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CHALLENGING THE PARADIGM: HOW TO EXTEND CONVENTIONAL AGRICULTURAL ECONOMIC ANALYSIS TO SUPPORT AGRIBUSINESS IN THE NEW GLOBAL ECONOMY

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Agribusinesses in the global agricultural and food system are experiencing formidable competitive pressures. Agricultural supply systems are exhibiting innovative production arrangements, contracts, and closer vertical marketing arrangements to increase efficiency and profitability through greater market co-ordination. The complexity of the emerging agricultural marketing structures necessitates an appropriate research paradigm to analyse and understand these changes. Constructivism is proposed as an applicable research paradigm and a potential research framework for the analysis of supply chains is discussed.

1. INTRODUCTION

Agribusinesses in the global agricultural and food system are experiencing formidable competitive pressures. To deal with these pressures firms have to realise all opportunities to enhance their competitiveness. In the United States the most noticeable change in the agricultural and food systems has been the emergence of tighter vertical relationships, or the process of "agricultural industrialisation". The governance structure of the agricultural supply system is exhibiting innovative production arrangements, contracts, and closer vertical marketing arrangements (Barkema & Drabenstott, 1996 and Van Rooyen & Van Rooyen, 1999). Companies are therefore seeking ways of increasing efficiency and profitability through greater market co-ordination.

Supply chain management can be seen as one of the last frontiers for profit improvement left in the race for international competitive advantage (Christopher, 1999). Zuurbier and Trienekens (2000) briefly defines supply chain management is the process of managing the system of producing, processing, and distributing food and agricultural products to the consumers. The emergence of closer vertical co-ordination of transactions in agricultural

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and food markets introduces new critical issues to the analysis of food marketing problems like: How are fair prices determined without 'transparent' auction markets? What is a fair distribution of profits and risks in a negotiated market with information and power asymmetry? A new inquiry paradigm and new research tools are required to address new issues. This paper briefly delves into the concept of supply chain management to explore the complexity of the subject matter. The nature of competing research paradigms in modern science is discussed with constructivist research proposed as an appropriate complement and augmentation to the positivist paradigm generally applied by agricultural economists. The paper concludes with an overview of applicable tools for supply chain management research and research priorities for the future.

2. THE NEED FOR SUPPLY CHAIN MANAGEMENT RESEARCH

A supply chain can be defined as an integrated process through which a number of business entities (e.g. producers, manufacturers, distributors and retailers) co-operate in an effort to: (1) acquire raw materials, (2) convert these raw materials into specified final products, and (3) deliver these final products to retailers (Beamon, 1998). Boehlje (1999) states that supply chains are developed to improve efficiency through better flow scheduling and resource utilisation, increase the ability to manage and control quality throughout the chain, reduce risk and increase the ability of the agricultural industries to respond quickly to changes in consumer demand.

Therefore, supply chain management enhances the efficiency and effectiveness of the system to deliver an array of healthy, safe and desirable food and fibre products in a cost-effective way to the consumer or public. Supply chain management entails much more than logistics. For suppliers or producers supply chain management offer new possibilities for creating organisational structures and linkages that will ensure them a strong position in the market and enhance their ability to generate healthy profits (Downey, 1996).

Due to increasing prevalence of co-ordinated supply chain governance in the flow of product, money and information between the members of the supply and demand systems, discrete transactions are being replaced by relational exchanges. In the discretional exchange the buyer and seller are in a relatively adversarial relationship since both aim to negotiate the highest possible economic advantage for themselves. It should be added that these adversarial relationships are mitigated over time as social interactions develop to smoothen price negotiations (Zuurbier & Trienekens, 2000).

Relational exchanges on the other hand are based on long term interactions that can also be called alliances, joint ventures or value adding partnerships and networks. The development of these alliances is based on substantial investments by both partners. Relational exchanges require a distribution of proprietary rights over more than one firm (Zuurbier & Trienekens, 2000).

