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MARKETING AND FINANCE
OCCASIONAL PAPER

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Guidelines for rapid appraisals of agrifood chain performance in developing countries

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Guidelines for rapid appraisals of agrifood chain performance in developing countries

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Abbreviations and acronyms

ALIDE	Latin American Association of Development Finance Institution (Spanish acronym)
BDS	Business Development Services
CEPAL	Economic Commission for Latin America and the Caribbean (Spanish acronym)
CF	Controlled by Firms
CG	Controlled by Government
COMTRADE	United Nations Commodity Trade Statistic Database
CSA	Commodity Systems Approach
EUREPGAP*	Euro Retailer Produce Good Agricultural Practices
FAOSTAT	Corporate database for substantive statistical data
FOB	Free On Board
FSI	Federal System of Inspection, Brazil
GAP	Good Agricultural Practices
GDP	Gross Domestic Product
GMO	Genetically Modified Organism
HACCP	Hazard Analysis and Critical Control Point
IICA	Inter-American Institute for Cooperation in Agriculture
IMF	International Monetary Fund
ISO	International Organization for Standardization
MERCOSUR	Southern Common Market
MIT	Massachusetts Institute of Technology, United States
NC	Non-Controllable factors
NGO	Non-Governmental Organization
NTB	Non Trade Carrier
QC	Quasi-Controllable factors
RA	Rapid Appraisal
R & D	Research and Development
SCM	Supply Chain Management
SCP	Structure, Conduct and Performance
SO	Strengths and Opportunities
SPS	Sanitary and Phytosanitary Standards
ST	Strengths and Threats
SWOT	Strengths, Weaknesses, Opportunities and Threats
TOWS	Threats, Opportunities, Weaknesses and Strengths
UNCTAD	United Nations Conference on Trade and Development
WB	World Bank
WITS/TRAINS	World Integrated Trade Solution / Trade Analysis and Information System
	WO Weaknesses and Opportunities
WT	Weaknesses and Threats
WTO	World Trade Organization

* Note, EurepGAP, as of September 2007, is referred to also as GLOBALG.A.P. (Global Partnership for Good Agricultural Practices). By January 2009, GLOBALG.A.P. will be used exclusively and will replace the EurepGAP term.

Introduction

This publication presents a methodological strategy for the analysis of agrifood value chains. Simply stated, chains can be seen as sets of interrelated activities that are typically organized as sequences of stages. In the agricultural, food and fiber sector, chains encompass activities that take place at the farm level, including input supply, and continue during first handling, processing and distribution. As products progressively move through the successive stages, transactions between chain actors – producers, processors, retailers, etc, - take place. Money changes hands, information is exchanged, and value is progressively added. Seen from a broader, systemic perspective, the chain concept includes also the 'rules of the game' – laws, regulations, policies and other institutional elements - as well as the support services, which form the environment where all activities take place. Value chain analysis under such a broad view seeks to characterize how chain activities are performed and to understand how value is created and shared among chain participants. It seeks also to evaluate the performance of chains and identify what, if any, are the barriers for their development.

International experiences have often demonstrated that chain analyses can be important tools in efforts towards the enhancement of performance of agricultural, food and fiber systems. By revealing strengths and weaknesses, such analyses help chain stakeholders and policy-makers to delineate corrective measures and to unleash the development of areas and activities where the potential for growth is identified. When properly conducted, they can also help to create a shared vision among chain participants regarding challenges and opportunities, thus facilitating the development of collaborative relationships.

Value chain analysis is also used for other related purposes. These include the promotion of enterprise development, the enhancement of food quality and safety, the quantitative measurement of value addition, the promotion of coordinated linkages among producers, processors and retailers and the improvement of an individual firm's competitive position in the market place, to name a few. Applications are found in both public and private domains, covering a wide spectrum of products and regions and crossing an ample set of disciplinary boundaries.

As agrifood systems worldwide continue undergoing rapid and dramatic changes, the interest in value chain analysis has been growing accordingly.

One of the main motivations for preparing these guidelines was the need to promote a pragmatic approach to agrifood chain analysis. Based on a set of fundamental principles, it proposes a methodological strategy that can be readily followed by field practitioners interested in examining agrifood systems with the purpose of understanding their organization and functioning, and in identifying possible areas for performance improvement. More specifically, the guidelines aim to accomplish the following objectives:

- provide information on the conceptual fundamentals of chain analyses, highlighting their importance in its planning and execution, as well as on the implementation of its recommendations;

- assist practitioners in the selection of the necessary information for the analysis, as well as on the methods to obtain, organize and evaluate it;

- orient practitioners in the identification of problems affecting chain performance and of areas which could be seen as leverage points for further growth and development;

- propose a general approach towards the definition of chain interventions aiming at performance improvement, with the identification of stakeholder responsibilities for implementation;

- propose a general approach for the prioritization of chain interventions;

- point out the limitations and potential difficulties of conducting chain analyses.

These specific objectives and the delimitation of the intended readership reflect the fact that these guidelines are meant to cover only a subset of the many purposes and domains for which chain analysis is being applied.

This guide is considered both opportune and necessary. It is considered opportune because chain analysis is very much present in the current agenda of governments, donors, international organizations and other institutions concerned with agrifood systems development. It is perceived as necessary because, notwithstanding the significant interest in the topic, there is still a void in the reference sources when it comes to the availability of unified materials that can lead agrifood professionals through both the understanding of the fundamental concepts of chain analysis and their application in a system development planning framework. Moreover, the present guidelines differ from the many recent publications on value chain analysis in a fundamental way: the level of focus. This text is not restricted to the analysis of a particular market channel for a specific product or group of products, between production and consumption. Instead, the emphasis herein is on the collection of market channels that constitute a given sector of the agrifood system. For example, rather than providing guidance to the analysis of a particular chain linking a group of tomato growers to one agroprocessor or to an exporter, the methodology here discussed looks at the aggregate of tomato growers and its interactions with the aggregate of agroprocessors or exporters. The focus is on the analysis of the organization and performance of the tomato sector (or subsector, as preferred by some authors) as a whole, and not on any particular tomato chain within that sector.

For a methodological proposal that purports to be practical and general, an initial challenge to be dealt with was represented by the heterogeneity of agrifood products and the variety of regional specificities, particularly in the developing world. We all know that value chains for food, fiber and agriculture are indeed complex and highly dissimilar. Moreover, as they engage in value chain research, practitioners will face different constraints represented by human, financial and time resources available to conduct the analyses. Given these singularities, a rigid and prescriptive methodological framework had to be eschewed at the outset. Flexibility instead

was chosen as a central characteristic. An effort was made to follow a broader, more general orientation perspective. Therefore, the chain research methods here discussed, including the categories of information suggested for collection and analysis, have ample allowance for adaptations to particular application settings and needs.

The guidelines are organized in four sections. Following this introduction, the conceptual basis for value chain analysis is examined. The third section discusses and illustrates each step of the proposed methodology. The aspects of research organization, data collection, information analysis, performance assessment, intervention design, prioritization and results validation are covered. Concluding, general recommendations on the application of the methodology are presented. Annexes, including references for further reading, complement the information offered.

Some conceptual issues

Practically oriented professionals seeking guidance about research methodologies are often reluctant to dedicate their attention to the discussion of conceptual issues. Yet, as we have already seen, value chain analysis has been used under so many different approaches and disciplinary backgrounds that a need for a discussion of its fundamentals is warranted. It is expected that readers will find, in the brief presentation that follows, the essential information for understanding what a 'value chain' means and how its theoretical principles can be useful for their professional activities.

The timeline presented in Box 1 should help in understanding the value chain concept, as it evolved through time across varied disciplinary fields, areas of application and levels of analytical aggregation. It should also illustrate the fact that, in spite of the differing notions associated with the concept, there is a clear unifying feature in the theoretical basis for value chain analysis: the systems approach.

Chains as systems

According to its classic definition, a system is made up of two different aspects: a set of components and a network of functional relationships, which work together to reach an objective. These components interact through dynamic links that involve the exchange of stimuli, information or other non-specific factors.

From a historical perspective, we can say that the consideration of agrifood chains as systems is a result of the gradual development of methods and approaches to analyze economic sectors. Economists, in particular, have long been concerned with the ways in which individual sectors are organized and perform. Their work in the area of 'industrial organization' has offered the theoretical and analytical background that inspired much of the earlier work about value chains.

Industrial organization studies typically viewed a sector, or industry, as a collection of firms producing similar products for similar markets. In these studies, the structure of the industry (number of firms, their market shares, the relative ease of entering and leaving markets, etc.) was related to the conduct of the firms (long-term strategies, pricing policies, investments in research and development, advertising policies, etc.) that, in turn, would define performance, indicated by criteria that include technical efficiency, social welfare and efficiency in resource allocation. Thus, the structure-conduct-performance paradigm offered a reference model for the investigation of economic sectors.

Yet, as these ideas began to influence the analysis of agrifood sectors, it became apparent that their consideration of industries as **horizontal** cross sections of the economy limited the understanding of performance influencing factors associated with the **vertical** relations

Box 1. The value-chain concept timeline

Period	Concepts / Paradigms	Major Disciplines			Level of Analysis
		Economics	**Business Management**	**Engineering / Management Science & Operations Research.**	
'50s	Input/Output Analysis*	X		X	Macro
	Agribusiness (Harvard)	X	X		Meso
	Industrial Dynamics & Systems Science (MIT)	X	X	X	Macro/Meso/Micro
'60s and '70s	Industrial Organization (S-C-P)	X			Meso (horizontal)
	Subsector Analysis (Commodity Systems Approach)	X			Meso (vertical)
	French 'Filiére'	X	X		Meso
'80s	Porter's 'value chain'		X		Initially Micro; later Macro
	Supply Chain Management		X	X	Intra and Inter Organizational
'90s	Agrifood chains; agro-industrial chains; productive chains; etc	X	X	X	Mostly Meso
	Global Commodity Chains	X			Macro
	Transaction cost theory* applied to vertical coordination analysis in agrifood systems	X			Meso
	Policy Analysis Matrix (PAM)	X			Macro
2000s	Value chains (revisited)	X	X	X	Micro and Meso

* The fundamental concepts of transaction cost theory appeared earlier in literature

established by firms. Clearly, if we were to examine, say, the dairy sector of an economy focusing in one horizontal dimension only - for instance the processing segment - we would not be in a position to identify dairy farm related factors that could be affecting processing and thus be key determinants of sector performance.

The realization of the importance of a vertical dimension in the analysis of agrifood sectors has been attributed to the seminal work of two researchers from the University of Harvard, John Davis and Ray Goldberg, who coined the term **agribusiness** to represent the aggregate of operations that take place between the farm and the consumer[1]. Later, agricultural economists in the United States have developed the general framework that became known as the 'commodity systems approach' (CSA), which offered a logical structure to perform agrifood sector analysis, taking into account both the horizontal and vertical dimensions[2]. A parallel development with a similar focus was the '*filière*' (chain) approach developed by French researchers.

As suggested by its own denomination, CSA is based in the fundamental principles of systems science. The systems approach takes into consideration properties such as interdependency, propagation, feedback and synergy, which are particularly relevant for the analysis of agrifood chains. These four principles provide the reference model we will be using to both the design and application of the methodology presented in this text.

Interdependency refers to the fact that the activities performed in a chain (production, processing, distribution, etc.) are related to one another. To operate efficiently and profitably, a chain actor, say a fruit processor, depends on a stable and regular supply of inputs that meet quality criteria and are delivered at an affordable cost. Raw material providers, such as fruit growers, depend on the other hand, on processors to guarantee a regular outlet for their products. Thus, the success of each one of these two actors is very much associated to the fortunes of the other.

Propagation exists because there is interdependency among a chain's components. Any action causing an impact in a particular component of the chain will have effects that propagate backwards and forwards. If, for example, fruit juice consumers require retailers to inform them about the presence of genetically modified organisms (GMO) in their products, then processors and growers will have to adjust their production methods, so as to ensure that this information is readily available. The action in this case, though initiated at the retail level, had its effects propagated throughout the chain until its initial stages were reached. It is interesting to note that the propagation property makes it often difficult to distinguish symptoms from causes, when analyzing an agrifood chain; effects might be separated from their sources, both in time and space along the chain.

Feedback is a property associated with the two system elements already discussed. As seen above, actions impacting a chain component will propagate throughout its links. As chain actors adjust to these changes, the propagation principle causes a new round of adjustments, in a process that continuously occurs until some form of equilibrium is reached. As an example,

1 Davis, J. and Goldberg, R. A *Concept of Agribusiness*. Harvard University Press, Boston, 1957.

2 Good overviews of the CSA approach are provided by Holtzman and Staatz (2004)

consider the typical cycles observed in some commodity markets. Eventual price rises at the retail level are propagated back into the chain, ultimately inducing farmers to increase production. As production rises, for a fixed level of demand, the excess supply created will cause prices to fall. Farmers will eventually be aware of the new prices and cut back production, thus starting a new cycle of supply and price adjustments.

Synergy is a system characteristic that in essence tells us that the whole is greater than the sum of the parts. In agrifood chains there are frequently opportunities for gains which can not be realized unless all actors work together for mutual benefit. Consider, for example, the case of product traceability. Some markets for internationally traded commodities require that products be fully traced along their chains. This calls for common standards for information gathering and record keeping, product labeling, bar coding and other data processing protocols. It is clear that such complex organizational arrangements are only possible with the adhesion of all chain participants.

The system thinking is clearly present in the original introduction of the idea of a 'value chain', attributed to Michael Porter. In the mid 1980s, this author published a book where he proposed the chain paradigm as a construct to relate the activities performed by one organization with its competitive position. Firms, he noted, can be organized into primary activities that include inbound and outbound logistics, operations, marketing and sales, and service. Support activities, also performed by firms, include procurement, technology development, human resource management and infrastructure. It is the systematic arrangement of these activities that creates value and influences the competitive position of the firm.

Porter's ideas had a large impact on managers and other professionals interested in the area of competitiveness. Since competitiveness is not only a key performance dimension for a firm, but also for their aggregation into sectors, regions or entire economies, soon the value chain terminology found use in the area of sector wide evaluations.

Systems principles are also present in the general thinking of the area of supply chain management (SCM). Originated in the logistics and management science disciplines, SCM is primarily concerned with the way firms organize the flow of inputs and production resources from procurement through product manufacturing and distribution. The processes necessary to accomplish this flow effectively, efficiently and profitably are seen as a system - a chain with nodes that can exist both internally and externally to an organization. (For more information about SCM, refer to: Van der Vorst, J. *et al.* 2007). Planning and executing these processes require managerial coordination of the internal nodes within the organization. Managerial coordination is also required beyond firm borders, often by nurturing cooperative relationships with chain participants external to the organization.

Other uses of the chain concept were promoted by researchers interested in globalization and international trade issues. The vast literature on 'global commodity chains' stems from this general interest, although its focus has been mostly in industrial, rather then agrifood products[3]. Additionally, the concept has been associated with policy analysis methodologies and

3 For a contrast among 'global commodity chain analysis' and the '*filière*' approach, see Raikes *et al.*, 2000.

with applications of neo-institutional economics. The list of suggestions for further readings, presented at the end of this text, includes studies that apply these approaches in agrifood chain analysis. None of them departs from the fundamental systems principles, though.

Hence, for the purposes of these guidelines, we use the term value chain to characterize a system composed by different actors, activities and institutions, all functioning interrelatedly, so as to enable the accomplishment of a common goal. Value chain analysis examines such a system and evaluates the extent to which its goals are being accomplished. This need for evaluation draws our attention to a second important conceptual issue: chain performance.

CHAIN PERFORMANCE

We will see later in the methodology presented that one initial concern will be with the characterization of a chain: how is it organized? How does it function? Who are the main actors? What are the institutions and forms of coordination? These are questions that can help us to make statements about what a chain is. In economic terms, these are concerned with the **positive** dimension of value chain analysis.

However, we should be also concerned with what ought to be the chain. How is it faring? Are there problems to be solved, bottlenecks to be removed or strengths to be reinforced? Are their goals being accomplished? For an economist, these are known as **normative** questions. They express judgments about whether an observed situation is desirable or undesirable and thus require the definition of performance criteria.

Performance dimensions for value chain analysis should be clearly associated with its objectives. They can be qualitative or quantitative and might involve the following criteria:

- **Competitiveness, as indicated by the relative market share of a chain in domestic or international markets**

The dairy chain of New Zealand, for example, is considered to perform efficiently because it can competitively and profitably offer its products in international dairy markets. The country is the world's leading dairy exporter, with a global market share of 30 percent in 2004. The same reasoning can be applied to analyses in domestic markets. In a given country, chains can be differently organized in different regions; their relative market shares in domestic markets could then be seen as a performance indicator.

- **Competitiveness of a chain's product against its substitutes**

For products with close substitutes, chain performance might be indicated by the market share of its products vis-à-vis the competing ones. Beef chain analysis, for example, can use relative shares of substitute meats (pork, poultry, fish, etc.) as performance indicators. In developing countries, it is not uncommon that domestic agrifood products face the competition of imports. The relative shares for domestic and foreign products could also be taken as performance measures.

- **Profitability of chain actors**

To be sustainable, competitiveness has to be the consequence of the combined, synergistic action of chain participants. Such actors, in turn, have to be able to cover their costs and receive an acceptable return on their investments. Otherwise, they will not remain in business. Profitability is thus a classical performance indicator. Yet, profitability must be achieved in a sustainable basis. If a chain's competitive position is a result of, say, subsidies or other distortions that artificially generate profits for chain participants, this is a potentially threatening situation in terms of future performance.

- **Food security**

For agrifood chains, the ability to provide enough products to guarantee an adequate supply to meet food needs is an important performance criterion. Related topics are production and price stability, as both affect food security.

- **Technical and operational efficiency**

Efficiency, as indicated by input – output ratios or other productivity measures, such as crop yields, also provide a reference for performance evaluation. Value chain analysis invariably examines efficiency measures within and across the different chain stages.

- **Equity considerations**

How is the value that is added along a chain distributed among chain members? Are there indications of non-competitive behavior by chain actors? Is information freely and evenly flowing among chain actors? The current discussion about the power exercised by supermarkets in fruit and vegetable chains in developing countries is an example of how the equity dimension can become a concern in value chain analysis. The distribution of value among countries that are part of so-called global value chains is also an example of equity concerns in performance measurement.

- **Consumer satisfaction**

Are consumers getting the products demanded, in terms of quantity, quality, timeliness and prices? To the extent that consumer demand should ultimately drive agrifood value chains, consumer preferences and their fulfillment is a relevant dimension for the analysis.

