand for food and energy in these countries together with other Asian and Middle Eastern countries should remain strong. That's why despite the crisis, I do not see by looking at the fundamentals a significant slowing in food commodities in the short term.

Recall that most agricultural commodities have a fairly inelastic demand, especially with those that are part of industrial or processed food supply chains. "The last thing people will do is stop eating," Warren Buffet once said while eating a hotdog during the dot.com bubble. He was responding to a question about why he kept investing in food companies and was short in dot.com investments.

Retail grocery-store prices leapt 7.6% last month from a year earlier, driven in part by a 14.2% rise in cereal and bakery prices, the Bureau of Labor Statistics reported. The USDA expects food prices to increase by as much as 5% next year, following an estimated 6% gain this year.

If we study other bull markets in agricultural commodities in modern history from 1906 to 1923; 1933 to 1955; and 1968 to 1982; all of them lasted more than twice as long as the ag commodity bull market we've been in since late 2001. All previous bull markets had significant corrections but the curve was bullish in the long term. This suggests that the recent fall in prices of some commodities might be temporary.

On the demand side, few analysts spoke about China's historic new policy, to start raising the income of farmers (740 M people left behind in income per capita). The motivation was to more closely align standards of living in rural areas to those in the cities. The new rural policy, as they call it, will try to reduce emigration from rural cities by increasing provincial economic activity.

Few analysts paid enough attention to Obama and McCain during the last debate where getting energy independent from countries like Iran, Venezuela and others was of the highest priority. This energy independence, in large part, will come from plant biomass. Obama even compared the challenge to the equivalent of sending a *Man to the moon*, an idea launched by Kennedy. A challenge which the majority of the world once thought impossible to achieve.

On the supply side we have the little discussed question among economists. How will the developed countries increase their budgets when they are already carrying large deficits and announcing bailout plans that increase daily? For example, Great Britain (USD692B), Japan (USD100B), Germany (USD780B), Spain (USD66B), USA (USD700B plus everything already invested).

That amount of government intervention may come from three sources (a) taxpayers (increasing the risk of recession in the short term), (b) printing more money (dangerous for inflation concerns) or (c) reducing the budget in other areas.

Whatever the source, these countries are the same ones that subsidize the global supply of food at approximately USD360 billion a year. So cuts will have to be in order so that their deficits do not become chronic and unpayable. One strong area of government expenditure is in agricultural subsidies. Therefore, this financial crisis should accelerate a trend already underway, the decline in the amounts for agricultural credits and subsidies in these countries.

Continuing with the analysis of supply, we see that the American harvest is ending well. Stocks are being replenished, (although we do not yet have the final results in soybean). Countries like Australia and Russia are rebuilding part of their stocks from previous bad harvests.

On the other side are commodities such as soybeans. Brazil has not increased their planted acreage because high (until this latest devaluation) oil and fertilizer costs at the time of planting created negative margins. According to satellite images in Mato Grosso there are approximately 650k fewer planted acres this year and the director of Global Sat expects 3.5 M tons less harvest.

If restrictive policy on taxes and exports continue jointly with the decrease in outputs prices, the Argentine farmer will face a similar problem. That's why we should see a price correction even though global supplies aren't falling. In other

commodities such as corn, Argentina is the second-largest world exporter and will decrease their planted area and output by around 28% as the government has shut down exports. Wheat harvest is estimated at 10M tons against the16M that were expected by the USDA.

All this makes us think that despite the irrationalities we saw last week, shares of Monsanto and Syngenta falling by approximately 30-40% in a week or so, and corporations such as Nokia, Motorola, Exxon-Mobil falling 30% to 9 times their annual profits, the fundamentals for the upward trend in agricultural commodities remain. The latest report from the United Nations predicts that prices for agricultural products will continue this upward trend. Food companies have outperformed the broader stock market in the last three months, with their shares are down 18% versus a 29% decline for the Dow Jones U.S. Total Market Index. I agree with Michael Lewis, global head of commodities research of Deutsche Bank and Kevin Norrish, Senior Researcher Commodity Barclay who say the fundamentals are still in place and that this is only a pause in the uptrend.