Dooley and Akridge (1998) used the following figure to represent the changes that took place within the governance structures of food and agribusiness firms:

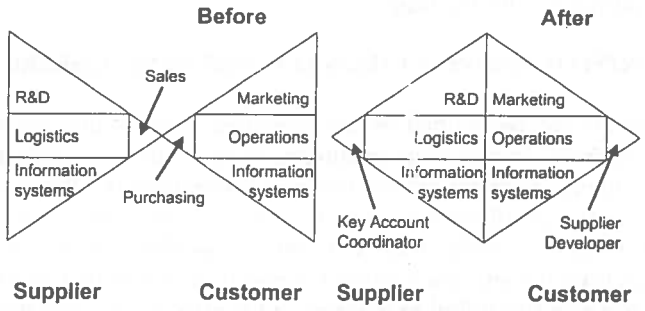

Figure 1: Changes in procurement with shift to supply chain management
Source: Dooley and Akridge (1998)

In Figure 1 it is clear that the firm increases its relationship interface from a single salesman/purchaser relationship with price as the only communication between the two parties to a co-ordination of a complex set of business activities. The activities of purchasing and selling undergo the most profound changes in the new governance structure and the personnel associated with these activities are usually the most affected by governance structure changes.

Ritson in Padberg, Ritson and Albisu (1997) identifies three kinds of problems in agro-food marketing problems. The first centres around the phenomenon of concentration in the agro-food sector which allows firms to exploit their market power at the detriment of farmers and consumers. Excessive marketing margins due to inefficiencies in the market structure is the second problem, with price formation the third problem. Analysis of these problems is divided into three broad categories analogous to the problems in the market namely (1) structure/conduct/performance analysis, (2) the analysis of marketing margins, and (3) the analysis of supply and demand relations and

the explanation for price movements over time and space. Finally market policies are divided into three broad categories namely (1) price controls (e.g. intervention buying, margin controls, and import taxes), (2) formation of producer or marketing groups and boards (i.e. countervailing power), and (3) various initiatives aimed at improving marketing efficiency (e.g. quality, standards and information). These issues are schematically represented in Figure 2.

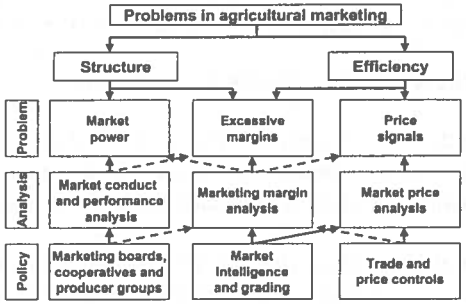

Figure 2: Schematic organisation of issues in agricultural marketing
Source: Padberg et al (1997)

The core problems in agro-food marketing will always remain. As agriculture is industrialised and supply chain management is implemented agricultural issues will become even more involved, demanding concomitant improvement of research and analysis paradigms and tools. In the past economists and managers have used traditional economic and cost analysis models to examine agro-food market problems. Supply and demand analysis, transaction costs, and other traditional tools in the neo-classical economics framework were used to examine the effectiveness of each stage of the flow of products from inputs through farm production and manufacturing to the final consumer. These tools are important and valid for many purposes. However, vital assumptions implicit to much of this paradigm can increasingly be questioned. The following challenges emerge (Downey, 1996, Boehlje, 1999 and Zuurbier & Trienekens, 2000):

- With fewer open markets, how is price determined?
- What constitutes a fair price and what does a price reflect that is negotiated behind closed doors?

- How much information flow is needed in a system to ensure that the needs of the producers, consumers and other players are satisfied?
- Who should bear risk and how should risk be divided between the members of the supply chain?
- What is a fair distribution of profits?
- What constitutes fair competition amongst firms when the number of competitors in a system is shrinking and the rest 'collude'?

3. TOWARDS A NEW INQUIRY PARADIGM

Before we consider the systems available to evaluate the performance of Supply Chains it would be constructive to consider, for a moment, the enquiry paradigm with which we should approach these challenges.