To sum up, we can say that there are a variety of chain performance indicators. Depending on the purpose of the analysis, the recommendation might be for one or more of the discussed criteria. Pragmatically however, the ability of an analyst to appraise the criteria must also be taken into consideration in the selection decision.

The scope of analysis of performance of an agrifood chain undoubtedly comprises, beyond agricultural and livestock production per se, all inputs for these activities (such as animal health inputs, fertilizers, machinery, equipment, etc), plus processing and distribution. Also, it should consider crucial aspects related to the institutional environment under which a chain operates. As we saw, the systemic thinking, implicit in the notion of an agrifood chain, is an

essential tenet of the theoretical framework that should ideally support this type of analysis. The overall performance of a given agrifood chain cannot be merely considered as the sum of the individual performance of its agents. There are gains in terms of coordination, normally revealed in contractual arrangements that are set up according to the conditions of various markets and the institutional environment. These gains should be taken into account in the analysis of the chain coordination, as discussed below.

Chain Coordination

Chain coordination should be understood as a process of transmitting information, stimuli and controls to guide the movements of players, so that they are consistent with the strategic objectives of market leaders, which are usually the same as the objectives of the chain as a whole. Coordination can assume a spectrum of modalities that include spot markets, strategic alliances, contractual partnerships and full vertical integration. All of them determine how product flows are regulated in terms of prices, quality, quantity, and delivery specifications, among other aspects.

Full vertical integration exists when one firm has total control among two or more stages of a chain. A tobacco company that also owns and operates tobacco farms would be an example of a vertically integrated operation. Alternatively, this firm could opt for an outgrower scheme, whereby tobacco farmers would be contracted to produce independently, but under closely specified production terms, price determination rules and delivery schedules. Coordination, in this example, would be specified by the contractual provisions. A third alternative would be for the firm to procure tobacco in the market place. Such a modality would characterize a coordination system based in spot markets. Alliances between producers, processors and retailers, not necessarily involving formal contracts, but clearly specifying transaction terms and mutual responsibilities and are another form of coordination that is gaining increased acceptance in agrifood chains.

The choice of coordination strategy by firms in agrifood chains is influenced by many factors, among which the so-called 'institutional environment' (also referred to as 'enabling environment') is of particular relevance.

The institutional environment in which firms establish relationships may enhance or impair the performance of the chain and its component parts. Institutions are formal rules, informal constraints, and the mechanisms responsible for the effectiveness of these two types of norms (North, 1994). Examples of formal rules include laws in general, the constitution, property rights, commercial and tax legislation in general, food safety legislation in the case of agrifood chains, and warranty and sales pricing policies, among others. Informal constraints are determined by conventions and self-imposed codes of conduct inherent to different cultures. They are also called informal rules and are usually unwritten.[4]

4 Note that coordination is associated with the concept of governance, which is very much used in the neo-institutional economics literature and in the global commodity chain studies. A difference in focus exists, though, as this use of the terminology is chiefly related to discussions regarding power asymmetry in a chain, especially in distinctions between supplier driven chains and buyer driven chains. For a discussion of governance, see Gereffy, G., Humphrey, J. and Sturgeon, T. The Governance of Global Value Chains. *Review of International Political Economy* (2004).

According to Williamson (1985), institutions set the 'rules of the game' and attenuate uncertainty. They generally help to make sure the market, society and socio-economic interactions function properly. Thus, institutions are important for the 'coordination' of linkages among firms operating in a chain. For example, as a mechanism for improving milk quality and safety, a government can set a combination of formal regulations, incentives and penalties to encourage adoption of cooling tanks. Government agencies will try to enforce adoption by means of penalty charges, combined with incentives, such as special credit terms and price differentiation for quality products.

Informal rules are equally important. Dairy farmers may informally agree with a processing firm on price and quality standards for raw milk. Both sides may respect the agreement because cheating is seen socially as a major non-ethical behavior. Opportunism may not be punished by legal sanctions, but may cause irremediable damage to the agent's reputation and put him or her out of the market. Thus, formal rules are not always the main instrument for coordination purposes, as relations between companies and growers transcend them and extend to a universe of values relating to tradition, local culture, etc.

Coordination in the chain may be established through contracts, which determine how product flows are regulated in terms of prices, quality, quantity and delivery specifications, among other aspects. Contracts may be formal (written and regulated by law) or informal (guaranteed by informal constraints). While formal contracts may be well-constructed in legal terms, from the standpoint of economic theory they are always imperfect instruments that cannot account for all possible developments in relations between the parties. The presence of contracts, whether formal or informal, reduces the uncertainty involved in economic relationships, but does not eliminate either uncertainty or the risk of opportunistic behavior, which at worst can entail breaches of contracts. Thus the challenge of coordination is how to define and operate mechanisms (economic, regulatory and contractual incentives) that reduce conflicts, contradictions and transaction costs along the entire chain, while at the same time strengthening the incentives for each player to act in accordance with the strategic objectives of the leaders, thereby limiting the cost of overseeing or monitoring the system. Further aspects of contracts in agrifood chains are presented in Annex 2.

The drivers of chain performance

We have seen that the chain paradigm provides a sound foundation for both positive and normative appraisals of agrifood systems performance. The methodology to be presented later in this publication is based on the premise that performance, as judged by one or more of the criteria we have discussed earlier, is the outcome of the combined impact of several factors that influence the ways in which a chain is organized and operates. These factors are here denominated **performance drivers.** To analyze chain performance, one must identify its main drivers and then assess the extent to which they contribute, positively or negatively, to the observed situation.

For the sake of analytical convenience, performance drivers can be clustered into a number of logical categories, which can be derived from the conceptual framework we have been discussing. Taking into account economic, organizational and technological issues, we will explore in this discussion six major performance drivers[5]. They are:

- The enabling environment
- Technology
- Market structure
- Coordination
- Firm management
- Inputs

While the six drivers above should cover the essential factors influencing performance for most agrifood chains, analysts certainly have the flexibility to adapt them and/or define new drivers, according to their specific needs and circumstances. For most practical purposes, the possibility of breaking down the drivers into their constituting elements should provide the flexibility one needs in order to consider these six categories as a general frame of reference. We will briefly discuss these major drivers next. Methodologies to assess performance drivers in chain analysis will be the subject of a later section in this document.

• The enabling environment

The 'enabling environment' comprises policies, institutions and support services that form the general setting under which enterprises are created and operate. Depending on the way it is arranged, it can either support or harm the performance of an agrifood chain. A chain might be extremely competitive internationally with regard to the quality and costs of its products, for example, but this competitive advantage may be lost if domestic policies restrict market access by mechanisms such as export taxes or costly regulations. On the other hand, competitive

5 This framework is based on Van Duren *et al* (1993)

disadvantages in cost and quality might be offset by policies that encourage investments in production technologies and / or support the provision of technical services. Understanding the enabling environment is thus crucial in chain analysis. As such, it constitutes the first performance driver in our framework.

The range of elements that constitute an enabling environment is varied. Annex 6 lists a number of issues that are generally considered as central components of a conducive climate for business activities and as such can be used as a source to guide the analysis of this specific performance driver.

- **Technology**

Technologies associated with production, processing and distribution operations in agrifood chains are essential determinants of productivity and costs. Also, technologies can influence agrifood product safety and quality. The ability to access technologies, including the requirements of financial resources, might on the other hand be a potential barrier to competition and thus affect performance in a negative way.

The evaluation of the 'technology' driver should take into account such broad issues. It should consider methods, processes, facilities and equipment used in agrifood chain operations, plus the aspects related to research and development (R&D), technology adaptability and technology adoption patterns.

- **Market Structure**

Evaluation of market structure might reveal the existence of competitive markets or of concentrated markets, dominated by oligopolies or monopolies. As noted earlier, there is a strong correlation between market structure and the conduct and performance of firms. In principle, competitive markets provide the incentives for firms to seek the type of intra and inter-organizational efficiencies that favor chain performance. However, the association of performance with the degree of market concentration is not a simple issue for the chain analyst. There is in fact a controversy among economists, in that respect. For some analysts, market concentration allows for economies of scale and investments in state of the art technologies, logistics, governance and other important determinant of firm competitiveness. Large firms would be able to coordinate horizontal and vertical arrangements to set up capital intensive infrastructure. Hence, the evaluation of market structure should not only consider the typical quantitative indicators, such as market concentration ratios or indexes, but also qualitative aspects regarding the existence of barriers to entry or the distribution of power among chain participants.

- **Chain Coordination**

Coordination refers to the harmonization of the physical, financial and information flows and of property right exchanges along a chain. Well functioning coordination facilitates planning and synchronizing such flows and exchanges among a chain's different echelons, thus promoting organizational efficiencies. These, in turn, should translate into lower systemic costs, better consumer responsiveness and increased overall competitiveness. Coordination is affected

by governments and/or organizations that can play a direct role in establishing or fostering public and private sector strategies and policies of interest to a particular chain. Commodity associations, chambers of commerce and other forms of trader groups, for instance, are known to have been instrumental in the promotion of particular chains in a number of countries. The evaluation of coordination should concentrate on the mechanisms that govern transactions among chain participants and on the effectiveness of such mechanisms in promoting the harmonization earlier referred to.

- **Firm Management**

The ability of individual firms to efficiently allocate resources, respond to consumer needs and adapt to market changes is to a great extent a function of its managerial prowess. Management tools enable firms to control and monitor their production and financial processes, identify process bottlenecks, make decisions under risks, build long-term strategies, explore markets, reduce costs, etc. These tools comprise cost accounting and controls, production planning, inventory control and quality management, to name a few.

While the most important management tools are fairly straightforward and generally well known in business administration, it should not be taken for granted that their widespread adoption is the norm in any given chain. In fact, lack of adoption of even the simplest managerial tools is frequently a barrier to improved efficiency, particular in small and medium scale firms of developing countries. Also, the complexity of some agrifood chains demands a move towards increasingly more sophisticated systems of management and control. The rise of the needs to comply with certification standards for processes and products (ISO, EUREPGAP, etc.) is an example of managerial challenges for which adequate responses are still needed in many areas of the world. Another example is the growing need for firms to adopt standardized enterprise resource planning systems, in order to be able to supply major retailers of agrifood products. An assessment of the extent to which management is affecting chain performance is thus warranted.

- **Inputs**

The availability and costs of the main inputs (land, labour and capital inputs) in the different segments of a chain directly affect its performance. Low cost or high quality inputs can be seen as comparative advantage of an agrifood chain in a country or region. Availability and regularity of supply of critical inputs, such as skilled labour and capital goods for both processing units and farms, should also be evaluated.

As previously mentioned, each performance driver can be sub-divided into sets of constituting elements, which can then be appraised with regard to their contribution to chain performance. For the driver 'technology', for example, three groups of elements could be defined. The first group could comprise indicators of technology diffusion. It is important to identify the key technologies for each echelon of the agrifood chain and the degree of diffusion of these technologies in the respective chain segment. A second group could comprise indicators of public and private support to R&D. In this case, information on public and private resource allocation to R&D, number of R&D organizations, number and types of R&D partnerships, human resources availability, infrastructure availability and number of

patents could be used as performance indicators. A third group could comprise indicators of yields and/or results already reached from the adoption. Annex 5 presents the interview guide utilized in a comprehensive analysis of the Brazilian beef chain (Silva & Batalha, 2000). It illustrates the categories of informations that are typically considered in the analysis of the performance drivers described above.

The methodology

We have seen that agrifood chain assessments have both normative and positive dimensions: essentially we want to characterize, describe and understand a chain, as well as evaluate its performance. Implicit also in our discussion is the **prescriptive** dimension of chain analysis: we want to promote improved performance through appropriate public policies and private firm strategies that should be recommended by our analysis.

To accomplish these general purposes, we will draw from a number of proven, workable approaches for planning and executing chain analysis for food, fiber and agricultural products in developing countries. These experiences are mostly based in the CSA methods earlier characterized and encompass the set of steps presented in Figure 1. Although presented sequentially, it should be observed that some of the steps might be undertaken concurrently. Others might have to be repeatedly revisited, as more knowledge is gained during the analysis process.

We will consider that the decision about which particular chain or subsector that is going to be analyzed has already been made. In case more than one choice exists and judgment on which partition chain should be prioritized is needed, guidance may be found in Lusby & Panlibutin (2004) and Haggblade & Gamser (1991).

Definition of objectives

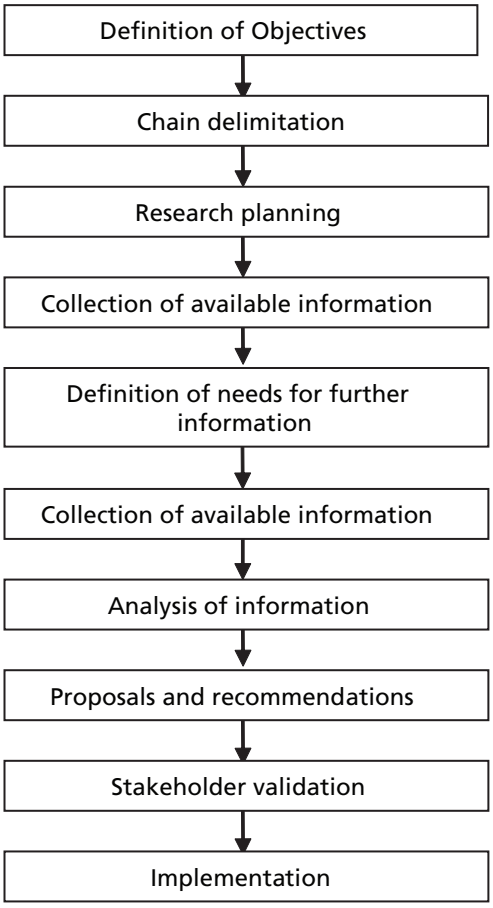
As we have already indicated, chain analysis might be performed for different ends. Regardless of the motivation, objectives should be clear and non-ambiguous. They must be thoroughly discussed and realistically set, as they ultimately determine the scope of the analysis, the choice of methods and the resource needs. Generally, an agri-chain study may investigate performance in order to improve competitiveness. This kind of investigation would attend common demands of the agri-chain agents. Such investigation would have many objectives:

- identify and quantify factors which affect the efficiency and competitiveness of the chain;
- propose a set of recommendations for the public and private sectors;
- contribute towards the improvement of the economic and financial performance of chain stakeholders;
- characterize the strategic importance of the chain in terms of its contribution to the country's social well being;

- contribute towards a permanent dialogue among chain stakeholders and public policy formulators, so as to remove bottlenecks affecting chain performance.

This list may increase, according to the problems facing agents. Often the investigation is motivated by some form of problem identification – perceptions about difficulties involving operational inefficiencies, flawed institutions, system dysfunctions or failure to seize growth opportunities, among others. It can also be done proactively, for exploratory reasons, where the intent is to improve knowledge about a chain (or parts thereof) and identify opportunities for growth and development. Government development agencies, or the Ministry of Agriculture and Fisheries are highly interested in information that supports the design of strategic plans and policies. Processing firms are interested in information that supports their strategic planning; most of them search for information on country or region agri-chain before they go ahead with plans to enter into the market or establish new plants. International trade agreement negotiators might be fully supported by information on the impacts of free trade on domestic agri-chains.

Figure 1. General outline of a proposed methodology for agrifood chain analysis



Chain Delimitation

Delimitation involves the consideration of at least four important dimensions, namely the product, the components of the agrifood chain, the geographical coverage and the time frame. Apparently straightforward, decisions about these four aspects are in fact multifaceted, requiring considerable forethought and evaluation of alternatives. Contrary to common wisdom, we will argue here that chains do not have a clear beginning or a well defined end. Moreover, they are not confined to simple geographical boundaries, nor are they static. Box 6 provides an example of agrifood chain delimitation in a study on the impact scenarios of a free trade agreement between Mercosur and the European Union, considering the four dimensions we discuss here.

The product dimension

The product dimension requires us to decide about the focus of the analysis. Shall we concentrate on a commodity, a group of commodities or on the final product(s) of the chain? The focus on a commodity (e.g., milk, beef, maize, etc.) is a frequent initial option, but rarely can this limitation be maintained in the analysis. Since commodities can be processed and transformed into final or intermediate products, we might need to branch out the analysis into 'subsystems', as our observations progressively lead us downstream along a chain. Milk, for instance, can be transformed into hundreds of products that will be destined to the final consumer or be used as inputs in other industries. The decision about which one of these should be considered in our investigation will be primarily dictated by the objectives initially stated. Additionally, we can consider criteria such as the relative importance of the product, in terms of processing utilization, labour absorption or income generation, international trade flow, domestic supply, food security, etc. If, for example, a sizable percentage of the beef flowing in a chain is used by the meat canning industry, then it is rather apparent that we should dedicate attention to that particular branch of the beef chain.

Focusing on groups of commodities (fruits, pulses, grains, etc.) can be an analytical choice when enough similarity is believed to exist in the way their chains are organized and perform. Consider the case of fruits. In some countries, the processing industry demands large amounts of fresh fruits for pulp and juice processing, often competing for raw materials in the final consumer markets. Typically, pulp and juice processing firms are not limited to a particular fruit: they have operational flexibility to take advantage of seasonal patterns throughout the year, adjusting product mixes in accordance with the availability of raw materials. Under such circumstances, if we were to analyze their chain it would be advisable to delimit it by a group of fruits, rather than by any particular one. Although the need to examine the 'subsystems' will be still present and perhaps even compounded, there will certainly be circumstances under which the focus in groups of commodities will be suitable.

A third option would be to narrow down the analysis into a final product or into a group of closely related products. Instead of examining an aggregate milk chain, for instance, we could choose to investigate its yoghurt or cheese 'branches', or any other milk product, for that matter. Each of these product chains might have its own determining forces and should then be analyzed as different systems. Chain analysis performed to attend the interest of private firms, industry associations, negotiators of international trade agreements are often delimited by final products,

rather than having a commodity focus. Although it seems appealing to have such a reduced focus in our analysis, it should be noted that the systemic nature of chains will make it necessary not to ignore the relationships between their 'branches', when analyzing chain performance. In other words, even when a product focus is chosen, care has to be exercised to avoid overseeing cause-effect relationships that might spread beyond any particular delimitation. Failure to properly separate observed symptoms from the respective causes is one of the reasons associated with ineffective prescription of policies and strategies for performance improvement.