Nevertheless, I and others believe that the crisis will continue. The question is the length in the pause, will it be months or years? It is certain that there will be downsizing in some agrifood chains (as it is already happening in the Brazilian agribusiness which is heavily financed by banks), less credit for ag commodity exports and imports (we know of some problems with Russian Letter of Credits), some defaults, and high volatility of the market.

I also believe that there will be a scenario of deflation in all assets no matter the color or the geography, and huge fiscal deficits no matter the ideology of governments. This scenario will lead at the end of the day to a great inflation scenario after the significant injections of money by government and after lowering interest rates to their minimum in order to jump-start the economy.

.

The question is the timeframe, and when and how all this will happen. But in the medium and long-term upward trend in agricultural commodity prices will continue. Paraphrasing again Warren Buffet to close this article, "this will be a time of crisis but also a time of great opportunities," and we add—for the food and agricultural sectors.

International Food and Agribusiness Management Review
Volume 11, Issue 4, 2008

La Industria Habla

Reflexiones en la Irracionalidad

José Gobbée [1]

Director of GOAGRO and ZEA GLOBAL
Tucuman, 141 6A, Buenos Aires, BA,1341, Argentina.

Resúmen

El articulo analiza algunos componentes de la crisis financiera mundial y las implicancias para el sector agropecuario. Mientras los mercados financieros han tenido fuertes declinaciones con movimientos violentos junto a la irracionalidad de la burbuja clásica, en el sector agropecuario todavía se mantienen fundamentals positivos y sus activos duros pueden servir como destino de inversión durante esta época difícil.

Palabras Claves: recesión global, commodities, demanda, crisis financiera.

ⓘ Autor correspondiente: Tel: + 11.54.4312.3494
Email: jgobbee@goagro.com.ar

[1] José Gobbée es un experto bien conocido por su conocimiento de los mercados globales agropecuarios. El ha publicado artículos en jornales científicos y la prensa publica. El ha experiencias interesantes que originaron en los sectores privado y académico, y que están integrados con sus intereses comerciales.

Ahora José es el director para el Agrifood Think Tank y la empresa GOAGRO, una consultoría de inversión con algunas clientes como Fonterra, Ospraie and Soros AgFunds. El también es un miembro de la cámara de consejo de Zea Global y GSS que desarrollan servicios de viveros para semilleros como Monsanto, Syngenta, y otros.

Difícil poner lógica en medio de la irracionalidad. Lo irracional es lo imperante en casi todos los mercados que analicemos en este momento. Difícil saber como quedarán los distintas variables económicas una vez que baje la marea como dice Warren y sepamos quienes estaban desnudos.

El fly to quality hacia Bonos del Tesoro americano (increíble que tengan la misma quality o mas ya que pagan nada o menos que antes) y el fly a cubrir posiciones creemos que son las razones mas fuertes para explicar la caída en los precios de commodities agrícolas. Según el banco Barclays en el tercer trimestre los fondos retiraron USD 5000M de inversiones en index funds ligados a commodities sus tenencias en los mismos bajaron de USD 175k a USd120k.

Sumado a estos los fears de cómo impactará la recesión global en el menor consumo de alimentos. Son estos miedos reales? Analizaremos esta última pregunta para tratar de empezar a entender que influencia en el corto y mediano plazo podría tener la recesión en la baja del consumo de alimentos. Los pronósticos de crecimiento del mundo con esta desaceleración van de 1,5 a 3% según las fuentes. Los países desarrollados no crecerían en 2009 mas de 0,5 a 1% con lo cual el grueso del crecimiento pronosticado para 2009 debería venir de los países emergentes.

Para países como Brasil y China aún con las desaceleraciones de la crisis financiera, las distintas fuentes pronostican crecimientos de 3,5 y 7 a 8% respectivamente. Estos países junto a otros países asiáticos y árabes son fuertes demandantes de energía y alimentos. Es por eso que a pesar de la crisis no vemos en los fundamentals un desaceleramiento significativo en el corto plazo. Recordemos que la mayor parte de los commodities agrícolas son bastante inelásticos sobretodo con respecto a los bienes industriales. ¨Lo último que hará la gente es dejar de comer estas cosas¨, como respondió alguna vez Warren Buffet mientras comía un hotdog jugando al golf y le preguntaban porque no invertía mas fuerte en las dot.com y menos en alimentos.