Beers, Beulens and Van Dalen (1998) argue that the diversity and complexity of the challenges involved in supply chain management necessitates a multi-disciplinary approach. A supply chain practitioner should be able to harness the contributions from various scientific disciplines to define adequate sub-problems and to obtain solutions for these from the disciplines available. The different solutions must be successfully synthesised to create a unique solution to the primary problem facing the supply chain. "*It is the explicit multi-disciplinary scope and its own level of abstraction that differentiates this challenge from more specialised disciplines*" (Beers *et al, 1998).*

Four paradigms have been competing for the paradigm of choice in informing and guiding inquiry: positivism, postpositivism, critical theory and constructivism. A paradigm may be viewed as a set of *basic beliefs* (or metaphysics) that deals with the ultimates or first principles. It represents a *world view* that defines, for its holder, the nature of the 'world', the individual's place in it, and the range of possible relations to that world and its parts. Historically there has been a heavy emphasis on quantification in science. Scientific maturity is commonly believed to emerge as the degree of quantification found within a field increases (Denzin & Lincoln, 1994).

Positivism was, until recently, the dominant philosophy for scientific enquiry in agricultural economics which supplied the dominant theory of how knowledge cumulates and declines in disciplines, but also directly informed virtually all economic practice (Ritzer, 1992). The theory of positivism asserts the existence of one absolute, physical-material reality from which there are

no variations (Patton, 1980). In recent years criticism has mounted against the conventional paradigm of quantification in terms of the metaphysical assumptions of positivist and postpositivist inquiry. Ritzer (1992) states that "*Positivist arguments privilege "scientific" methods and knowledge so strongly that they tower imperiously above all public discussion, providing ready-made rationales for expert planning, elite decision making, and weak democracy.*" This does not imply a criticism against the application of quantification itself, but the assumptions on which the commonly accepted superiority of quantification has been based.

The critiques against the quantitative schools, i.e. positivism and postpositivism can be classified into internal or intraparadigm critiques and external or extraparadigm critiques (Denzin & Lincoln, 1994):

Intraparadigm critiques: In the process of quantification certain variables and subsets of variables are excluded due to the difficulties in quantifying these variables. Consequently the context is "stripped" because of the exclusionary design of the quantitative model. Quantitative research tends to exclude the meaning and purpose of human behaviour in the research context. Qualitative data can provide a rich insight into human behaviour in this context. Positivist and postpositivist research tend to cause a disjunction of ground theories with local contexts. Generalised theory based on aggregated data has little or no relevance to the local context of economic actors i.e. business firms. This is directly related to the inapplicability of general data to individual cases. And finally the positivist and postpositivist research paradigm tends to diminish the discovery dimension in inquiry. The reference framework of the researcher and applied theory binds *a prior* hypotheses that have to be tested against data gathered especially for the purpose.

Extraparadigm critiques. Conventional approaches to research involve the verification or falsification of hypotheses within a certain theoretical framework. The facts or data used for proving or disproving the hypotheses are considered for their applicability to the research question against the background of the chosen theory. It can therefore be said that facts are only facts within some theoretical framework. Theory tends to be underdetermined. This problem is based on the difficulty of successful induction of observations to theory. Although it is relatively easy to deduce certain facts from a specific theory, it is very difficult to induce theory from a set of facts. A set of data can consequently be viewed through the "glasses" of several different theories with satisfactory results. The challenge, although unattainable, remains to induce a single, unchallengeable theory to explain the "real" truth. Facts are also interdependent and value laden. The use of specific

Table 1: Basic beliefs (metaphysics) of alternative inquiry paradigms

Item	Positivism	Postpositivism	Critical Theory	Constructivism
Ontology	naïve realism – "real" reality but apprehendable	critical realism – "real" reality but only imperfectly and probabilistically apprehendable	historical realism – virtual reality shaped by social, political, cultural, economic, ethnic, and gender values; crystallised over time	Relativism – local and specific constructed realities
Epistemology	dualist/objectivist; findings true	modified dualist/objectivist; critical traditional/ community; findings probably true	transactional/subjectivist; value-mediated findings	transactional/ subjectivist; created findings
Methodology	experimental/manipulative; verification of hypotheses; chiefly quantitative methods	modified experimental/ manipulative; falsification of hypotheses; may include qualitative methods	dialogic/dialectical	hermeneutical/ dialectical