A common source of analytical difficulties in chain analysis is to consider production of a broad group of products as a single system. There are known cases of government agencies tendering contracts for studies of product groups as if they all belonged to the same chain, e.g. the 'organic food chain'. Conceptual errors of this nature can have serious consequences in terms of the outcomes of the analysis; the objectives are not likely to be attained. Sooner or later the agency's researchers or technicians will find out that there is no such thing as an 'organic food chain', but rather several chains or subsystems inside different chains. After all, most agrifood products are nowadays produced organically, including important commodities such as soy, corn, coffee, sugar, many fruits, milk etc. Organic products, such as wines, juices and cheeses are also more and more common. One other illustrative real case is a study of a 'marineculture chain' that started with the same misconception. Fortunately, the involved researchers were soon able to refine their objectives and delimit the scope of the analysis. Instead of a single chain, they ended up focusing on the three most important chains: marine prawns, oysters and mussels.

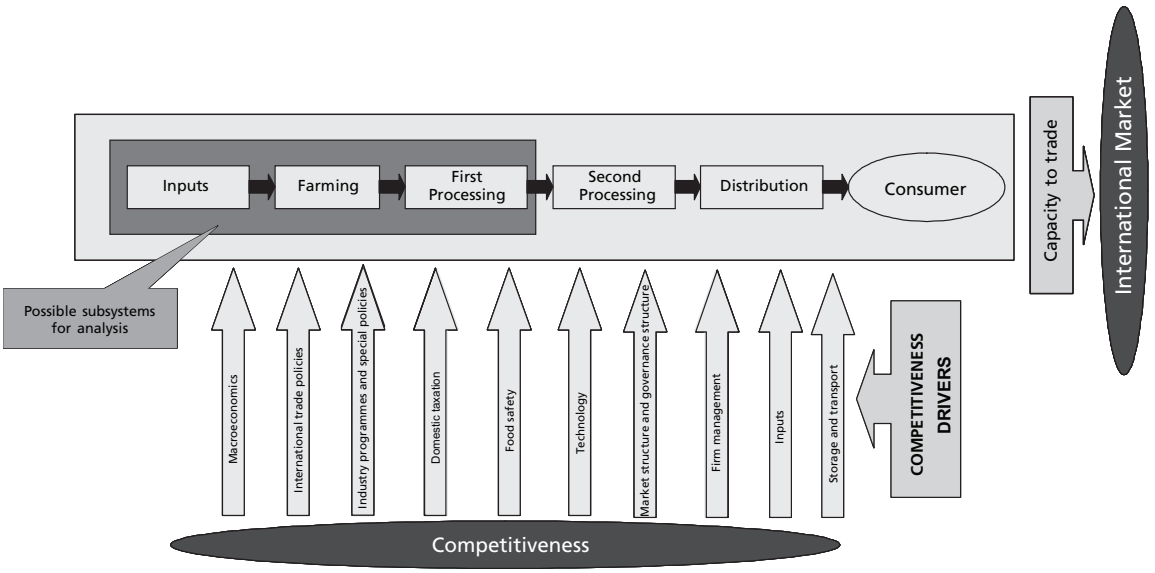
The 'components' dimension

Considering our definition of a chain, we might recall that it explicitly considered the activities that are performed on farm and off-farm, both upstream and downstream from the primary production stage. This being the case, if we want to examine the maize chain, we would typically start out by looking at the inputs for its production, i.e., the seeds, fertilizers, plant protection materials and farm implements used in maize cultivation, among others. In this case, the initial segment, or component of the chain would be the input industry. Yet, most input industries have a transversal dimension, in the sense that their products are inputs for many different agrifood systems. For example, the same fertilizer industrial unit can supply different fertilizer specifications according to different crops, in different agrifood chains. The same can be said for most of the input industry: pesticides, machinery, animal health, etc. Perhaps because of this practical difficulty, the initial component of many chain analyses is the production segment.

Having defined the initial stage of the chain, the delimitation of the remaining segments can be done by an examination of the product flows (see the section on chain mapping). In any case, arbitrary choices will likely have to be made on how much 'branching' should be accepted, both in the definition of the intermediate stages and the decision of the final, 'downstream' one. If one wishes to examine the cotton chain, for example, shall all the intermediate stages after cotton production (ginning, textile mills, clothes manufacturing, etc.) be taken into account? What about the final stage of this chain: is it the clothes retailing segment? Although there is no unique answer to this type of problem, there is a consensus that the components of the agrifood chain to be investigated should be set in accordance with the objective of the analysis and the availability of funds. For instance, if the analysis will be used to support suggestions

on technological policies, then it is the case of taking into consideration the strategies of input industries and R&D organizations. If the analysis will be used to support negotiators of a free trade agreement, then it is the case of taking into consideration critical segments for building up capacity to trade (Figure 2 and Box 2).

Figure 2. Indication of chain components in a study on the impacts of a free trade agreement



Source: Eumercopol

Box 2. Chain delimitation: impacts of the free trade agreement between the European Union and Mercosur agrifood chains

In order to provide information for negotiation on the free trade agreement between the European Union and Mercosur, the European Commission granted a study on ten agri-chains in six Mercosur countries, comprising a total of 29 country agri-chains.

Products dimension

The list of agri-chains was defined according to the following criteria: importance of the agri-chain's products for trade flow, intra-regional trade, and potential for trade flow increase. In each chosen agri-chain, only the products considered most important for trade flows were taken into consideration, as shown below:

Chain	Products
Sugarcane	sugar and ethanol
Wheat	grain
Maize	grain
Rice	grain with husks, white rice first processing
Soybeans	grain, soybean oil, soybean animal feed
Bovine	livestock, frozen beef, cuts

Chicken	livestock, fresh/frozen/salted, cuts and whole
Dairy	milk powder
Apples	table apple, apple juice
Orange	concentrated and frozen juice, pasteurized juice

Components dimension
The research focused on the agri-chain's critical components and critical subsystems, those considered important for building up capacity to trade. Investigations were mainly concerned with the first components of the agri-chains (production of inputs, farming and first processing). For some agri-chains, the analysis targeted at farming (e.g. wheat) only, while for others the analysis comprised, in addition, first processing (e.g. bovine meat, soybeans, maize and milk). The industry of manufactured inputs (fertilizers, pesticides, animal health and nutrition) was not analysed in-depth, although availability and supply conditions of these inputs were taken into consideration. In all cases, the researchers were oriented to use information from other components of the agri-chain (e.g. distribution, retailers, etc) to explain critical aspects only.

Geographical dimension
In the Mercosur area, the institutional environment and other performance drivers of the agri-chains can vary according to the country. For instance, soybean is an important chain for Brazil, Argentina, Uruguay, Paraguay and Bolivia. As chain drivers vary from country to country, the project set up five case studies, one for each country. In some countries, such as Brazil and Paraguay, production of soybeans has been increasing in new areas, sometimes under different farm systems and environments. In this case, the study would pay special attention to these differences and take eventual comparisons between traditional and new areas into consideration.

Time dimension
The impact of a possible free trade agreement was considered by means of scenario analysis. Drivers of performance were evaluated through time varying indicators (production, market-share, prices, and others) for the last five years. Then, econometric modelling was used to predict future scenarios.

The geographical dimension

A source of criticism of the agrifood chain approach rests on the difficulty of establishing limits (borders) to the chain. As we asserted above, where does a chain start and where does it end is a question that will necessarily have an arbitrary answer. We also indicated that the analysis of a maize chain would typically start out with the inputs segment. But if our geographical boundaries are set to a particular country, what shall we do if these inputs are partly or totally imported? Should our analysis be extended to the exporting country? And what if the inputs are locally produced, but using imported raw materials? Shall we consider their sourcing in our analysis?

A similar reasoning applies to the opposite end of the delimitation. We already saw that chains can 'feed' into other chains – what is a product in one chain might be an input in another. One commodity might be clearly clustered in a specific geographical area, as is often the case in food, fiber and agriculture, where climate and soil conditions tend to generate regional specialization patterns. But consider the following example: maize is used as a feed ingredient by the poultry industry and according to our system principles, what affects the poultry chain will affect the maize chain as well. If poultry and maize are geographically separated, shall we amplify our regional delimitation? Again, these are questions for which there is no straight answer, but typically the delimitation will not transcend a country's national borders.

Although a national delimitation is often a logical choice, for some countries there might be regional differences that should be taken into account when defining the geographical boundaries of the agrifood chain. These differences come not only from weather and soil conditions, but also from policies and other elements of the institutional, or enabling environment. For large countries, agricultural production may be expanding towards new areas, where new farm systems are adopted. In these cases, the study may limit itself to the target area and consider its own characteristics. Alternatively, a comparative analysis of different areas of the country may be recommended, as it can support particular regional policies.

Our definition of a chain also included the 'institutional environment' in which activities take place. It should be noted that there will be situations in which such institutional aspects of a chain will vary regionally, and this characteristic could be a criterion for the definition of a geographical delimitation. Depending on the governmental organization of the different countries, norms and regulations affecting agrifood production and distribution might be unified nationwide or they may vary among counties, states or provinces. There might be regional differences regarding food safety regulations, environmental norms, sales taxes, import tariffs, etc. Supporting services, including extension and market information, might also vary regionally. Local authorities (municipalities, states or provinces) may be able to enact local policies. In that case, in-depth analysis of the local components of the agrifood chain would be necessary to support policy recommendations.

Agricultural production may be expanding towards new areas where new farm systems are adopted. The study may limit itself to one target area and consider its own drivers. Alternatively, a comparative analysis of different areas of the country may be recommended, as it can support regional policies. In any case, in-depth analysis of the local components of the agri-chain would be necessary to support policy suggestions. This does not mean that national and international determinants should not be taken into consideration. However, if the budget is limited, an in-depth analysis of the national and international situation can be substituted by a desk study, based on the available literature and secondary data. Alternatively, an expert may be contracted to write down a short paper on the subject. Then, more resources can be devoted to in-depth analysis at a local level.

Hence, delimitation by the level of geographical aggregation that corresponds to the institutional organization of relevance to a particular chain might be a suitable choice. In any case, the geographical delimitation of the chain will depend very much on the specific objectives of the analysis. It is a choice that has to be made, based on informed judgment and pragmatism, for which we recommend the consideration of the questions presented in Box 3.

Box 3. Issues to be taken into account in chain delimitation

- Consider the objectives of the analysis. Why? For whom? For what purpose?
- Be pragmatic; what is ideal might not be doable. What resources do we have? Who will do the analysis? How much time do we have?
- Inform yourself about the general issues to be addressed by the desired chain analysis
- When defining a focus, look at the relative importance of products and their constituting raw materials. What is most important, given the stated objectives?
- Start with the most logical geographical delimitations (county, region, province, country, etc.) and ponder the trade-offs of the alternative choices
- Draw preliminary chain diagrams (see discussion in next section); discuss and evaluate them
- Think about the analytical convenience of alternative delimitations
- Look at the present, but learn about the past and think about the future

The time dimension

Concerning the time dimension, a common criticism to agrifood chain analysis is that it tends to be static. The investigation, according to critics, is usually conducted at one specific point in time and the situation at that particular moment is taken as a basis for the evaluations and recommendations.

Even though there might be analyses for which such a criticism is valid, we can argue that it is indeed possible to include a dynamic element in chain analysis. Resource and time constraints are likely to impede lengthy assessments of chains or repeated analyses at different moments. But dynamics can be taken into account by a diligent consideration of the evolution of chains, combined with a prospective view of the situation at the moment of the analysis. Essentially, the past can help us to understand the present, in turn leading into the structuring of plausible scenarios for the future.

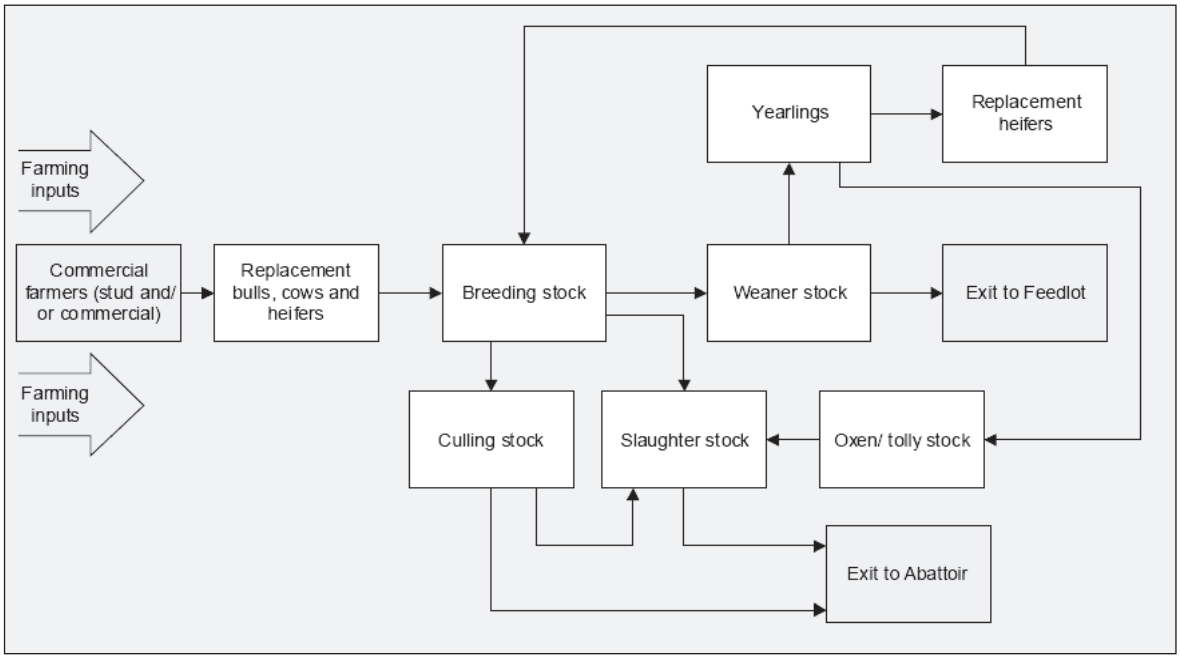
The agrifood chain can be assessed, considering what it can do and what it cannot do, in the presence of future favorable and unfavorable conditions. Information is taken from the environmental analysis and separated into current influences and potential future developments. The analysis should help to support policy recommendations in different future scenarios.

To sum up, we have seen that chain delimitation has no simple recipe, but some guidance can be obtained by the examination of a number of issues, as indicated above and summarized in Box 3.

Chain Mapping

Diagrams representing the chain functions, main actors, flows and supporting services are useful tools that help us to develop an understanding of the way a chain operates. They should offer a general overview of the chain structure and might be drawn with varying levels of detail and patterned after different design arrangements.

Figure 3. The cattle farming component of the South African beef chain



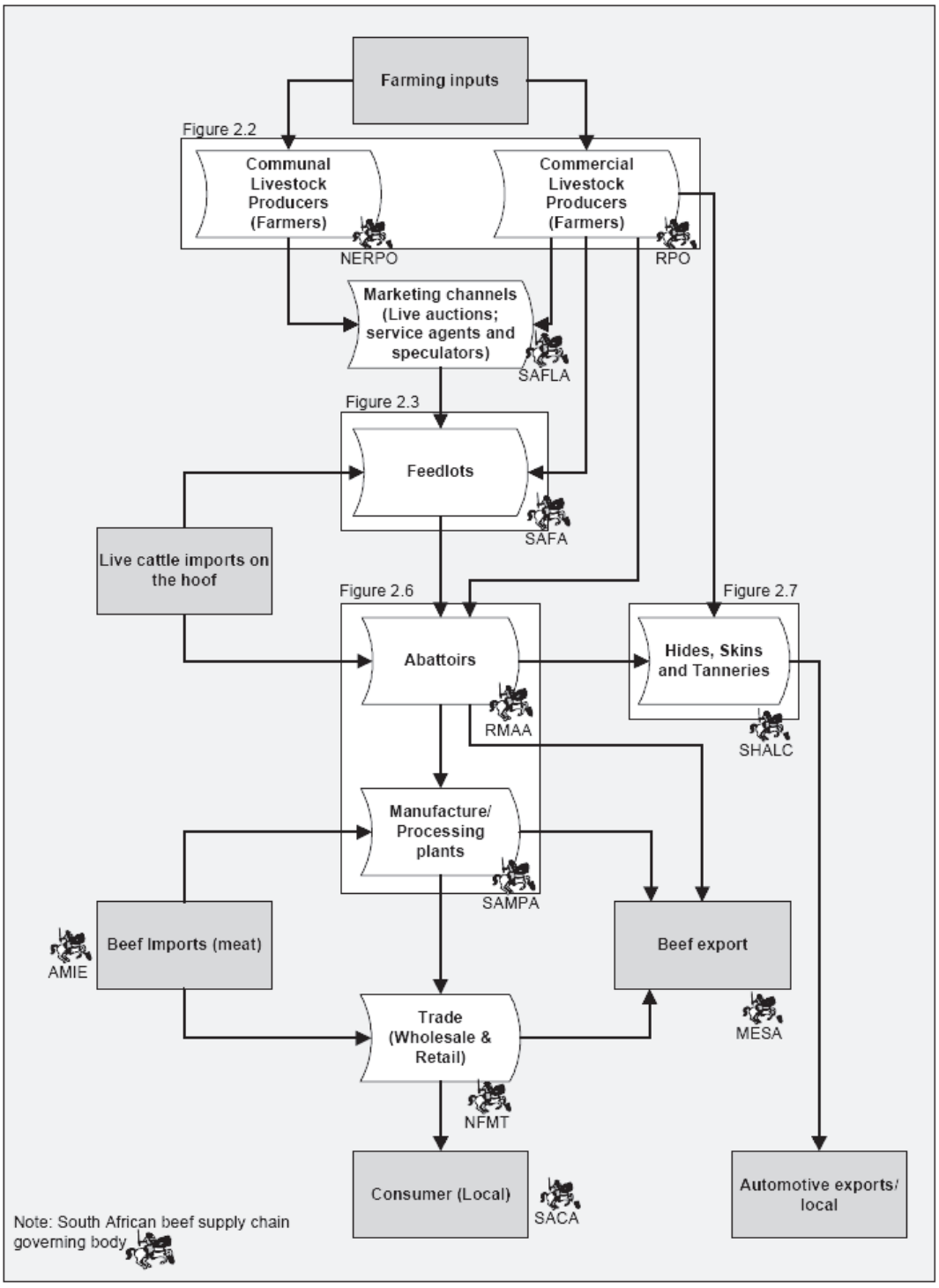
Source: Olivier (2004) *An analysis of the South African beef supply-chain: from farm to fork*. Rand Afrikaans University.