Si miramos los otros bull markets en commodities agrícolas de la historia moderna — 1906 a 1923, 1933 a 1955 y 1968 a 1982 — todos duraron mas del doble que la tendencia alcista que venían recorriendo las commodities desde fines del 2001 hasta la crisis financiera. Todas tuvieron significativas correciones pero la curva fue alcista en el largo plazo sugiriendo que la reciente caída en los precios de algunos commodities podría ser temporaria.

Del lado de la demanda, a pasado casi desapercibido que China planea con la histórica disposición tomada hoy por su gobierno equiparar el ingreso de los campesinos (740 M de habitantes postergados) con el ingreso de los que viven en las grandes ciudades. (ver nota)

Obama y McCain en el último debate pusieron como prioridades N1 y N2 en sus agendas no depender mas del petróleo de países como Irán, Venezuela y otros y seguir acelerando el objetivo de autosuficiencia energética en gran parte a través de biocombustibles derivados de biomasa vegetal. Inclusive Obama comparó el desafío con el del hombre llegando a la luna lanzado por Kennedy. Desafío quela mayoría pensaba imposible de cumplir.

Del lado de la oferta nos hacemos una pregunta que aún es poco discutida entre los economistas. Como harán para incrementar sus presupuestos países ya con importantes déficits que deben aumentarlos con los planes de salvataje anunciados hasta hoy como Gran Bretaña(USD692B), Japón (USD100B), Alemania (USD78B), España (USD66B), EEUU (USD700B mas todo lo ya invertido)?
Todo ese dinero puede provenir de tres fuentes a) los contribuyentes (aumentarían la recesión), b) mayor impresión de moneda (generarían inflación) o c) disminución del presupuesto en otras áreas

Cualquiera sea la fuente, estos países que son los que subsidian a la oferta mundial de alimentos en USD360 billones por año deberán cortar gastos en otras áreas para que sus déficits no se vuelvan crónicos e impagables. Una de las áreas de mas gastos son los subsidios agrícolas. Allí entonces vemos que esta crisis financiera debería acelerar lo que se venía haciendo hasta ahora, la disminución de los montos para subsidios y créditos agrícolas en estos países.

Siguiendo con el análisis de la oferta vemos que la cosecha americana termina bien recomponiendo stocks (aunque aún no tenemos los resultados finales) y países como Australia y Rusia se recomponen de malas campañas.

Pero por el otro lado en commodities como la soja, países como Brasil no han aumentado su superficie plantada porque los números para el agricultor son de quebranto (hasta esta última devaluación). Según imagenes satelitales en Mato Grosso se ven mas de 650k hectareas menos plantadas y el director de Global Sat prevee 3.5 M de toneladas menos en esa zona para este año.

Para el agricultor argentino la situación es parecida en la mayoría de los casos de seguir con los actuales impuestos a las exportaciones y a este precio de la soja. Es por eso que el precio debería corregirse para que siguiera habiendo la misma oferta mundial. En otros commodities como maíz, Argentina segundo país exportador decrecería el área plantada en un 28% (el gobierno ha cerrado las exportaciones) y ya la cosecha de trigo se estima en 10M de toneladas contras los 16M que se esperaban.

Todo esto nos hace pensar que a pesar de ver irracionalidades como que la acción de Monsanto y Syngenta cae en semanas un 40%, o que corporaciones como Nokia, Exxon Mobil cayeron 30% a 9 veces sus beneficios anuales, los fundamentals para la

tendencia alcista en commodities agrícolas seguiría tarde o temprano mas en relación con el último informe de la ONU (United Nations) que predice esto para los precios agrícolas (food prices). Los fundamentals siguen estando ahí y coincidimos con Michael Lewis, global head of commodities research del Deutsche Bank y Kevin Norrish, Senior Commodity Researcher de Barclay que dicen que esto es solo una pausa en la tendencia alcista.