Source: *Denzin and Lincoln (1994).*

Note: *Ontology: What is the form and nature of reality and what can be known about it? Epistimology: What is the nature of the relationship between the knower and would-be knower and what can be known? Methodology: How can the inquirer go about finding out whatever he or she believes can be known?*

Table 2: Paradigm positions on selected practical issues

Item	Positivism	Postpositivism	Critical Theory	Constructivism
Inquiry aim	explanation: prediction and control		critique and transformation; restitution and emancipation	understanding; reconstruction
Nature of knowledge	verified hypotheses established as facts or laws	nonfalsified hypotheses that are probable facts or laws	structural/historical insights	individual reconstructions coalescing around consensus
Knowledge accumulation	accretion – "building blocks" adding to "edifice of knowledge" – generalisations and cause-effect linkages		historical revisionism; generalisation by similarity	more informed and sophisticated reconstructions; vicarious experience
Goodness or quality criteria	conventional benchmarks of "rigour" internal and external validity, reliability and objectivity		historical situatedness; erosion of ignorance; action stimulus	trustworthiness and authenticity and misapprehensions
Values	excluded – influence denied		included-formative	
Ethics	extrinsic; tilt toward deception		intrinsic; moral tilt toward revelation	intrinsic; process tilt toward revelation; special problems
Voice	"disinterested scientist" as informer of decision makers, policy makers and change agents		"transformative intellectual" as advocate and activist	"passionate participant" as facilitator of multi-voice reconstruction
Training	technical and quantitative; substantive theories	technical; quantitative and qualitative; substantive theories	resocialisation; qualitative and quantitative; history; values of altruism and empowerment	

Adapted from: Denzin and Lincoln (1994)

theories lends inordinately more value to certain facts or subsets of facts that what should be the case. The interactive nature of research will always create uncertainty as to what "really" exists. Even in the physical (or hard) sciences, phenomena such as Heisenberg's uncertainty principle and the Bohr complementarity principle indicates measurement and induction uncertainty. In the same way the collection of data influences the behaviour of the subject, while the data collection process is bound by the framework and theories of the researcher (Denzin & Lincoln, 1994).

Constructivism differ the most from other paradigm in terms of the ontological position. The relativism of the constructivist approach, which assumes multiple, apprehensible, and sometimes conflicting social realities, contrasts significantly with the naïve realism of the positivist paradigm.

Constructivism aims to understand and reconstruct the realities of the actors in the research problem. "Knowledge" used in the reconstruction is based on relative consensus of those competent to interpret the substance of the construction.

Ritzer (1992) points out that although positivism should not be seen as the only research paradigm, the alternatives (e.g. critical or constructivist theory) should be applied with circumspection. Most of the alternative research paradigms are heavily dependent on the interpretive skills of the individual investigator which can be idiosyncratic and essentially unstructured. Morgan (1983) holds a very strong and significant opinion on the application of positivism in research. In substantive study a determinist, realist, and positivist approach will always remain the most applicable. Unnecessary application of constructivist, or other, research paradigms can be counter-productive. Positivist research 'cuts to the bone' while the danger always exists that the researcher can remain caught up in metaphysical or philosophical exploration of the topic rather than getting down to the important issues of the problem when applying a constructivist research paradigm

In agribusiness research the complex view on reality of the constructivist approach is deemed an important complement to positivist paradigms to understand the complexities of business interactions in supply chains. The epistemology and methodology of the constructivist approach grants the researcher the opportunity to create knowledge through interaction with the subject(s). The information learned from the interaction can then be used to reconstruct previously held construction in a hermeneutic or dialectical methodology.

New paradigms of inquiry are posing weighty challenges to conventional methodology. The problems associated with conventional methodology can be ameliorated through the augmented application of qualitative data in research. This is not an argument for or against the use of quantitative data, but rather a challenge to carefully consider the fundamental inquiry paradigm relevant to the research problem and consequently the basic assumptions applied in the research problem (Ritzer, 1992, Patton, 1980; and Denzin & Lincoln, 1994). The emerging focus on Supply Chain Management challenges is a relevant example to agricultural economics research. 'Chain science' is an example of the assertion of new paradigms in research.