Experience has shown that it is often advisable to start with a simplified map, as the South African beef chain illustrated in Figure 4, and gradually refine it, as knowledge is gained during the analysis. Complex chains, with many activities, links and subsystems, can be better visualized when some of specific parts are aggregated in logical clusters, which can be separately viewed by scaling-up into further maps, if need be. Figure 3, for example, depicts details of the cattle farming production segment that is part of the South African beef chain as presented in Figure 4.

A typical chain map will have either a vertical structure, as illustrated in Figure 5, or a horizontal one, whereby the leftmost area is used to depict so-called 'upstream' activities and functions (input supply, farming activities, etc.) whereas the rightmost region shows the 'downstream' ones (Figure 6).

Chain segments will normally be represented by boxes that will be linked by arrows, in order to symbolize product, information or monetary flows. Some authors will go as far as to propose conventions to characterize the type of arrows and boxes one should use, but there is no universally accepted standard to be followed. So, practitioners have flexibility to opt for a mapping format that is convenient for the specific purposes at hand. A general word of caution is that we should try to avoid overly detailed representations. Complex chains, with many activities, links and subsystems, can be better visualized when some of specific parts are aggregated in logical clusters, which can be separately viewed by scaling-up into further maps, if need be. Annex 1 presents some other examples of chain maps.

Figure 4. The South African Beef Chain



Source: Olivier (2004) *An analysis of the South African beef supply-chain: from farm to fork*. Rand Afrikaans University.

Figure 5. A two subsystems chain mapping

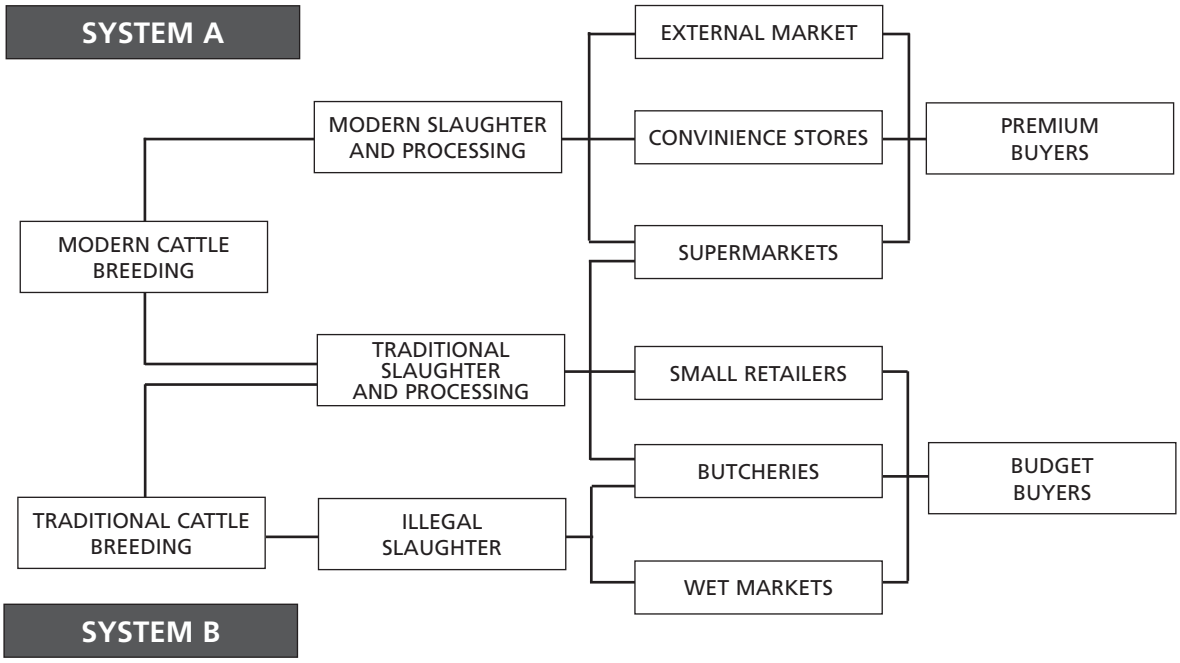
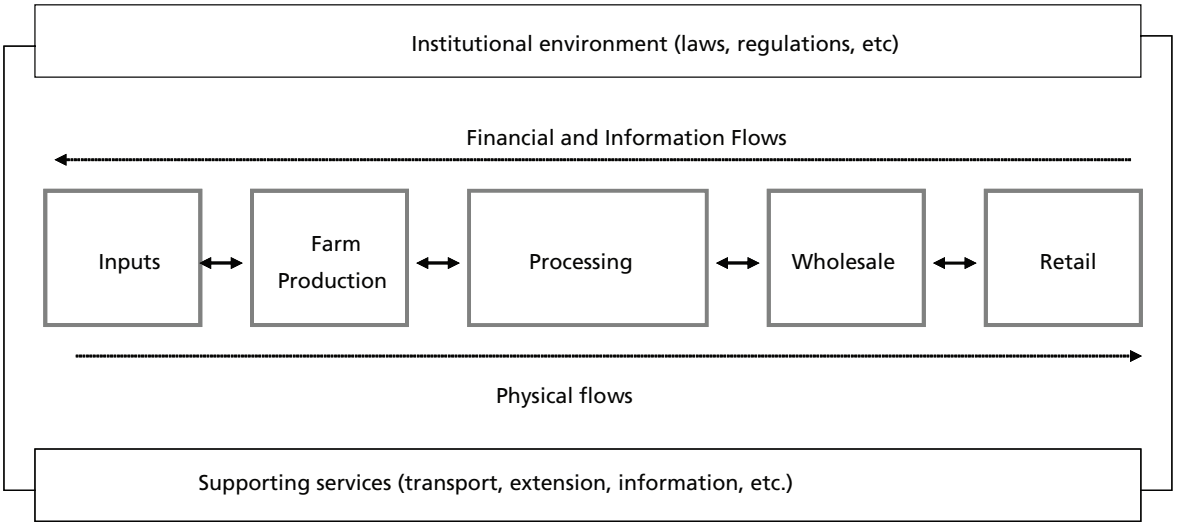


Figure 6. A generic, horizontally drawn chain map



Source: SEBRAE, 2000.

In some cases, the agrifood chain can present a high level of heterogeneity among agents and components. For instance, high tech firms can be supplying the most demanding external market while traditional firms are in charge of the low income internal market. In these cases, it could be advisable to split the system into two subsystems which will provide a better picture, thus reducing the complexity of an aggregated map (Figure 5).

One of the important purposes of the chain mapping exercise is the support it provides for decisions regarding chain delimitation. As we have seen, this decision process can be a rather complex one. By drawing tentative maps for the alternative delimitation options, we can certainly make more informed choices.

A related function performed by a chain map is the provision of a tool for the development of a shared vision, among stakeholders, of the way in which a chain is organized. Practitioners of chain analysis will agree that the perceptions of different chain actors about the structure and functioning of their sector of activities are not necessarily similar. A corn producer, for example, might understand well the chain stages where he or she directly acts, i.e. the immediate links upstream and downstream from the farm business. On the other hand, it is far more difficult for him or her to have a precise idea of the organization of the processing industry, including the interactions with other chains, such as the poultry one, as we mentioned earlier. Conversely, corn syrup buyers might not be as informed about the chain structure at the levels closer to the farm business. Therefore, the discussion of chain maps with actors is an important aspect of promoting a common understanding among these stakeholders.

Chain maps are additionally useful as a guiding resource for research planning. As we will see next, by knowing the logical organization of a chain, its extent and geographical coverage, one is enabled to assemble and deploy the team of investigators, as well as better estimate the timing and resource needs.

Research Planning

The third step in the proposed methodological approach for chain assessments focuses on planning the processes related to collecting and analyzing information, as well on the utilization of the results to propose strategies, policies and measures to improve chain performance. As with any planning process, it helps to utilize a framework whereby objectives can be stated, tasks can be specified, responsibilities can be shared, a time frame can be defined, budgets can be estimated and execution procedures can be determined. In essence, we need to have answers to questions related to 'WHAT, WHO, WHEN, WHERE and HOW' are things going to be done and 'HOW MUCH' will they cost.

We have previously discussed the importance of defining objectives for chain analysis. These objectives give us a general direction for the planning efforts. They tell us what needs to be done. General objectives, as the ones earlier illustrated, can be further detailed into specific objectives that, in turn, may be unfolded into particular tasks.

Who: defining the research team

Chain analysis must ideally be performed by multidisciplinary research teams. The reason for this is the fact that the analysis covers a wide spectrum of technical, economical, managerial and institutional issues, be they specific to particular chain segments or cross cutting, affecting

more than one segment or the system as whole. The analysis of a dairy chain, for example, will have to examine milk production aspects, as well as the characteristics of processing and distribution. The analysis of some singular chains, such as medicinal plants, may demand experts who may be difficult to identify. Additionally, it will have to focus on quality and safety regulations, international trade issues, price policies and many other factors relevant to the competitive performance of the sector. Very few professionals can be expected to have the combined expertise needed for a sound assessment of all these items.

A typical team for a chain study will be composed of one or more economists or agricultural economists working in cooperation with agronomists, statisticians, animal scientists, food engineers and agricultural engineers, among others. Supporting staff, such as research assistants and secretaries, will also be needed. The number of individuals in the team will depend on factors such as the extension of the investigation, its time frame, the amount of financial resources available and on the methodological choices regarding data collection and analysis.

Multidisciplinary investigation teams do not necessarily have to have equal time assignments for all members throughout the period of the chain study. On the contrary, from a cost efficiency standpoint, it is often advisable to define a small, permanent core team, supported by the eventual, shorter term collaboration of specific experts. The participation of an expert in some highly specific technical aspect of agricultural production or processing, for instance, might be limited to a short assignment. Agricultural marketing experts, on the other hand, might have longer term responsibilities, as their expertise can be applied to a more general class of issues in the chain assessment.

Terms of reference, defining the expected contributions of each team member and their desired professional qualifications, should be defined by the study coordinator. They are helpful tools not only for recruitment purposes, but also for budget estimation, as we will see later.

When: defining a time frame

The length of time necessary for the conduct of a chain assessment can vary from a few weeks to several months, depending on factors such as the complexity of the chain, its geographical delimitation, the availability of previous studies and of information from secondary sources, and the amount of resources available, among other factors. It is also a function of the objectives of the assessment: more comprehensive purposes will probably demand more allocation of time for their achievement.

A time frame has also to take into account the seasonal patterns of supply and demand for the products under investigation. As we will see later, some data collection methods require that the researcher engages in participatory observation of chain flows and activities, when and where they happen. It might become necessary to engage in data collection activities during different periods of the year and this might extend the duration of the research effort.

As in any planning process, it is advisable to prepare a chronogram, or Gantt chart, depicting the timing of each of the chain assessment tasks. An example of such charts will be shown later, when we conclude the presentation of the suggested methodological approach for chain assessments. (see Figure 15).

Where: the chain delimitation issue revisited

We have already discussed the challenges involved in delimitating a chain. Among the several dimensions to be considered, the geographical aspect will ultimately define the framework for establishing where we should be focusing our information collection efforts.

Regardless of the type of delimitation, information at the national level will have to be accessed. That's the usual starting point of the information collection effort. For these purposes, data from secondary sources can be obtained from national agencies, the academic literature, research institutes, and inter-professional associations, among other sources. Increasingly, data from these sources are available on the Internet, but access to a number of particular items might require personal contacts with the statistical unit of government departments or of class representative associations.

If the chain is clustered in a region, local agencies/associations might have to be visited, not only to make personal interviews with stakeholders, but also to get data collected by them. There might be cases where local units collect data that are not relayed to the national statistics system.

Frequently, information has to be gathered in all segments of the chain, from farm production to retail distribution. If the chain is to be analyzed as a whole and it is not clustered, but segments are located in different regions, even abroad, then national or international tours to collect both primary and secondary information would be necessary. If the chain analysis is focused on a micro-region, much more time might need to be dedicated to local information collection.

How: data collection

The analysis of an agrifood chain requires access to qualitative and quantitative information on an ample array of variables related to its organization and performance. Regardless of the product under focus, there will be a need to characterize each of the chain segments and assess the performance drivers we discussed earlier, as they affect the segments and the chain as a whole. This will call for consideration of information on input availability and costs, production technologies, management practices, transformation processes, governance structures, markets, prices, trade standards, macroeconomic policies, product regulations, competitive strategies, infrastructure, support services and many other issues that impact the way a chain is organized and performs. The sample interview guide presented in Annex 5 and the study report structures presented in Boxes 12 and 13 illustrate the nature and extent of the information that typically will be required in a chain study.

The provision of the required information can be secured by following any of the varied informal and formal modes of data collection approaches, or combinations thereof. Traditionally, the approaches range from the simple review of existing studies and statistical data to the conduct of rigorous, probabilistic sample surveys. The methodology hereby proposed advocates a set of methods that lie between the extremes of this continuum: the so called rapid appraisal methods (Kumar, 1993).

Rapid appraisal (RA) methods are particularly attractive for applied research efforts, such as chain analysis as presented here. The advantages are the suitability to the nature of the information required, the time efficiency of the information gathering processes and the lower costs, when compared with more formalized alternatives.

While chain analysis does make use of data that must be obtained through formal, statistically rigorous approaches, it can be argued that secondary sources can be accessed to provide this type of information. In fact, as shown in Figure 1, the methodology proposed should initiate the data collection efforts with a thorough search of the information already available from secondary sources. Hence, there is a need to access statistical yearbooks, previous studies, academic research papers, press articles, government reports, analyses from trade associations and documents from international organizations, donors and NGOs, among other sources. Often, these sources will not only provide the types of information that are traditionally generated by the formal data collection approaches, such as statistical data. General information of a more qualitative nature will also be uncovered, enabling a pre-diagnosis of the chain at the very early stages of the study. The pre-diagnosis will reveal the information gaps and is likely to indicate the need for deeper knowledge in a number of issues. At this point, the traditional RA methods will then be used.

Proponents of RA methods argue that they are especially strong in addressing information needs regarding perceptions, concerns, evaluations and attitudes of stakeholders. In chain analyses, such qualitative views regarding performance drivers as they affect stakeholders, their activities and commercial relationships are of particular relevance. The core RA methods are 'key informant interviews', 'structured direct observation', 'focus group interviews', 'community interviews', and 'informal surveys'(Kumar 1993). Although all of these can be used in chain analyses, be it in isolation or in a combined fashion, we will discuss only the ones that are more frequently applied: key informant interviews and structured direct observations. Interested readers can find more information about all of these methods in Kumar (1993).

Key informant interviews are '...essentially qualitative interviews, and are carried out with interview guides that list topics and issues to be covered in a session' (Kumar, 1993). Key informants should be selected for each of the chain components and for the overall enabling environment. They will generally be industry leaders, representatives of farmer and trader associations, representative producers, processors and retailers, knowledgeable researchers, sector analysts and government officials.

The discussions with them will be oriented by interview guides, which should be prepared only after the extensive initial review of the existing information on the chain is performed. The greater the quantity of information the interviewer possesses previously to the interview, the more efficient the information gathering process will be. The questions should allow the coverage of the information gaps found in the initial review. They should also elicit perceptions, opinions and viewpoints of key informants with regard to varied issues affecting present and future chain performance. For these reasons, care has to be exercised in the design and use of the interview guides. Also, contrary to traditional sample surveys, where enumerators can be trained to apply questionnaires to the research subjects, it is crucial that the interviews are conducted by expert personnel. The interviewers must be experienced and must have knowledge about the specific chain under analysis. They should

also have participated in the initial search and analysis of information from the secondary sources, as earlier observed.

The interview guide presented in Annex 5 illustrates the types of questions that might be posed to different stakeholders in a chain analysis. It should be stressed that each question or topic in the interview guide is proposed with the sole objective of contributing to an analytical process that has been initiated by the collection of information from secondary sources. The respondents will likely be time constrained and for this reason the opportunity to talk to him or her has to be optimally used. In this regard, only questions that can not be possibly answered from alternative sources should be included in the interview guide.

Note also that the interviewer should have flexibility to explore topics that might not have been included in the interview guide, but that have surfaced in the interviewing process. As we do not want the interviews to be too time consuming, this possibility to add topics to the list is another reason to keep the guides a reasonable, manageable size. This dynamic nature of the interview process is a further reason why experienced and knowledgeable professionals should be conducting them.

It is important to develop a good rapport with the respondent, so as to motivate him or her to freely answer the questions posed. In this regard, we often find it useful to start the interview with a broad explanation of the purposes of the analysis, followed by an open, very general question that can let the informant make comments at ease. Following the general question, additional themes of greater specificity or sensitivity can then be more easily introduced in the interview. Yet, even though the respondent should feel comfortable to develop unexplored or unexpected aspects of all questions posed, interviewers have to find a polite way to establish limits to the development of themes that escape the information collection aims. As an additional precaution, the respondent should be clearly identified, with name, address, phones, email, organization/company in which he/she works and his/her function, as there might be a need for clarifications or follow-up at a later moment.

The number of interviews will depend on the complexity of the chain studied, the breadth of its regional coverage, the issues initially revealed as information gaps and the time and amount of resources available, among other considerations. To increase the likelihood that heterogeneity of viewpoints is properly captured in the interviews, a rule of thumb is to consider at least 5 informants per chain segment per region and keep adding to this number if essential divergence becomes apparent.

Complementing the interviews and the analysis of secondary data, the research team can gain invaluable insights and understanding about the functioning of a chain by following a direct observation approach. This entails the actual observation of activities, flows and processes as they occur, in and across the different chain segments. The observation is often done informally and in parallel to the key informant interviews; when the research team visits a farm or a processing plant, for instance, the opportunity is used to obtain first hand knowledge about the physical environment (roads, buildings, equipment, etc.) or the processes that take place at these sites (activities performed, managerial practices, etc.). When a market is visited, the nature of the transactions taking place can also be scrutinized – sales practices can be directly observed, prices can be asked to traders, logistical arrangements can be seen in practice, facts on the actual use of grades and standards can be gathered and the exercise of controls

and regulatory systems can be directly checked. The team can use the opportunity of all these visits to talk to chain actors not necessarily listed as key informants, thus broadening the range of perceptions and viewpoints collected.

The observation approach can also be structured, in the sense that a previously defined set of observation items, akin to an interview guide, is previously decided upon and closely followed by the research team in their visits. This helps to standardize the information collected and thus facilitates the analysis at a later stage.