Creemos que la crisis seguirá. La pregunta es meses, años?. Es seguro que habrá cortes de cadenas de pago (como ya está ocurriendo en el agro brasileño que es fuertemente financiado por los bancos), menor crédito para exportaciones, algunos defaults y gran volatilidad de mercados. Creemos también que habrá un escenario de deflación en todos los activos no importa el color ni la geografía de los mismos e inmensos déficits fiscales no importa la ideología de los gobiernos. Este escenario llevará al final a una gran inflación después del chorro de dinero enviado por los grandes gobiernos y la baja de tasas hasta sus mínimos para no dejar caer el sistema.

La pregunta es el timming y cuando y como pasará todo esto. Pero en el mediano y largo plazo la tendencia alcista de los commodities agrícolas creemos que continuará. Cerrando también con Warren este será tiempo de crisis pero también de grandes oportunidades.

José Gobbée para AGRI FOOD THINK TANK

International Food and Agribusiness Management Review
Volume 11, Issue 4, 2008

Trends and Opportunities in Agriculture
An Executive Interview with Lowell Catlett [1]

H. Douglas Jose [Φ]

Professor and Extension Farm Management Specialist, Department of Agricultural Economics
Room 304 Filley Hall, University of Nebraska, Lincoln NE 68583-0922

Introduction

Agriculture will change more in the next decade than it did in the last century. Lowell Catlett is a futurist sharing his knowledge and insight on the new trends and technologies shaping the future of agriculture and how those working in this industry can take advantage of new opportunities. Dr. Catlett is a Regent's Professor at New Mexico State University and Dean of the College of Agriculture and Home Economics.

This podcast can be seen with Realplayer on IAMA's website at:
http://www.ifama.org/dispatch.asp?page=executive_interviews_2008

[1] Lowell Catlett has authored numerous books and articles and won the Westhafer Award, NMSU's highest award given to a professor. He works nationally and internationally with corporations and organizations doing futuristic planning on the impact of technology on careers, lifestyles and the economy. Catlett also works with the U.S. Departments of Agriculture, Labor, Interior, Defense, Education, Energy and the World Bank. He has presented to more than 75 universities including Harvard, MIT, and Cornell. Dr. Catlett can be contacted at: agdean@nmsu.edu.

[Φ] Doug Jose is the host of the Market Journal, a weekly televised program on agriculture produced by the University of Nebraska-Lincoln. This interview was conducted during the 18th Annual World Forum and Symposium in Monterey, California, June 18, 2008. Doug Jose can be contacted at: hjose1@unl.edu

In the changing world of agriculture, creativity and innovation are becoming very important. Lowell Catlett who is dean of agriculture at New Mexico State University has gained a reputation of sort for getting our thinking going. Let's talk about innovation. Is it important these days?

Catlett: Well, I think it's more critical now, than at any time in agriculture and natural resources history. We've got lots of opportunities and a lot of problems—however you want to frame them. The only way they're going to be solved is by people who will, take a fresh look and be creative. We've had people in the past doing wonderful things in the field of agriculture. But, we've got some really interesting opportunities now where agriculture is not just food anymore. It's as you know, in Nebraska and other places, becoming a vital energy component, and as we start looking at other potential things, such as pharmacology. We're going to need some creativity to get those jobs done.

We can think about some of the road blocks in the past. Maybe lack of communication and these sort of things, but maybe it's better to talk about opportunities. There are opportunities in terms of both information and in terms of things we can do.

Catlett: One of things that I try to get people to understand is this generation coming on now, the young people, that I call iPodders, they grew up in a world where they've had total food security. The worst thing that's happened to them is not getting tomatoes for a week, or they had to quit eating fresh spinach. You know, whereas our parents went through the great depression, they had to scramble to make sure there was enough food on the table. And, I'm not saying this is bad, they just have a totally different concept of food. So, we have to ramp up to an idea of what we thought was maybe silly—to know from birth to the slaughter house where a cow was. We think that's silly, but to the generation that grew up basically saying, "well, I don't want a one-one-billionth of a chance of getting mad cow disease, so I want to know exactly where that calf was born." And so it's one of those things that we've got to now ramp up our understanding of what they demand and want, and that takes a lot of creativity to figure it out.