4. AGRIBUSINESS ANALYSIS: INQUIRY TOOL FOR THE SUPPLY CHAIN

In the previous section the need for a combination of positivist and constructivist research paradigms was expounded. This section comprises an overview of the theoretical constructs available to the researcher to study the challenges of supply chain management. The theoretical constructs range from procedural to the relational aspects of supply chains. This is where the biggest challenge is posed to the researcher: to integrate and apply the different (positivist/reductionist) methodologies to render constructivist results that will make sense in complex supply chain systems.

The complexity of supply chain systems is vested in their different but interrelated dimensions. Handfield and Nichols (1999) divides their book: "*Introduction to Supply Chain Management*" into three subsections which are: (1) information systems and technology, (2) managing the flow of materials across the supply chain, and (3) developing and maintaining supply chain relationships. Boehlje (1999) identifies six critical dimensions of the value chain as illustrated in Figure 2. These critical dimensions relate first of all to the set of processes or activities that create the attributes or products that are demanded by the consumer, to the flows of product, finance and information between the different participants in the supply chain, induced and maintained by incentive structures within a governance structure.

Trienekens (1999), and Beers *et al.* (1998) propose three dimensions to describe the supply chain namely the process, performance and institutional dimensions. Chain performance refers to the relationship between the supply chain and its environment as perceived by the actors within the chain and the actors within the environment of the supply chain. The perspective of the process focuses on the way the supply chains perform the process of delivering a product with specific attributes to the consumer. These processes

encompass primary, support, communication, co-ordination, and management. The institutional perspective concentrates on the way different organisations co-operate with each other in a formalised way. Different possibilities for linking participants together is described and analysed (Beers *et al*, 1998).

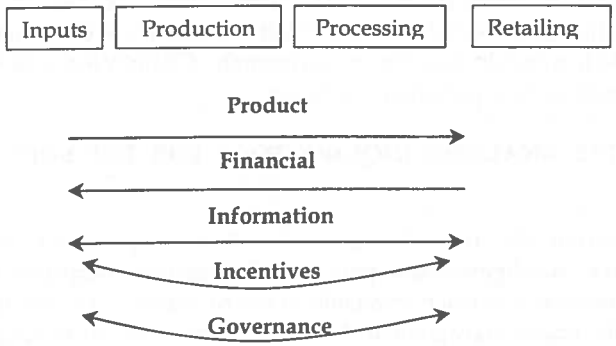

Figure 3: Critical dimensions of a value chain

Boehlje (1999) divides the measurement of economic performance of emerging phenomena in the agricultural industry into two categories as indicated in Table 3.

Table 3: Measurement of economic performance

Physical Product/Financial Stocks and Flows	Relationship/Information Stocks and Flows
1. Quality	1. Trust
2. Yield/input-output/physical efficiency	2. Accuracy of messages (information)
3. Economic value	3. Flexibility
4. Market or transfer price	4. Commitment
5. Time to market	5. Speed of response
6. Errors/mistakes	6. Strength of signals
7. Cost	7. Equitability (fairness)/distributional issues (cost, revenue, risk)
8. Profit	8. Adaptability
9. Return on assets	9. Transition/switching cost
10. Cash flows	10. Value creation and capture
11. Capital turnover	11. Value decay
12. Property rights	

Source: Boehlje, 1999

The different dimensions of supply chains can be isolated and researched using the positivist paradigm because each of these dimensions are described by scientific disciplines in their own right e.g. product flow – logistics and information flow - Information and Communication Technology (ICT). The different dimensions are quantifiable their own right by their own disciplines. However, the challenge to future researchers would be to recognise that the dimensions are interrelated and a positivist approach will not be able to truly appreciate and explain observed supply chain phenomena. A constructivist approach is therefore essential to the successful establishment of chain science as a discipline.