A possible drawback of the direct observation method is the risk of biased judgments from the observers: preconceived notions, not necessarily corroborated by the observation process, may affect the assessments. For this reason, team approaches are recommended. Not only the bias risk is minimized, but the data collection process gains in its comprehensiveness. Another difficulty of direct observation in agrifood chain studies is the need to synchronize the research calendar with the times when the activities that should be observed are actually taking place. In the investigation of a chain of an agricultural product with a seasonal cropping pattern, for example, observations on production activities are to be done in one time of the season, while observation on harvest and post-harvest activities can only be done some months later. This is often impractical for a RA methodology.

In sum, RA methods can be convenient and cost efficient, but do require experienced personnel for the performance of the information gathering and analysis tasks. Information can be obtained by different RA methods, but in any case, before data collection starts it is strongly advisable that the following important steps are observed:

- Make an exhaustive list of the information needed, taking the performance drivers as your general guide.

- Examine all previous information already produced about the agrifood chain, including articles, research reports, documents on policy recommendations, relevant legislation, technical papers, evaluation reports, government documents, documents of representative organizations, etc. This literature can provide secondary data, information on sources of secondary data, as well as indications of organizations, companies, academic organizations, in which key informants can be found.

- Develop an info-gap matrix in which a list of the desirable information can be written in the lines, and their sources, description, products, time series length and delivery deadlines appear in the columns (see an example in Annex 4). The info-gap matrix will guide researchers on the collection of data via the RA methods.

- Identify your informants. In this regard, the so-called 'snowball' method, whereby informants indicate other key informants, may be used in complement to other forms of identification.

- Develop your interview guides; test them.

- Gather the information needed, organize it, analyze it, following the methods we now present.

How: evaluating chain performance

The analysis of the gathered information should allow an overall assessment of the performance of a chain and the identification of the potential areas for improvements. Although approaches to conduct chain performance analysis are varied and often informal and ad-hoc, the use of a well structured methodology is hereby endorsed. For that matter, two options are presented: a scoring approach developed by the authors for a number of applications in Brazil, and a more traditional SWOT methodology.

The scoring approach

This method builds on the identification and analysis of the major chain performance drivers as we discussed earlier. As we saw in the discussion of conceptual issues, the decomposition of each performance driver into a number of constituting elements, henceforth called 'subfactors', allows the objective evaluation of their impacts on system performance. The approach is useful to reduce subjectivity in the evaluation of qualitative or hard to quantify performance drivers, as it is often the case in agrifood value chain analyses.

The method consists of three phases. In the first one, performance drivers and their constituting elements (the 'subfactors') are selected and assessed for each segment of the chain. The performance driver related to the overall enabling environment for the chain is also decomposed into 'subfactors' and evaluated accordingly. For example, a performance driver such as 'inputs' could have, as 'subfactors' at the farm production component of the chain, items such as fertilizer availability and relative costs, availability and costs of plant protection chemicals, fuel and electrical energy availability and costs, etc. For an agro-processing segment, subfactors for the 'inputs' driver could be the availability, quality and relative costs of packaging materials, processing ingredients, energy, water, etc. It is up to the analysts to establish which and how many subfactors should be considered for each performance driver in each of the chain components and its enabling environment.

The performance of a chain can be affected, in a positive or negative way, by the way the different subfactors affect their respective performance driver. In the above example, the driver 'inputs' can be a deterrent or a promoter of performance, depending on the way its component elements, or subfactors, are evaluated. Figure 7 shows an example of the drivers and subfactors that were used in the analysis of the enabling environment performance driver of the beef chain in Brazil. In the same study, drivers and subfactors were also designed for livestock production, the processing industry, and the distribution system.

In the second phase of the method, the subfactors are classified according to their 'degree of controllability'. As far as the stakeholders know who is able to control a subfactor, an appropriate strategy or policy can be defined. Van Duren *et al.* (1991) proposed four groups of factors in this regard:

- Factors controlled by the firms (CF), such as strategy, products, technology, training, internal research and development and costs;

- Factors controlled by governments (CG), such as fiscal and monetary policy, research and development policy, market structure (through anti-trust policy), training and labour policy, agricultural policies, industrial policy, specific programmes and regulations;

- Quasi-controllable factors (QC), such as input prices, demand conditions, pest and diseases;

- Non-controllable factors (NC), such as natural resource endowment

It is important to ascertain the ultimate responsibility for decisions affecting each subfactor, as the analysis should provide information for firms and governments to formulate strategies and policies towards improved chain performance. Firms' strategies would take advantage of factors which are under the firms' control, while governments should focus on policies which affect factors that governments can best control. In some cases, neither firms nor governments are able to control the subfactors. Classification of subfactors according to their controllability is thus very useful for policy and strategy recommendations.

The third phase consists of the evaluation of the drivers and subfactors by the analysts. From the information obtained during the data gathering processes, including personal interviews with chain stakeholders, researchers should evaluate the subfactors according to the procedure we now describe.

The impact of each subfactor on their respective driver is qualitatively evaluated by using a 'likert' scale. The judgment ranges from 'very favorable', when there is a significant positive contribution of the subfactor, to 'very unfavorable', when there are bottlenecks or even barriers to reach or sustain performance (see column 'Relevance' in Figures 7 and 8). Intermediate conditions are classified as 'favorable', 'neutral' and 'unfavorable'. The qualitative scale is then transformed numerically into unitary steps ranging from –2, for 'very unfavorable' to +2, for 'very favorable'.

Each subfactor is weighted with a value that indicates its capacity to influence the performance driver to which it belongs (see column 'Weight' in Figures 7 and 8). This procedure is relevant, since analysts may wish to attribute different levels of importance for the subfactors, when considering their aggregate effect. In fact, each performance driver can be also weighted differently, according to its contribution to the overall chain performance.

Finally, the column 'Relevance' is multiplied by the column 'Weight' to give an overall evaluation for each performance driver, as exemplified in the column 'Drivers Evaluation' (Figures 7 and 8). The rows labeled 'Total' of this column present the final score of each driver. These scores can be graphically represented, as shown in Figures 9 and 10.

Needless to say, the evaluation has to be clearly backed by the evidence uncovered in the information gathering processes. Analysts must be ready to justify the choice of subfactors and the scores and weights attributed to them.

Graphs are very powerful tools to depict areas for which interventions for improved chain performance are mostly needed. A negative bar indicates an obvious need for intervention; the

Figure 7. Drivers and subfactors considered in an analysis of the beef chain in Brazil: the enabling environment

Drivers and subfactors	Controlability				Relevance		Weight	Drivers Evaluation
	CF	CG	QC	I				
International Trade								
Barriers		X		X	VU	-2	0,8	-1,6
Mercosul		X			F	1	0,2	0,2
TOTAL							**1**	**-1,4**
Macroeconomic								
Exchange rate		X			F	1	0,3	0,3
Interest rate		X			U	-1	0,2	-0,2
Income		X			U	-1	0,3	-0,3
Taxes		X			VU	-2	0,2	-0,4
TOTAL							**1**	**-0,6**
Food Safety Regulation								
Rules 304 e 145		X			F	1	0,5	0,5
HACCP	X	X			F	1	0,3	0,3
Traceability	X	X			U	-1	0,2	-0,2
TOTAL							**1**	**0,6**
Inspection								
Inspection service system		X			VU	-2	0,5	-1
Illegal/informal slaughter		X			VU	-2	0,2	-0,4
Foot and mouth disease		X	X		VU	-2	0,3	-0,6
TOTAL							**1**	**-2**
Sector data source								
Non-governmental information	X		X		U	-1	0,3	-0,3
Governmental information		X			U	-1	0,7	-0,7
TOTAL							**1**	**-1**
R&D								
Public Organizations		X			F	1	0,25	0,25
Firms – Livestock	X				F	1	0,25	0,25
Firms – Livestock inputs	X				F	1	0,25	0,25
Firms – slaughter and processing	X				N	0	0,25	0
TOTAL							**1**	**0,75**
Chain Governance								
Colective policies			X		VU	-2	0,2	-0,4
Chain representativeness			X		U	-1	0,2	-0,2
Chain information flow			X		VU	-2	0,1	-0,2
Market relations	X				VU	-2	0,2	-0,4
Institutional Marketing		X	X		VU	-2	0,3	-0,6
TOTAL							**1**	**-1,8**

CF-Controlled by firm; CG-Controlled by government; QC-Quasi-controllable; NC-Non-controllable; VF-very favorable = 2; VU-very unfavorable = -2; F-favorable = 1; N-neutral = 0; and U-unfavorable = -1.
Source: Silva & Batalha, 2000

Figure 8. Performance drivers and subfactors considered in an analysis of the beef chain in Brazil: farm production component

Drivers and subfactors	Controlability				Relevance		Weight	Drivers Evaluation
	CF	CG	QC	I				
Breeding								
Environment				X	U	-1	0,2	-0,2
Localization	X		X		N	0	0,1	0
Grazing conditions	X				U	-1	0,2	-0,2
Genetics	X				N	0	0,1	0
Breeding control	X				F	1	0,1	0,1
Animal health control	X				F	1	0,1	0,1
New technologies adoption	X				N	0	0,1	0
Technical assistence	X	X			N	0	0,1	0
TOTAL							**1**	**-0,2**
Raising								
Environment				X	F	1	0,3	0,3
Localization	X		X		F	1	0,1	0,1
Grazing conditions	X				N	0	0,2	0
Animal health control	X				F	1	0,1	0,1
New technologies adoption	X				F	1	0,2	0,2
Technical assistence	X	X			F	1	0,1	0,1
TOTAL							**1**	**0,8**
Terminal raising								
Environment				X	F	1	0,3	0,3
Localization	X				F	1	0,1	0,1
Grazing conditions	X				F	1	0,2	0,2
Animal health control	X				F	1	0,1	0,1
New technologies adoption	X				F	1	0,2	0,2
Technical assistence	X	X			F	1	0,1	0,1
TOTAL							**1**	**1**
INPUTS								
Pasture	X				F	1	0,5	0,5
Veterinary inputs	X				F	1	0,1	0,1
Feeding - Concentrates	X				N	0	0,2	0
Feeding - Minerals					F	1	0,15	0,15
Other inputs	X				U	-1	0,05	-0,05
TOTAL							**1**	**0,7**

Drivers and subfactors	Controlability				Relevance		Weight	Drivers Evaluation
Market structure								
Regional relocation	X				F	1	0,4	0,4
Economy of scale			X		F	1	0,3	0,3
Land property rights			X		F	1	0,3	0,3
TOTAL							**1**	**1**
Farm management								
Cost control	X				U	-1	0,3	-0,3
Zootechnical control	X				U	-1	0,1	-0,1
Decision-making criteria	X				U	-1	0,2	-0,2
Labour skills	X	X			U	-1	0,3	-0,3
Managers skills	X	X			U	-1	0,1	-0,1
TOTAL							**1**	**-1**
Institutional environment								
Taxes		X			VU	-2	0,5	-1
Animal health control		X			U	-1	0,3	-0,3
Sources of credit		X			U	-1	0,2	-0,2
TOTAL							**1**	**-1,5**
Market								
Payment conditions			X		U	-1	0,15	-0,15
Output quality	X				F	1	0,2	0,2
Commercialization scale	X				F	1	0,05	0,05
Information	X	X			F	1	0,25	0,25
Intermediary Channel			X		F	1	0,15	0,15
Informal/illegal slaughter	X	X			VD	-2	0,2	-0,4
TOTAL							**1**	**0,1**

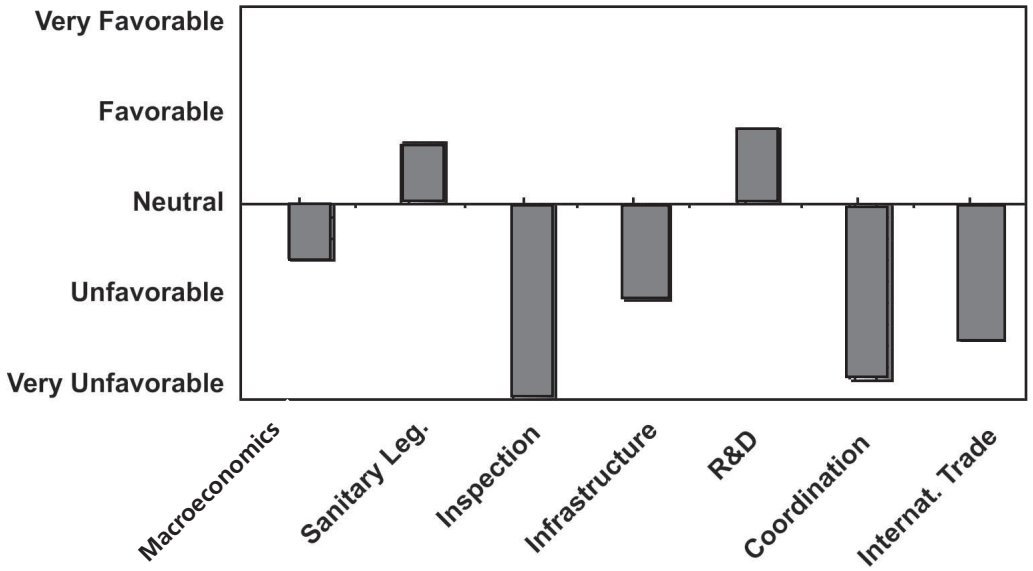
CF; CG-Controlled by government; QC-Quasi-controllable; NC-Non-controllable; VF-very favorable = 2; VU-very unfavorable = -2; F-favorable = 1; N-neutral = 0; and U-unfavorable = -1.
Source: Silva & Batalha, 2000

examination of the respective subfactors, in turn, indicates what the intervention should address. The graphs also help to facilitate dialogue with stakeholders, when discussing the results of the chain analysis. An interesting possibility, offered by this general methodology, is the revision, with the participation of chain stakeholders, of the evaluation of individual judgments and weights for the subfactors and drivers. It is a simple matter to link the scoring tables with the final graphs, via use of standard spreadsheet tools. The sensitivity of the graphs to the individual judgments can be dynamically assessed, in an open discussion with chain stakeholders.

The SWOT approach

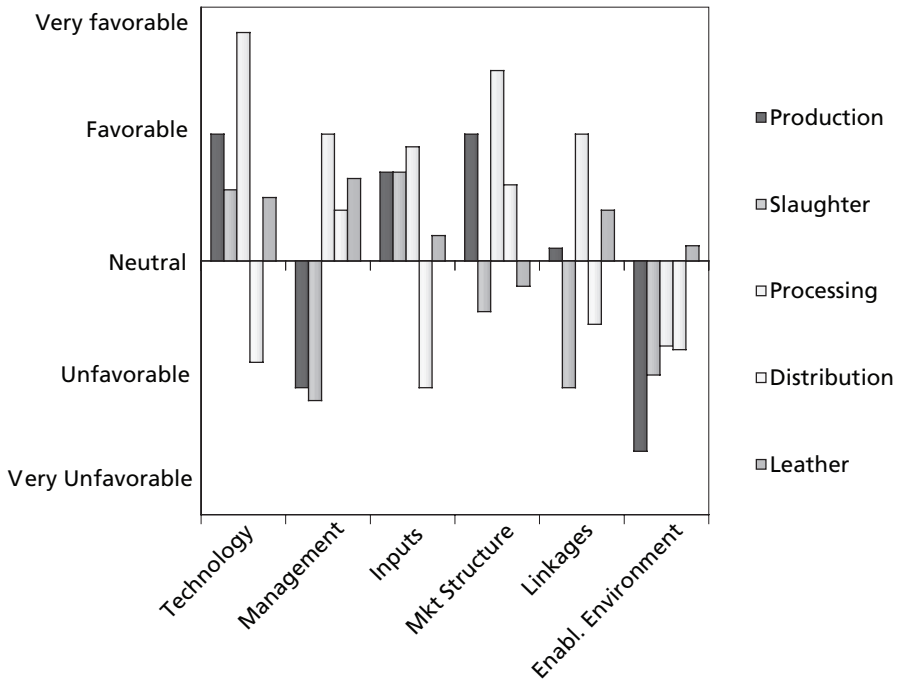
The SWOT (Strengths, Weaknesses, Opportunities and Threats) approach has often been used to identify the major factors affecting the performance of an agrifood chain. The

Figure 9. Drivers of performance: overall evaluation of the enabling environment



Source: Silva & Batalha, 2000

Figure 10. Performance: overall evaluation for the beef chain



Source: Silva & Batalha (2000)

chain can be assessed with regard to its strengths (what it can do) and weaknesses (what it cannot do) in addition to opportunities (potentially favorable conditions) and threats (potential unfavorable conditions). The role of SWOT analysis is to take information from the analysis and separate it into current influences (strengths and weaknesses) and potential future developments (opportunities and threats). The SWOT analysis determines whether the information indicates something that will assist an agrifood chain in being successful in a certain environment, or if it indicates obstacles that must be overcome or minimized. The intention is to provide an information base to support policy recommendations in a scenario of opportunities and threats.

In traditional applications of the SWOT approach, opportunities and threats are considered to arise from factors external to the subject of analysis. For chain analysis, these would be issues primarily associated with our definition of the enabling environment (policies, trade agreements, etc.). Strengths and weaknesses, on the other hand, would be associated with elements internal to the object of analysis. For chain analysis, this would often include items related to performance drivers such as technologies, inputs or firm management. Although the external vs. internal classification is not entirely rigid, it does provide a helpful way to begin identifying the relevant variables to consider in a SWOT exercise.

A variation of SWOT analysis is the TOWS matrix, in which opportunities and threats are paired with strengths and weaknesses (Figure 11). The analysis starts with the listing of opportunities, threats, strengths and weaknesses. The TOWS matrix indicates policies from four conceptual alternatives; in practice, some policies overlap or may be pursued in concert. The focus of the analysis is on the interactions of a four set of variable combinations:

1. The WT Policies. The aim of WT policies is to minimize both weaknesses and threats.

2. The WO Policies. WO polices attempts to minimize the weaknesses and to maximize opportunities. External opportunities may be identified, but the agrifood chain has weaknesses which prevent it from taking advantage of these opportunities.

3. The ST Policies. These policies are based on the strengths of the agrifood chain that can deal with threats in the environment. The aim is to maximize strengths while minimizing threats.

4. The SO Policies. SO policies aim to maximize both strengths and opportunities. An agrifood chain in this position can lead from strengths, taking advantage of the market for its products.

This framework can become complex when many factors are being identified. The matrix shown in Figure 12 can be used to identify combinations of relationships that may become the basis for policy and strategy recommendations. In Figure 12, a '+' indicates a match between the strengths of the agrifood system and external opportunities, while a '0' indicates a weak or nonexistent relationship. Similar tables can be used for analyzing the other three policies boxes (WO, ST, and WT) shown in Figure 13.