So, there's demand, but also an opportunity here. Consumers have this opportunity to ask for more information, but there's an opportunity from the point of view of the seller to respond to that.

Catlett: Oh, absolutely. If you want to certify your animals so that they are e-coli free or if you want to make sure they are certified to the source—there's a market for them. There's a market now that's doubled in the last decade for organic. Well, you know, our parents grew up with organic. That's why they told us to cook chicken and wash the vegetables. They grew up in an organic world and we moved away from it, and now there's a certain class of people that want it. And hey, if you

can provide that and make money off of them, more power to you. It's a totally changing dynamic. We now have 50 million square feet of office space in the United States now, that's considered to be green, green roofs. So, we've got farmers that are now taking care of green roofs. Downtown Chicago led the nation last year—2.5 millions square feet of downtown skyscrapers in Chicago with green roofs. It's sod. It's bedding plants. I keep trying to tell the next generation of farmers "you're going to be farming the top of the John Hancock Tower". And it's going to be kind of high up. Our parents would have said, "What are you talking about?" But here's a great opportunity, green roofs, green walls, things that weren't even on the horizon five years ago, are providing great opportunities.

So, how does a producer approach this? What am I doing and where are the opportunities around this? How do you approach it and find those creative ideas to exploit?

Catlett: Well, part of it has always been, you know, as Thomas Jefferson told us, reading imparts knowledge but travel imparts wisdom. And part of it is to always be receptive to an opportunity. And that's one of the things that we find, that people lose their creativity because they go "oh, we've tried that." Okay, or they don't go to enough events, or they're not around enough people. They're not around a stimulating enough environment. And when you don't use your brain, it atrophies. But what we do know from the new neuro-genesis is that the brain, what we were told early on in human medicine was that the brain, did not reproduce itself. But we now know that that's not true. About every fourteen days, your brain, just like your bones and other parts of your body, is a totally new one. So, we've got to get out of the mindset that we don't have new brain cells. How do we do it? We've just got to keep them stimulated. So, how do you do it? They understand the numbers. It takes about 150 ideas. People sitting around brainstorming, "I think saw dust would be a good energy source." Ok, of 150 new ideas…only about 10 are worth exploring. Only one will have any substance or value. So, it takes a lot of bouncing around and talking to people and creative discussions. And most of us, and it's not just farmers, most of us don't live in an environment that keeps us constantly stimulated. And my point is, if you will read, travel and share with people, throwing ideas out, your creative goes up. You've got a better chance of finding new markets.

So, finding ways to at least discuss those 150 ideas every day, every week, whatever the time period is. At least, interacting with people, or maybe on the internet… some way to get those 150 ideas at least on the table.

Catlett: What's interesting, the older you get, the more you find out that these problems existed a long time ago. Many of the farmer organizations got their start after the Civil War; people would travel and look at the very poverty-stricken, very socially-closed environments in rural America. They said, you know, "The only way

we can help these people is to open up a larger social network in order to know the opportunities." The cooperative extension service was founded on that concept. But most of the farmer organizations trace their roots back to trying to bring farmers out of a very isolated environment into a larger social environment so they could trade seed and learn a new practice, and get those ideas stimulated. It's not a new concept.

But yet, we've maybe withdrawn from that over the recent years…The neighbor is a competitor. But maybe you go beyond the neighbor and talk to someone else in the next county or the next state.

Catlett: We used to call it "coffee shop talk". But surprisingly, if it's in the coffee shop or talking with your neighbors where you get some new ideas, then so be it. And the young generation—the new young generation, carries their cell phones with them. They've notched it up and are constantly texting their friends. So this young generation is the one coming up with a lot of new ideas because they are socially connected now in a way that you and I have never been. My wife will text me and I just pick up the phone and call her, and she goes "Why didn't you text me?" I go, "It's easier for me to call you." But this generation, they love to text, so they have a social network almost 24 hours a day. They have great ideas.

So the key here is keep that brain functioning and think about ideas and find that one gem there.

Catlett: That's exactly right. Don't give up.