Trienekens (1999) followed a constructivist approach when he related various scientific approaches applicable to supply chains to the three primary dimensions of chain analysis. This division is represented in Table 4.

Table 4: Possible contributions of different theoretical frameworks to supply chain analysis

Institution	Performance	Process
Transaction cost economics	Transaction cost economics	Supply Chain Management
Agency theory	Transaction cost economics	Information and Communication Technology
Network Theory	Agency theory	Activity Based Costing
Strategic Management	Resource Dependency theory	Direct Product Profitability
Transaction Cost of Ownership	Activity Based Costing	Transaction Cost of Ownership
	Direct Product Profitability	
	Transaction Cost of Ownership	

Source: Trienekens, 1999

These theories can be evaluated according to their contribution to the research framework in terms of the subject and context of the theory (why), the applicable variables (what), and the problem approach (how). The scientific approaches to analyse supply chains are classified according to these standards in Table 5.

Table 5: Examples of theory elements of various scientific approaches to supply chain research

Approach	Why? (view of reality)	What? (aspects/ variables)	How? (problem approach)
Transaction cost economics	Goal: search for the most appropriate organisational form to govern transactions. Elements in view: - nexus of contracts - bounded rationality - opportunism	Frequency Uncertainty Asset specificity (of transactions)	Make/buy decision
Agency theory	Goal: contract optimisation. Elements in view: - self interest - bounded rationality - risk aversion	Principal Agent Information	Trade-off between risks and costs of measurement
Strategic management	Goal: competitive advantage Elements in view: - market - strategic position	Stakeholders Competitors Market	Strategy building (e.g. cost/ differentiation)
Network theory	Goal: best network position Elements in view: - dynamic relationships - power - trust	Nodes Links Market	Building network relationships
Resource dependency theory	Goal: resource securement/control. Elements in view: - resource dependency - core competencies	Resources: - information - capital - labour - capabilities	Building supply networks Outsourcing
Supply chain management	Goal: efficient and effective replenishment Elements in view: - customer orientation - efficiency of processes	Product flow Information flow Processes Co-ordination	Throughput time reduction Gearing processes

Approach	Why? (view of reality)	What? (aspects/ variables)	How? (problem approach)
Information technology	Goal: enable co-ordination between parties Elements in view: reduce costs and risk of co-ordination	Data Process Event Object	Information modelling System building Information technology in products
Cost approaches	Goal: cost minimisation Elements in view: - activity based costing - direct product profitability - total costs of ownership	Process Costs Product Ownership	Define processes as cost centres Assign processes to products Define ownership relationships

Source: Trienekens, 1999

5. CONCLUDING REMARKS

In this paper it is argued that the complexity of the business and institutional environments facing firms in the new global economy extend beyond the scope of neo-classical resource allocation economics and should be augmented by a holistic application of various economic theories within a constructivist paradigm. Conventional agricultural economic analysis is bound by the Leibnitzian (positivist) inquiry paradigm (Van Rooyen, 1983). This paradigm approaches reality with in a deterministic view where clear and linear assumptions apply.

Within the constructivist paradigm researchers would have to move away from describing and analysing problems to understanding and reconstructing real world solutions. The researcher would be challenged to evolve from an objective observer to a passionate participant as the facilitator of a multi-voice reconstruction. The constructivist researcher will therefore have to aim to resocialise existing qualitative and quantitative techniques and substantive theories to find solutions to real world problems. In this paradigm a group of theories would be more applicable to address a problem rather than the current single theory approach. The quality criteria would have to change from "academic rigour" and external validity to trustworthiness, authenticity and relevance to everyday agribusiness challenges.

Supply chains are highly complex entities with various unique, but interrelated dimensions. Each of the supply chain dimensions can be researched in their own right, but a constructivist approach is required create a complete understanding of the functioning of the supply chain as an entity. Agricultural economic analysis is therefore challenged to capture complex business reality and decisions in scientific models in order to explain and predict the institutional and governance structures and optimal resource allocation behaviour of firms within a labile global business environment.

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