Figure 11. TOWS matrix

Internal Factors → **External Factors** ↓	**Strengths:** List of strengths	**Weaknesses:** List of weaknesses
Opportunities: List of opportunities	SO Policies: List of SO Policies	WO Policies: List of WO Policies
Threats: List of threats	ST Policies: List of ST Policies	WT Policies: List of WT Policies

Figure 12. Interaction matrix

Strengths → **Opportunities** ↓	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	+	+	+	0	0	0	+	+	+	0
2	0	+	+	0	+	0	0	+	+	+
3	+	0	+	0	0	0	0	0	0	0
4	+	+	0	0	0	+	0	0	0	0

Under the TOWS framework, the performance analysis of an agrifood chain would typically consider three major sets of information:

a) Indicators of recent evolution of the agrifood chain's production and domestic consumption (see Box 4). This set of information seeks to identify the total amount of products being offered, the importance of the agrifood chain in meeting domestic demand, the production of surpluses that can be exported, the importance of the agrifood chain for the agricultural sector of the country, as well as the most important production regions of the country.

b) Indicators of a recent evolution of the agrifood chain's international trade, including the agrifood chain international market-share (see Box 4). The latter is an indicator of competitiveness, which can be measured by the participation of an agrifood chain's exports in the global exports. The objective of this analysis is to identify the importance of the agrifood chain in the global production, in the international trade flow and in the trade balance of the country. Also, the main players (countries) in trade flow of the agrifood chain's products (destination and origin of exports) can be identified. Competitors (as a threat) can be identified from this analysis.

c) Other drivers of performance of the agrifood chain.

From this set of information, researchers will be able to create SWOT lists. The main objective is to explore possible strengths, weaknesses, opportunities and threats. As performance drivers have ideally been defined for each of the chain's components (input sector, agricultural production, processing industry, distribution, etc.), SWOT analysis and SWOT lists can be held for each relevant chain component as well. Boxes 5 to 8 provide lists of possible strengths, weaknesses, opportunities and threats, Boxes 9 and 10 present two examples of lists from a SWOT analysis of the aquaculture sector in Canada.

Box 4. Indicators of an agrifood chain's domestic and international markets

An overview on the agri-system's recent evolution in terms of production, domestic consumption, and international trade is suggested in order to identify:

- The total amount of products being offered.
- The importance of the agrifood chain in meeting domestic demand.
- The production of surpluses that can be exported.
- The importance of the agrifood chain for the agricultural sector of the country.
- The most important production regions in each country.
- The agrifood chain international market-share (an indicator of competitiveness)
- The importance of the agrifood chain in global production.
- The international trade flow and its importance for the trade balance of the country.
- Main players (countries, competitors) in the trade flow of the agrifood chain's products (destination and origin of exports).

Indicators of production and domestic consumption:

- Domestic production – quality and value of production of the agrifood chain's most relevant products.
- Domestic consumption – quantity of domestic consumption of relevant products.
- Domestic consumption/domestic production – domestic consumption share of domestic production of relevant products.
- Regional production – identification of the country's most important production regions and their shares on total production.
- Value of domestic production/agricultural GDP – commodities shares of agricultural GDP

Indicators of international trade:

- World consumption – total quantity of world consumption.
- Domestic production/world production – country's agrifood chain share of world production of relevant products (quantity).
- Agrifood chain exports/world exports – country's agrifood chain share of world exports of relevant products (quantity).
- Production of main countries – production of the most important countries and their share of world production.
- Destination of exports – identification of main destinations (import countries) of the agrifood chain's exports and their share of total agrifood chain's exports.
- Origin of imports – identification of main supplier (export countries) of the agrifood chain's imports and their share of total agrifood chain's imports.
- Agrifood chain exports/agricultural exports – agrifood chain relevant products share of total agricultural exports value.
- Agrifood chain imports/agricultural imports – agrifood chain relevant products share of total agricultural import value.
- Agri-system export/country total export – agrifood chain relevant products share of total country exports value.

Source: Eumercopol

Box 5. Example list of STRENGTHS

Macroeconomics

- Low interest rates reduce financing cost and make investments possible.
- Exchange rate devaluation increases the competitiveness of exports.
- Exchange rate valuation may reduce cost of imported goods, decreasing the cost of production and favouring investment in high technology.

Domestic Market

- High share of the domestic demand in the total consumption of the domestic production of the chain products enables companies to have more flexibility in terms of market strategy. For instance, Brazilian exporters of meat, in times of market crises, such as decreasing demand because of bird flu and foot-and-mouth disease, can quickly redirect production to the domestic market, which ensures greater stability to agri-chains.
- A large domestic market is able to produce synergies and positive externalities, such as R&D structures, a specialized labour force market, specialized domestic suppliers, specialized services, etc.
- New productive regions may foster a renewed agri-chain with new technology and commercial bases.
- Increased participation in agricultural GDP can mean better articulation with the government, making govemmental policies for the agri-chain possible.

International Market

- High share of the agri-chain in the production and/or international consumption increases bargaining power in negotiations.
- High share of the agri-system in the production and/or the international consumption may produce synergies and positive externalities, such as R&D structures, a specialized labour force market, specialized domestic suppliers, specialized services, etc.
- High share in world imports/exports increases bargaining power in international negotiations.
- Exports/Imports to/from diversified markets reduce the risks which are related to dependence.
- High share of exports/imports of agri-chain products in the country's exports or in the country's agricultural exports may facilitate better articulation of agri-chain agents with the government, which favours the design and implementation of governmental policies.

International trade policies

- The agri-system is able to meet the demands of international trade, such as those related to sanitary and phytosanitary control, child labour, slave labour, other human rights, environmental issues, etc, which can be understood as non-tariff barriers. The analysis of this issue can be done together with other aspects related to the issue of food safety.

Industry programmemes and special policies

- There are programmes and policies which support the agri-chain such as credit programmes, commercialization/trade programmes (guarantee of minimum prices, farmer commercialization programmes, government agricultural stocks, etc), non-banking credit, etc. These policies and/or programmes may compensate the sector for the damage caused by other policies (e.g. monetary policy — high interest rates, price control, etc).

Donmestic Taxation
- Low taxation and/or tax exemption policies for export products

Food Safety
- Domestic laws related to food safety meet international standards
- The agri-system has an adequate laboratorial infrastructure in order to carry out certification tests, etc
- The inspection system is able to assure that food and safety standards are met.

Technology
- High level of diffusion of key technologies in processing plants and rural production.
- High yields in agricultural production.
- Availability of research centres which can ensure development of technologies, even if only adapting technology, either for agriculture or industrial processing plants.
- Government policies ensure resources for R&D.
- Companies able to support R&D.

Market Structure and Governance Structure
- Production units (rural or processing) are large and show economies of scale.
- The agri-system has organizations (farmer and/or processing companies) which are well articulated and able to develop policies.
- Governance structure (e.g. vertical integration, contracts, spot market, etc) shows mechanisms of incentives, penalties, risk reduction etc, which increases the efficiency and efficacy of the agri-chain.
- Processing companies are able to adopt diversification as a market strategy.
- Large companies (oligopolies) have efficient governances.

Firm Management / Company management
- Farms are run under efficient management models.
- High diffusion of managerial tools: quality control (ISO, HACCP), environmental control (ISO, certification), information technologies (bar code, traceability, etc.).

Inputs
- Availability of low cost inputs (land, labour, fixed capital, fertilizers, etc).
- Availability of land to expand rural production.
- Availability of skilled labour.
- Low production cost (rural and processing).
- Low transportation cost and port costs.
- Domestic availability of strategic inputs at a low price.

Storage and Transport
- Efficient transportation infrastructure (rural production to processing plants, processing to ports/airports): motorways, railways, waterways, ports and airports.

Source: Eumercopol

Box 6. Example list of WEAKNESSES

Macroeconomic Factors
- High interest rate increases the costs of financing and makes investments not viable.
- High exchange rates reduce the competitiveness of exports.

Domestic Market
- High share of the international market in relation to the total demand of a chain's products increases risks related to the volatility of international markets.
- Low share of the agrifood chain production value in the agricultural GDP may mean low capacity to articulate and implement governmental policies for the agrifood system.

International Market
- Low share of the agrifood system's products in the international market means low bargaining power in trade negotiations.
- High dependence of few trade partners increases risks.
- Low share of exports/imports of agrifood chain products with relation to the country's total exports, or with relation to the country's agricultural exports, may imply low capacity to articulate and implement governmental policies for the agrifood chain.

International trade policies
- The agrifood system is not able to meet the requirements of international markets with regard to issues such as sanitary controls, prevention of child or slave labour, human right concerns, environmental issues etc.

Industry programmes and special policies
- Absence of support policy / programmes targeting the sector, including compensatory sector policies.

Domestic Taxation
- High taxation of export products. The share of taxes in the final product cost can be high and this reduces competitiveness.

Food Safety
- Lack of laboratories to ensure compliance with standards
- Weak domestic institutions in the area of safety and quality regulations and their enforcement

Technology
- Converse conditions to the ones mentioned in the list of strengths.
- Processing units and farms using out-of-date technologies.

Market Structure and Governance Structure
- Small production units, reducing scale gains.
- Poor sector representation; absence of active organizations.
- Governance structure is not adequate (compared to international standards), does not have adequate mechanisms of incentive, risk reduction etc, leading to conflicts and difficulties of planning and quickly answering changes in the market.
- Other weaknesses can be derived by considering the converse of the items in the list of strengths.

Firm inputs
- Converse conditions from those shown in the list of strengths.

Inputs
- Converse conditions from those shown in the list of strengths
- High dependence of imports for strategic inputs (e.g. fertilizers, packaging materials, etc.)

Transport and Storage
- Converse conditions from those shown in the list of strengths

Source: Eumercopol

Box 7. Example list of OPPORTUNITIES and THREATS

OPPORTUNITIES

Macroeconomic Factors / Determiners

- Stable macroeconomic conditions, such as controlled inflation and sustainable economic growth, create a favourable environment for long-term investments. Sustainable economic growth, and growth of domestic demand, favour investments to increase the production basis and also allows for economies of scale. The economic growth can increase the demand for agrifood chain products as well as government capacity to support basic infrastructure investments and policies for the agrifood chain.
- Sizable Domestic Market; Sustainable growth of domestic consumption of agrifood chain products favors economies of scale and scope. This opportunity can be analysed together with the opportunities created by economic growth. However, the demand for agrifood system products can increase because of other factors, such as changes in consumer behaviour.

International Market

- Demand growth in new markets (emerging markets, e.g. Asia)
- Expansion of international markets because of world economic growth.

International trade policies

- Barrier reductions (tariff or non-tariff), because of trade agreements (multi-lateral – WTO / blocks or bi-lateral). The opportunity arises because of the possibilities of an increase in exports, supposing the agrifood chain has competitiveness (i.e. it presents strengths in other competitiveness drivers).

THREATS

Macroeconomic Factors

- Unstable macroeconomic conditions, such as inflation and absence of sustainable economic growth, create an unfavourable environment for long-term investments. Unstable economic growth, absence of growth of domestic demand and investments prevent adoption of innovations, economies of scale, and other factors of competitiveness, including government capacity to support basic infrastructure investments and policies for the agrifood chain.

Domestic Market

- Increase in domestic consumption of agrifood chain products may prevent increase in exports.

International Market

- Increase in production of competitors / other countries (traditional or non traditional market players).

International trade policies

- Reduction of tariff and non-tariff barriers because of trade agreements. There is a threat because of the possibility of increasing imports, supposing that the agrifood chain does not have good indicators of performance (i.e. it presents weaknesses in other performance drivers).

Industry programmes and special policies

- Economic reforms may hinder the availability of public resources to the agricultural sector or agrifood chain policies. This threat can be analysed together with the weaknesses from macroeconomic drivers.
- Land reform may cause rupture of production systems.

Domestic Taxation

- Fiscal policy and the economic restructuring may cause an increase in taxation for the agrifood chain. This threat can be analysed together with macroeconomic drivers.

Source: Eumercopol

Box 8. SWOT analysis, aquaculture to farm gate, Canada

SWOT Analysis — British Columbia (BC) Aquaculture to Farm Gate

Strengths	**Opportunities**
1 Good biophysical growing conditions for both finfish and shellfish (room for expansion)	1 More efficient and timely CEAA review process (new tenures and renewals)
2. Relatively clean water and environment relative to Lower 48 competitors	2. Bulk zoning of broad areas for aquacullure development
3. Proximity to US market	3. Access to more lakes for smolt rearing
4. Consolidation of salmon operations, strong presence by large multinationals selling food around the world	4. Farming of new 'whitefish' species — halibut, sablefish, cod
5 Codes of practice developed by and with the cooperation of industry	5. Improved productivity/consolidation from shellfish tenures
6. Good traceability (all products flow through federally-registered plants)	6. Technology transfer in farming shellfish and farming new finfish species
7. Good backward linkages and forward linkages for most industry supplies and services	7. More coordination of marketing and deliveries by shellfish producers
8. 'Naturalness' of bivalve shellfish/health benefits of seafood in general	8. New preservation technology to extend shelf-life —MAP, ozone
9. Strong market demand for clams	9. Increased sales to the domestic canadian market
10. Good quality reputation of BC cultured finfish and shellfish	10.Increased capacity for environmental research and monitoring in rural BC
Weaknesses	**Threats**
1. Regulatory delays In CEAA approval process	1. Real environmental, disease and product quality issues e.g. IHN. Xudoa
2. Lack of federal-provincial harmonization of the tenure approval process	2. Perceived environmental, disease, and product quality issues (attacks by some environmentalists, wild producers, media)
3. Bc is a high-cost producer — high wages, smolt and regulatory costs, lack of economies of scale	3. Strengthening Canadian dollar
4. Lack of DFO support to develop new species for aquaculture	4. Increasing world supply of low-cost farmed finfish
5. Limited technology transfer in the shellfish sector	5. Feed cost increases for farmed finfish
6. Dependence on Canada's East Coast for farm site labour in salmon	6. Water quality and disease outbreaks
7. Dependence on Washington State for seed in shellfish	7. Aboriginal land claims process and associated uncertainty
8. Lack of water quality monitoring in Central and North Coast	8. Lack of access to wild broodstock to culture new species
9. Environmental opposition, poor public image, mixed public support	9 Lack of technical knowledge prevents BC from culturing new species
10. Poor profile and economic data on industry	10.Loss of public and community support for aquaculture

Source: British Columbia Ministry of Agriculture, Food and Fisheries, 2004

Box 9. SWOT analysis, seafood processing, Canada

SWOT Analysis — BC Seafood Processing

Strengths

I Consumer trend to healthy diet/seafood consumption is growing worldwide
2. Proximity to US and Asian markets
3. High quality and reputation of Canadian fish inspection system
4. IQ fisheries management system produces quality raw material in most cases
5. BC farmed salmon sites produce quality raw material and deliveries are scheduled to meet market demand
6. Skills and efficiency of farmed fish processing plants
7. Vertical Integration of farmed salmon growout, processing, and marketing operations
8. Vertical integration of wild salmon, herring, and groundfish operations
9. Selected high-quality niche products, e.g., herring roe, geoducks
10. Top tier Seafood Alliance industry association

Opportunities

11. Improved quality raw material if salmon management changes
12. Improving quality, slower more consistent plant volumes can spur product development, cost savings
13. Produce high value-added processed niche products
14. Increased focus on and sales to domestic Canadian market
15. Achieving MSC certification
16. New preservation technologies to extend shell-life —MAP, ozone
17. Focus on quality and high-end fresh/live market to the extent possible
18. Greater traceability including tag programmes, third party monitoring
19. Re-skilling of workforce in quality, traceability, marketing
20. Value Chain Round Table for seafood

Weaknesses

1. Inconsistent timing, quality and price of some BC raw material, especially salmon
2. BC is a high cost producer — wages, environmental regulations, and inspection
3. Lack of MSC certification that is important to several European markets
4. Increasing market power of large distributors, discounters, and retailers
5. Aging and low skills of much of the wild fish plant workforce
6. High cost of Canadian environmental and fish inspection standards
7. Small size of seafood processors/marketers on the world stage
8. Farmed salmon is becoming a commodity
9. Lack of cooperation between wild and farmed seafood sectors
10. Fragility of the capture salmon processing sector

Threats

11. Aboriginal land claims process and associated uncertainty
12. Imminent collapse of the capture salmon processing industry
13. Stronger Canadian dollar
14. Weak world economies
15. Increasing non-tariff trade barriers
I6. Environmental opposition to industry — wild and farmed
I7. Failure to re-skill the workforce
18. Failure to improve traceability and sustainability
19. Large wild salmon volume from Alaska/ large farmed salmon volumes from Norway and Chile
20. Lack of community and public support for the seafood industry

Source: British Columbia Ministry of Agriculture, Food and Fisheries, 2004

A hypothetical example of a TOWS matrix is presented in Figure 13. In the four boxes of the figure, there are qualitative indications of policies and areas of investment, which are crucial to reaping opportunities and lessening threats offered by trade:

1. The WT Policies. Privatization of roads (WT policy 2) intends to stimulate private investment to overcome both lack of transport infrastructure (weakness) and shortened government budget (threat of macroeconomic instability).

2. The WO Policies. An agrifood chain can lose the opportunity of an increasing demand (opportunities 1 and 2), given that farms are not able to attend product quality standards (weakness 7), as diffusion of proper technology is low (weakness 6). The extension system can be improved by cooperative arrangements between the governmental R&D system and processing firms. Processing firms will set new contracts with farmers, offering incentives (eg. premium prices) to those who adopt the new technology (weakness 5). Government can also offer tax exemptions (weakness 4) to encourage private investments. Thus, WO policies 2 and 3 are suggested, allowing to increase farm yields (weakness 2) and farm product quality (weakness 7), by speeding up diffusion of new technology (weakness 6).

3. The ST Policies. Increasing non-tariff barriers are expected (threat 3). Some of these barriers are designed to meet legitimate policy goals, while others are used deliberately to distort trade. Non-tariff barriers can be challenged, but the process is complex and time-consuming. In order to overcome legitimate non-tariff barriers, R&D system (strength 6) can develop innovations (eg. a new quality control system). In order to overcome illegitimate non-tariff barrier (eg. countervailing duty), government capacity to negotiate and/or settle disputes under WTO rules should be strengthened (strength 1).

4. The SO Policies. In order to increase production, and take advantage of increasing demand (opportunities 1 and 2) farmers and processing firms have access to low cost credit from a current government programme (strength 3). Extra funds would be necessary in view of these opportunities, and so the programme should be enlarged (SO policies 1 and 2).

Figure 14 presents a TOWS matrix analysis of the fisheries sector in the Penang State, Malaysia.

Figure 13. Example of a TOWS matrix

Internal Factors → **External Factors** ↓	**Strengths**: 1. Good institutional support from government 2. Large international market-share 3. Availability of low cost credit programme 4. Large firms providing financial resources and economies of scale 5. Availability of cheap land in new production region 6. Good R&D system 7. Low farm production cost	**Weaknesses**: 1. Lack of good governmental inspection service 2. On farm production with low yields 3. Lack of transportation infrastructure 4. Excessive domestic taxation 5. Inadequate governance 6. Low diffusion of farm technology 7. Low quality of farm products
Opportunities: 1. Increasing exports owed to trade agreement 2. Emerging markets (e.g. Asian countries)	**SO Policies:** 1. Increase credit availability to expand farm production (O1, O2, S1, S3, S4, S5, S7) 2. Increase credit availability to expand processing industry capacity (O1, O2, S1, S3, S4, S5).	**WO Policies:** 1. Partial privatization of the inspection service (O1, O2, W1) 2. Improve extension system for technology transfer to farms (O1, O2, W2, W5, W6, W7) 3. Introduction of incentives for farmers who adopt new technology (O1, O2, W2, W5, W4, W6, W7) 4. Privatization of roads (O1, O2, W3)
Threats: 1. New competitors 2. Macroeconomic instability 3.Increasing non-tariff barriers 4.Competition of substitute products	**ST Policies:** 1. Support to develop niche markets through quality products (T1, T4, S1, S6) 2. Special credit to prevent financial resource shortage (T2, S3). 3. Strengthen negotiation capacity in WTO (T3, S2, S6) 4. Support to R&D (T1, T3, T4, S1, S4, S6)	**WT Policies:** 1. Improve the extension system to diffuse technology of high quality products (T1, T4, W2, W6, W7) 2. Privatization of roads (T2, W3) 3. Partial privatization of the inspection service (T2, W1)

Source: Eumercopol

Figure 14. TOWS matrix analysis of the fisheries sector, Malaysia

FISHERIES SECTOR IN PENANG	STRENGTHS	WEAKNESSES
	S1. Strategically placed between the Indian Ocean and the South China Sea. S2. Good Infrastructure such as good port and airport facilities. S3. Presence of strong R&D Institutions eg. ICLARM, FRI, USM S4. Good institutional support from Government S5. Presence of experienced marine product processing industries S6. Rich natural fisheries biodiversity	W1.Lack of market intelligence and promotion W2.Low technology use by operators W3.Small-scale coastal fishermen W4.High cost of feed for aquaculture W5.Inadequate R&D on development of new species, product quality and downstream processing W6.Lack of skilled and semi-skilled workers W7.Lack of institutional support for financing ornamental fish industry W8.Lack of cargo space for export of ornamental fish and products W9.Inadequate private sector participation in R&D
OPPORTUNITIES O1.Good export market for marine products O2.Product diversification by improving value added in the processing industries. O3.Opportunities for R&D to develop local feed meals for aquaculture, processing, postharvest handling, O4.Surrounding islands available to increase production O5.Opportunities for developing signature species in ornamental fish	**SO:** 1. Develop and expand new markets (O1, S2, S3, S4, S5) 2. Expand product line through R&D (O2, S3, S4, S5, S6) 3. Develop R&D on producing feed meals using local material, processing, postharvest handling, better hybrids and equipment (O3, S3, S4, S6) 4. Use surrounding islands for the fisheries industry (O4, S4, S6) 5. Develop high value signature species (O5, S3, S4, S6)	**WO:** 1. Expand market through market intelligence and promotion (O1, W1, W5) 2. Encourage use of hi-tech automation and mechanisation to improve production and reduce labour requirement (O2, W2, W3, W4, W6) 3. Provide financial incentives for ornamental fish industry (O5, W7) 4. Dedicate cargo space for fisheries exports (O1, W8) 5. Intensify private sector participation in R&D on upstream and downstream activities (O3, W5, W9)
THREATS T1.Competition from neighbouring countries T2. Dependency on foreign labour T3. Dwindling fish stocks due to land reclamation, water pollution, over exploitation and destruction of mangrove swamps T4. Competition for labour from manufacturing sector T5. Competition for land use for land-based aquaculture from other sectors T6. Inadequate transfer of technology from research institutions to operators	**ST:** 1. Develop niche markets and high quality species through R&D (T1, S3, S4, S6) 2. Enhance HRD development through training and recruitment of foreign expertise (T2, S4, S5) 3. Adopt and Implement Penang's environmental conservation plan to manage and conserve fisheries resources (T3,S3,S4, S6) 4. Encourage professionalism in industry through training (T4, S4) 5. Convert suitable land from other uses to aquaculture (T5, S4) 6. Strengthen extensions services and system in the Dept of Fisheries (T6, S4)	**WT:** 1. Improve extension system for transfer of technology to grassroots level (T6, W6)

Source: Penang State Government, 2002

How much

The methodological choices have a direct impact on the budget of a chain analysis. The delimitation of the chain, the time frame of the analysis, the composition of the research team and the data collection approaches are some of the variables that will ultimately define the amount of resources needed. Costs of the studies in which the authors of this text have been involved varied widely, from the low 5 digit United States dollar figures for the simplest ones to figures in the mid 6 digit range, for the more complex.

There are three special aspects of the proposed methodology that differentiate its type of budget from the ones of more traditional analyses or research investigations. First, the team of researchers typically comprises a number of qualified professionals, from different areas of knowledge. This means that the cost with qualified personnel will tend to be high. These researchers are likely to come from different organizations. As we earlier saw, some may be hired as consultants for special tasks, while others might have to have a longer term engagement. Typically, expenses for personnel will constitute the bulk of a chain analysis budget.

A second budget item that tends to be relatively high is travel expenses. Internet searches and mail surveys have been used in some chain studies as a simple and relatively inexpensive method to collect information, but as we saw in the previous item, travel will often be required for data collection. Indeed, the RA methodology we presented proposes the realization of interviews with a non-probabilistic sample of qualified stakeholders, plus some participatory observations along the different chain stages, during different moments of the production-distribution cycle. These interviews should be held by a team of qualified professionals, who will be in charge of exploring several issues previously enumerated in interview guides. Although the number of interviews can be relatively small, their cost can be high, as the researchers will have to travel to meet the informants at their locations, often at the most convenient moment for the latter. The longer the distances and the more extensive the scope of the investigation, the higher the travel expenses will be. An overall travel plan is of course advisable, as savings can be made by following a well planned schedule.

A third important budgetary aspect of the proposed methodology, as depicted in Figure 1, is the workshop with stakeholders in order to validate results. Representative stakeholders, experts and the research team are all expected to participate. The costs can include not only the expenses with organization, rooms, lunches, and other regular workshop costs, but also transport and accommodation for guests, the stakeholders and other non research team members.

Finally, the budget will have to include provisions for items such as office supplies, communications, administrative support, processing equipment and general operating expenses, among others.

Stakeholder Validation

The methodological steps presented in Figure 1 drew attention to a very important factor for a successful chain analysis: the involvement of stakeholders in all stages of the methodological process. Besides helping in defining the purposes of the analysis, stakeholders will be instrumental in facilitating its execution. Better than any analyst, they know the characteristics of the chains, their strengths and their weaknesses. They also know who the key informants are and can ease access to them.

Typical stakeholders in chain assessments are the representative associations of farmers, input suppliers, traders, processors and consumers. Representatives of governmental agencies, ministries and secretariats, in addition to policy advocacy groups and NGO's, might also be included.

An executive summary of the chain analysis' main report, comprising the proposed interventions should be made available in advance to workshop participants. Stakeholders have to validate the results of the analysis – otherwise the recommendations of the study stand a large chance of not being implemented. In a workshop, the attributed scores or the SWOT lists should be validated. The list of performance drivers and subfactors, as well as their controllability and scores, can also be refined. All stakeholders who participated in the preceding phases of the research, other experts, and agents who will be affected by strategies and policies that will be proposed, should be invited. This workshop is important to mobilize agents of the chain, and obtain commitment to proposals (Box 10).

In the workshop for validation of results, stakeholders will be able to assume mutual commitment to common values and policy proposals. In many cases, participants will be having the first chance to participate in a round table where their mutual problems will be discussed. They will know the problems of their suppliers, buyers and competitors, and have the opportunity of setting up horizontal and vertical forms of cooperation. Government officials will be able to know and understand the agrifood chain from a systemic perspective and validate or not the proposals advocated by the chain agents themselves. Firms will also have access to information that can be used to support their strategies of competition and cooperation.

Box 10. The objectives of the workshop with stakeholders

- Present the analytical framework and methodology used;
- Presentations of the chain's SWOT or Scoring analysis
- Validation of the results
- Harmonize views on the analysis and proposed interventions
- Development of a shared vision regarding a strategy for chain performance improvement
- Prioritize interventions
- Identification of funding sources for interventions

Policy and Strategy Implementation

Chain analysis, as hereby proposed, should indicate technological, economic and institutional bottlenecks that negatively affect overall performance. It should also identify the strong points that might be promoting performance and that need to be reinforced or sustained. The identification of these strengths and weaknesses will provide the basis for the design of policy proposals and firms' strategies towards enhanced chain performance. Proposals may also point out the need for further analyses and investigations.

The results of the analysis, validated in the workshop, should be condensed in a synthesis of intervention proposals. For each proposal, a clear justification should be provided, followed by an indication of the public and private agents with roles in the implementation. If the framework proposed in the discussion of the scoring method is followed, then it should be a simple matter to associate the responsibility for proposal implementation with the 'degree of controllability' of the issue addressed by the specific proposal. Issues primarily under government control require interventions by the public sector, while issues under the control of firms have to be the focus of private agents' strategies.

For each proposal, there is also a need to indicate the degree of priority attributed to it. The election of priorities under a stakeholders' validation process will give the recommendations of the chain analysis the credibility to become an authoritative source of reference for actions by government and private stakeholders alike. Policies and strategies considered to have a high impact on agrifood chain performance must clearly be given higher priority. Policies and strategies with higher leveraging potential should also be prioritized. Finally, each proposal must identify the impacted chain agents and the potential sources of financial resources for implementation.

Box 11 presents some examples of policy proposals and strategies associated with identified problems. These are indicated as illustrative cases only and should not be seen as recommendations that are necessarily appropriate or desirable under all circumstances. Also, it should be noted that because of the systemic nature of agrifood chains, the analyst must be sure that the proposed intervention is addressing the **cause** of the problem and not its **consequences** only. Problem diagnosis should go beyond the consideration of the apparent 'symptoms', as we earlier discussed in our presentation of system principles.

An additional word of caution is warranted, namely the fact that policies, as the ones illustrated in Box 11 affect chain participants and society as a whole in different ways: some firms, individuals or groups of individuals may benefit, while others may be negatively affected. There might be resistance to the proposed interventions; as in most policy reform processes, effective advocacy and ample political representation will be key to assure that the reform measures deemed necessary by chain stakeholders can be implemented.

Box 11. Examples of policy proposals and strategies

Agri-chain problems	General policies and strategies
Macroeconomics	
• High domestic interest rates increase the costs of financing	• Promote economic restructuring considering fiscal and monetary policies, among other macroeconomic issues. • Formulate compensatory policy for agriculture, such as special credit programmes for working and investment capital.
• Overvalued exchange rate reduces the competitiveness of exports and increase competitiveness of imported substitutes.	• Devalue exchange rate. • Revise taxes affecting agrifood chain products; reduce or eliminate where feasible • Establish quotas and tariffs for imported goods
• Undervalued exchange rate increases cost of imported inputs, including high tech capital goods used in the agri-chain.	• Provide tax exemptions or reduce / eliminate tariffs on imported high tech capital goods and strategic inputs.
Domestic Market	
• Dependence on international market increases risks related to price volatility and unexpected non-trade barriers.	• Favour domestic markets; promote expansion of domestic market shares
International Market	
• High dependence on few trade partners increases market risks.	• Diversify production and markets
International trade policies	
• Tariff and non-tariff barriers to trade	• Negotiate trade agreements.
• The agrifood system is not able to meet international standards and requirements regarding sanitary control, labour practices (child and slave labour), human rights, environmental issues, etc.	• Develop and/or promote SPS, GAP's, and regulations regarding environment and labour. • Develop systems for monitoring and enforcing SPS, environment and labour regulations. • Establish or reformulate agencies to regulate, monitor, enforce regulations and provide certification services. • Promote contract farming or other chain coordination arrangements that facilitate enforcement of regulations on minimum standards, use of labour and environment.
Industry programmes and special policies	
• Absence of support policy programmes, including compensatory sector policies.	• Design special programmemes addressing the needs of credit by farms, processing firms and retailers. • Eliminate or reduce taxes on capital goods and agrifood chain export products. • Promote R&D programmes. • Establish support policies that contemplate improvements in regulatory systems and government agencies, • Establish mechanisms for crop insurance (mutual or private system). • Develop futures markets.

Domestic Taxation	
• The total cost of taxes and other domestic levies is high, thus decreasing competitiveness in the international market.	• Eliminate cascade taxes • Bring taxes and levies to international standards. • Eliminate / reduce taxes on food products.
Food Safety	
• Domestic SPS regulation does not meet international standards	• Develop regulations on SPS control.
• Governmental inspection service is deficient.	• Improve food quality and safety inspection services. • Promote contract farming or other chain coordination arrangements that facilitate compliance with quality and safety standards
• The agrifood system has inadequate laboratorial infrastructure to carry out quality and safety monitoring and certification tests.	• Create laboratorial infrastructure to carry out independent and internationally accepted tests. • Promote public-private partnerships for service provision in agrifood quality and safety testing and certification
• Lack of a traceability system.	• Establish a national traceability system.
• Low level of adoption of food safety technologies	• Promote capacity building and awareness raising programmes • Create regulations to enforce adoption. • Establish a credit programme to support the adoption of quality and safety improvement technologies.
Technology	
• Lack of public and private R&D, both for farming and processing.	• Establish / promote research centres considering the possibilities for public-private partnerships. • Create incentives for private R&D: provide tax exemption for high tech laboratory equipments (imported), grants, partnership promotion with universities and public research institutions, regulation on intellectual and patent rights.
• Low yields in agricultural production because low level adoption of key technologies. • Low diffusion of environmental friendly technologies on both farms and processing plants.	• Improve public extension services • Promote private extension services, with roles for NGO's and other private service providers. • Promote contract farming • Promote incentives for adoption of new technologies: premium prices for quality standards, tax incentives, special credit conditions, cross-compliance, etc.
• Low quality of processed products because of low level of adoption of key technologies.	• Enforce minimum standards regulations combined with credit for technology adoption. • Promote technology diffusion programmes
• Public R&D spending on themes that do not match agrifood chain priorities.	• Encourage public and private stakeholders' joint definition of R&D priorities.

Market Structure	
• Concentrated markets cause inequitable distribution of returns and asymmetry of information along the chain.	• Develop anti-trust regulation. • Promote the establishment of sector chambers, where chain coordination issues can be discussed and self-regulating mechanisms can be promoted. • Promote cooperative (group action) schemes for processing, buying inputs, collective use of farm equipments and storage facilities, bargaining processes, etc.
Governance Structure	
• Absence of representative and active organizations.	• Promote farmers and processing companies' organizations with capacity to propose and promote policies • Promote 'sector chambers'
• Inadequate mechanisms of incentive and enforcement. • Conflicts of objectives, absence of strategic planning and ineffective responses to market changes.	• Promote horizontal and vertical partnerships. • Develop contract farming.
Firm management	
• Low diffusion of managerial tools: quality control (ISO, HACCP), environmental control (ISO, certification), information technologies (bar code, traceability, etc.).	• Improve support services offered by sector organizations and private consultants. • Create infrastructure and promote capacity building on management issues. • Update undergraduate and vocational course curricula of agrobased careers, so as to include / expand management discipline contents.
Inputs	
• High cost of inputs (land, labour, fixed capital, fertilizers, etc).	• Develop input saving technologies. • Encourage supply of inputs by means of contract farming, thus allowing economies of scale in purchasing. • Review regulations on land use, land market, labour, etc. • Review tax structure affecting input costs
• Unavailability of skilled labour.	• Promote training; facilitate hiring of expatriates
• Lack of domestic supply of strategic inputs, including capital goods.	• Remove import barriers on strategic inputs, including high tech inputs. • Develop partnership with foreign suppliers.
Transport and Storage	
• Inefficient or insufficient infrastructure of transport: roads, railways, waterways, ports, airports, and storage facilities	• Reduce barriers to investments in infrastructure. • Establish public-private partnership programmes for infrastructure investments, management and maintenance services. • Promote government investments in essential infrastructure.

SUMMARY: A CHRONOGRAM MODEL

Proper planning and implementation of the chain analysis methodological process here proposed requires that a chronogram showing its major activities be prepared. Figure 15 shows an example. The main methodological phases suggested, are as follows:

- The first step is the collection of information from previous studies, comprising an exhaustive reading of reports, government documents, legislation, and other available documents. Collection of statistical data from government and non-government sector organizations must also be done in this phase.

- The reading will help to identify stakeholders, sector organizations and governmental agencies, as well as build up a so-called 'infogap' matrix. The first partial report of the chain analysis can be written after the examination of this first set of (mostly secondary) information.

- From the latter, researchers will be able to draw the interview guides, which will be applied to an intentional, small sample of chain participants to yield a complementary set of information. These stakeholder interviews will ideally fill any information gaps.

- After the interviews, the set of information must be systematized in the form of tables for quantitative data, and as text for qualitative issues. For each item of the interview guide or questionnaire, a summarized list of the stakeholders' answers can be displayed, often in a two column format (question vs. summarized answers). This is an easy method to observe concordances and discordances among viewpoints expressed in the interviews.

- The full set of information must be analyzed, following the conceptual framework proposed. The team of researchers must share all findings, in order to discuss and present policies and strategies from a systemic perspective. They also should provide a list of priority policies and strategies, according to their view.

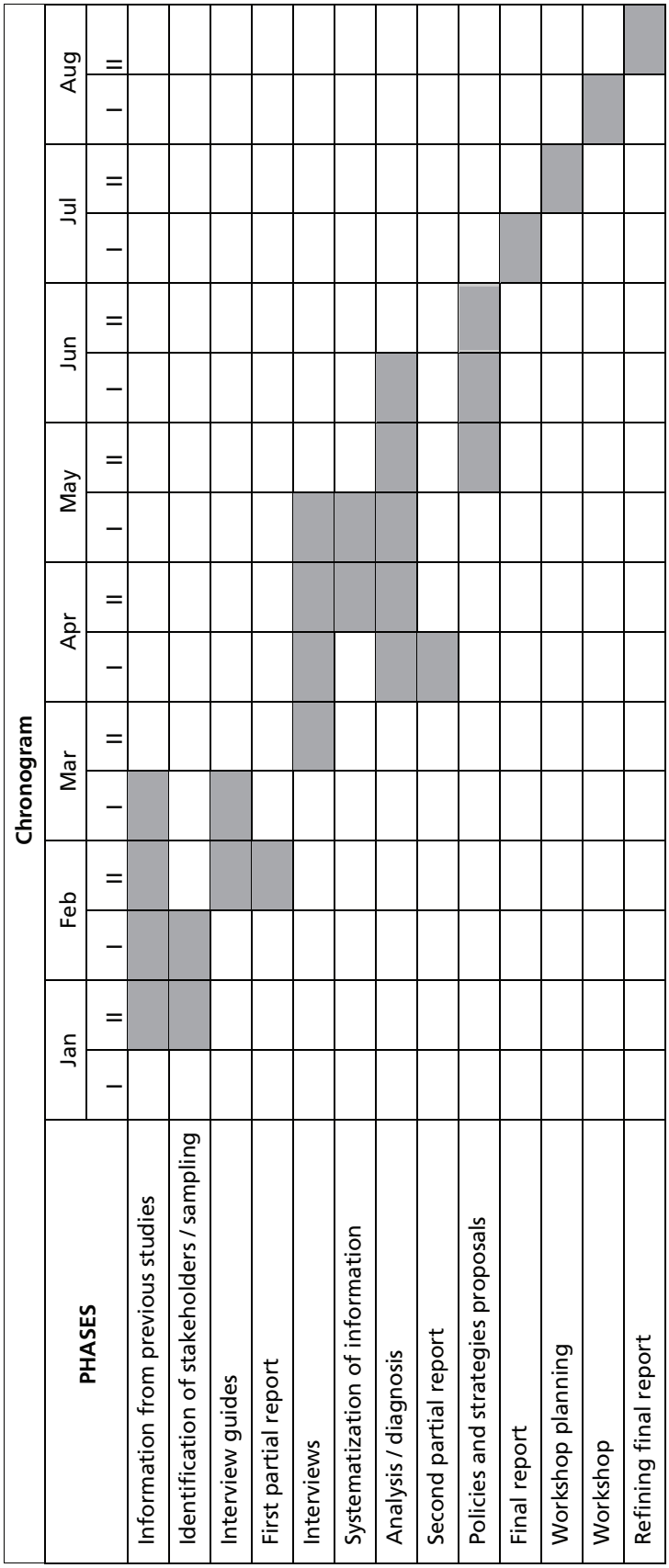
- A final report should be written to incorporate the results of this internal round of discussions and definition of policies and strategies. This report should be disseminated among the participants of the stockholders' workshop.

- The workshop should be planned. All participants must be invited and well informed in advance. The executive summary and the workshop programme, at least, must be sent to all. If necessary, discussion groups and plenary sessions can be organized.

- In the workshop, researchers will present their analysis and proposals, followed by discussions and a validation process. If the scoring method has been adopted, a member of the research team should coordinate discussions that end up in an agreement on the scores and weights for each performance driver and their subfactors. For a SWOT list, a similar procedure can be followed.

- Finally, the workshop results must be incorporated in the final report of the analysis. This document will be a reference for all agents of the chain, including government agencies, companies, and researchers. Guidance to the organization of this report is provided in the next section.

Figure 15. Example of a chronogram



Defining a report structure and contents

The last phase of the research is to prepare and present a final report. The report should include an executive summary which can be easily consulted by stakeholders and other interested readers. The organization of the text into chapters and sections should ideally follow the general sequential structure of the adopted methodology. Typically, sections are created to comprise each of the chain components. For instance, a section on the overall enabling environment can be followed by sections on each chain component, such as farm production, first and second processing, etc. For each chain component, subsections can be created to include the discussion of the respective performance drivers. These subsections would be repeatedly presented for each component section, as illustrated by the example of Box 12. Alternatively, the drivers of performance could be used to establish the organization of topics in each chapter. For instance, after an introductory chapter, additional chapters or subsections would follow, covering each of the performance drivers, as shown in the example in Box 13. In both of these alternative presentation formats, final chapters can be defined for the overall analysis and policy proposals.

In the example of Box 13, not only is a report structure presented, but also an exhaustive list of contents which are based on the drivers of performance and methodologies of analysis presented in this document. Note that the list should be seen as merely indicative of the types of issues that could be covered in such a report.

Box 12. Example of report contents

1. Introduction

2. Methodology
- 2.1. Conceptual basis
- 2.2. The agrifood chain delimitation
- 2.3. Methodology

3. The international market
- 3.1. Production
- 3.2. Consumption
- 3.3. Trade flows
- 3.4. Chain share of world trade

4. Analysis of the agrifood chain
- **4.1. The enabling environment**
  - 4.1.1. Macroeconomic issues
  - 4.1.2. International trade
  - 4.1.3. Agrifood chain programmes and special policies
  - 4.1.4. Taxation
  - 4.1.5. Sanitary legislation
  - 4.1.6. Inspection services
  - 4.1.7. Availability of statistical information
  - 4.1.8. R&D
  - 4.1.9. Organizations
  - 4.1.10. Infrastructure
- **4.2. Consumption**
  - 4.2.1. Price demand analysis
  - 4.2.2. Demand projection
  - 4.2.3. Consumer behavior
- **4.3. Distribution**
  - 4.3.1. Distribution channels
  - 4.3.2. Drivers of performance
    - 4.3.2.1. Firm management
    - 4.3.2.2. Inputs
    - 4.3.2.3. Technology
    - 4.3.2.4. Market structure
    - 4.3.2.5. Institutional environment
    - 4.3.2.6. Market relations
- **4.4. Processing**
  - 4.4.1. Sector size
  - 4.4.2. Technology
  - 4.4.3. Inputs
  - 4.4.4. Market structure
  - 4.4.5. Firm management
  - 4.4.6. Institutional environment
  - 4.4.7. Market relations
  - 4.4.8. Infrastructure
- **4.5. Farm production**
  - 4.5.1. Production systems
  - 4.5.2. Technology
  - 4.5.3. Inputs
  - 4.5.4. Market structure
  - 4.5.5. Firm management
  - 4.5.6. Institutional environment
  - 4.5.7. Market relations

5. Performance evaluation
- 5.1. Institutional environment
- 5.2. Consumption and distribution
- 5.3. Processing
- 5.4. Farm production
- 5.5. Overall performance

6. Policy proposals

7. Bibliography

8. Annex

Source: Silva & Batalha, 2000

Box 13. Example of a report structure and contents

SUMMARY

- Executive summary comprising objectives, methodology, main results and policy proposals.

1. INTRODUCTION

- Objectives, methodology used for analysis, sources of information, type of information and structure of the document.

2. AGRIFOOD CHAIN ANALYSIS

- A brief description of the agrifood chain, its components, agents and organizations.
- A description of the chain map and flows
- Indicate the components of the main products that will be analysed in-depth.

2.1. Macroeconomic Factors / Determinants

- Brief description of the current macroeconomic environment including the monetary and exchange-rate policies.
- Show the impacts of these policies in terms of the GDP and the agricultural GDP performance.
- Analyze the impact of macroeconomic policies on the ability of the state to formulate and carry out policies regarding the agrifood chain.

2.2. Domestic Market

- Performance of the production and domestic consumption in terms of quantity and the production value. Some determinants of performance can be related to the macroeconomic variables, while others may come from the themes referred below. They may be mentioned in this section, but they are better explained in the following sections.
- Identify the importance of the domestic market concerning the demand of the products. Exportable surplus, deficits or dependency on the international market should be assessed.
- Identify the main productive regions and movements to re-locate production (agriculture, livestock and agro-industrial). Show main causes and main impacts on the agrifood system.
- Identify the importance of the agrifood chain to draw up the agricultural GDP (Value of the production of the products/agricultural GDP). For cases in which the final product of the chain is an industrial product, identify the percentage of the production value in the industrial GDP. For instance, in the milk chain, a final product is powdered milk, a product classified as industrial.

2.3. International markets

- Total world-wide consumption, consumption of the main demanding countries and their share in the total worldwide consumption (including your country, in case it is not among the main ones).
- Worldwide production, production of the main producing countries and their percentage in the total worldwide production. Indicate your country's relevance.
- Identify the main producing and consuming regions in the world. The main producing and consuming countries are not always the largest world-wide exporters and importers. Nevertheless, they can be important 'players' in the international market. Changes

in production and consumption of these countries can have an effect on prices and quantities in the international market.
- Identify the importance of the agrifood chain in the world-wide consumption and production. Can changes in domestic production and consumption have an effect on the international market?

International market flows:
- Total exports, exports of the main exporting countries and their percentage in the total exports (including your country, in case it is not among the main ones).
- Total imports, imports of the main importing countries and their percentage in the total imports (including your country, in case it is not among the main ones).
- Identify the international market flows and the main participants. Identify the main countries which are able to create surpluses, or which are oriented to the external market, and the main deficient countries, which depend on the international market for their domestic supply.
- Indicate the importance of your country in the international market flows of these products.

The agrifood chain in your country and the international market:
- The main export destinations (the main import countries of your product/ products) and their percentage in chain exports. Create a table. Identify dependence or diversification of your destination market.
- Percentage of the chain exports in the total exports of the country.
- Percentage participation of the exports of the agricultural products of your chain in the total agricultural exports of the country. It is important to have in mind that for some chains there are products classified as industrial (i.e. powdered milk). For this reason, identify also the percentage participation of the exports of these products which are classified as industrial in the total industrial exports of the country.
- The main import origins (the main supplier countries of your imports) and their percentage in the chain imports. Identify dependence and diversification of external suppliers.
- Percentage participation of the imports of products of your chain in the total imports of the country. Evaluate the possibility of substitution of imports.
- Percentage participation of the imports of the agricultural products of your chain in the total agricultural imports of the country. Identify the percentage participation of the imports of the products which are classified as industrial in the total industrial imports of the country.
- Identify the importance of the chain products for the external market of the country. High percentage in the imports may indicate a higher governmental interest in the formulation of support policies for the chain.

2.4. International trade policies
- Identify the main tariff barriers, informing: the *ad valoren* tariffs and the main countries responsible for these barriers.
- Identify the main non-tariff barriers; describe them (quotes, sanitary control and phytosanitary, child labour, slave labour, other human rights, environmental issues, etc) and inform the main countries responsible for them.
- Examine the issue of private standards, i.e., these set up by retailers, traders or their associations

- Describe trade agreements in which tariff and non-tariff barriers (which ones?) were reduced. Identify the impacts already observed (or possible ones) of these agreements for the external market flow of your chain.

2.5. Industry programmes and special policies

- Identify programmes and/or special policies that support the chain. Some policies might have been created especially for a particular chain (i.e. a Milk National Programme). Others may be sector policies, but which have impacts on the chain (i.e. National Credit Programme for Agriculture, Price Support Programmes). Describe the general conditions of these policies, their main instruments, interest rates and other credit conditions, explicit and implicit subsidies, private and public funds, non-banking credit, etc.
- Identify the allocated resources for the programme in recent years. The existence of budget allocation for determined policies does not necessarily mean effective disbursements

2.6. Domestic taxation

- Identify existing taxes and levies in the main chain components.
- Identify the taxation on the aggregated value and the cumulative taxation on the final value of the products as well. Evaluate the impact on the final cost of products. A high taxation could suggest a weak point and may mean the need for compensatory policies.
- Draw attention to special regime policies (e.g. tax exemption for farming and first processing products for exports) and regional fiscal policies to lower the taxes such as fiscal competition between states/provinces and/or regional development policies.

2.7. Food safety

- Being part of international commerce depends on meeting the minimum food safety requirements determined by international trade agreements.
- Describe the main aspects of the country's legislation, specifically showing that international standards are being met: epizootic, agro-chemical residuals, transgenic, etc.
- Having sanitary legislation that meets international standards is not sufficient. The inspection system must be efficient when complying with legislation. Describe the working mechanism of the inspection system to show its efficacy.
- For some chains, private standards and certification systems may be relevant. Identify both the existence and importance of these systems within the context of the international market of these products.

2.8. Technology

- Identify key technologies that help to sustain the competitiveness of the chain in the long run. Key technologies have the potential to reduce costs, ensure quality, increase the aggregated value, etc. In this case, it is important to assess the contributions of these technologies and also assess their diffusion levels based on some indicators such as the proportion of farms or firms that adopted them. Indicators that could be constructed as proxies should also be taken into consideration. If this is not possible, one should carry out a qualitative evaluation based on assessment of experts.
- Yields (factor productivity) concerning farm production.
- Compare the indicators to international benchmarks.

- Identify public and private support to R&D. Indicators of technological support could be: number and quality of the research centres, private and public budget resources allocated to R&D, existence of R&D departments at processing companies, high technological companies (in both public and private sectors), obtained results (patents, ability already observed in terms of creating species adapted to climates and regions, etc).
- Evaluate the ability of the systems to disseminate technology, either by a public system or private mechanisms.
- The analysis must comprise qualitative and quantitative information and also include both the current technological situation and the chain's ability to obtain and disseminate key technologies. It may point out areas in which there is external technological dependence / independence.

2.9. Market structure and governance structure

- Identify the market concentration level based on the indicators: number of farms, number of processing companies, number of companies in charge of the international trade, main processing / trading companies and their participation in the market (CR-2, CR-4, Herfindahl-Hirshman index) and/or their real production capacity. Having these indicators as references, assess the competition level of the market (perfect competition, monopoly and oligopoly). In agrifood chains, this analysis is more often important at the processing level, where oligopolies and oligopsonies might have emerged.
- Identify possible barriers to entry by new competitors
- Identify the average size of the processing plants and, if possible, categorize them according to their sizes (e.g. number of units up to 50 thousand tonnes of capacity, up to 200 thousand tonnes, etc). Compare to most relevant competitors in the international market, attempting to identify economies / diseconomies of scale.
- Identify the average size of the farms or plots and, if possible, their distribution according to their sizes. Compare to most relevant competitors in the international markets, attempting to identify economies / diseconomies of scale.
- Identify the ability to diversify products, which enables for value to be aggregated and for meeting the domestic and international demand for differented products
- Identify and describe the main coordination / governance structure. Identify positive / negative impacts of the coordination mode with regard to chain performance (e.g. cost reduction, better quality control, access to markets, etc).
- Identify organizations such as farmers' associations, unions, processing firm associations, governmental organizations and their role in defining public or private policies for the chain.

2.10. Firm management

- Identify key managerial tools in farm production, processing, distribution, etc. such as costing systems, certifications, quality control, information technologies, logistics, etc.
- Identify the diffusion level of the technologies, using indicators (percentage of adopters in total number of farms / companies), whenever possible, or via evaluation based on what was noticed from stakeholder interviews

2.11. Inputs

- Identify the main inputs of rural production (fertilizers, pesticides, animal feeds, etc). Present the recent performance of the exports and imports of these inputs, attempting

to identify if the chain depends on the imports of these inputs, or whether the domestic demand is met by the domestic production. The existence of relevant exports of inputs may indicate domestic production at competitive prices, which can be considered a strength or a high performance score for the chain. Dependence on imports of strategic inputs may indicate a weakness

- Evaluate recent trends of factors in agricultural production: main inputs, land and labour.
- Consider recent trends of labour costs for the processing segment
- Identify land availability to expand production. Identify the existence of unused agricultural land. Identify the possibility of expanding land use by substituting farming activities
- Identify farm production costs (at the farm gate). Assess the cost structure, aiming to identify the major cost items.
- In order to estimate the final cost of the products (FOB), add processing and transport costs (farm to processing unit, processing to port), as well as taxes and port costs. Consider the average cost from the main regions and main ports.

2.12. Storage and transport

- Identify the national capacity of storage, especially for the main products of the agrifood system.
- Analyze the infrastructure available for transport, in terms of quality and capacity. Precarious infrastructure can mean high transportation costs. Identify the need for investments in infrastructure. If possible, show the estimates carried out by secondary sources in terms of investment needs in monetary values. If it is not available, list the needs for physical investments, new road projects, ports, etc.

3. The SWOT analysis
4. Policy proposals
5. Bibliography
6. Annex

Source: Eumercopol

Final remarks

The methodology for chain analysis presented has proven to be a workable and cost effective approach for the analysis of agrifood systems. In Brazil, many governmental and non-governmental organizations have adopted this general approach in studies that have generated a large set of information on the organization and performance of agrifood chains, at national and regional levels. Many of these studies have supported the design of successful governmental policies and firm strategies, increasing competitive performance in both domestic and international markets. The study on the competitiveness of the Brazilian beef chain, often cited in this text, is a case in point. It has been instrumental in guiding sector stakeholders and government agencies in a process of institutional reforms that allowed the sector to be prepared to benefit from the favorable international market opportunities that appeared in the early 2000s. In a few years, the country achieved leadership in the international beef export market.

There are indeed advantages to the approach. First, it has a solid foundation in systems thinking: the principles of interdependence, propagation, feedback and synergy are considered at all phases of the analysis, from research planning to the design of performance improvement policies and strategies. Second, it draws from an extensively proven framework for the conduct of sector studies in the agrifood domain: the methods and conceptual basis of the commodity systems approach constitute the backbone of the proposed approach. Third, it does not require the application of time consuming, costly data collection and analysis methodologies; RA methods are adopted instead. Fourth, it is conducive to the development of a sense of ownership by chain stakeholders, who become proactive participants in the entire effort. In fact, experience has shown that the methodology can be very simply communicated to stakeholders: by understanding and accepting the analytical approach, stakeholders are more likely to be jointly engaged in search of solutions for their mutual problems.

Finally, it should be noted that there are also challenges to be overcome, in order to successfully apply the methodology. Perhaps the most critical of these is the definition of a multidisciplinary team with appropriate set of skills to perform the required duties within a short time frame; a typical characteristic of these applications. Experienced professionals are needed and depending on the sector under analysis or the regional area of the application, the required expertise might not be readily available. The second challenge has to do with the need to elect partner stakeholders with a truly representative status within the focused chain. It is not uncommon that a chain may have more than one interprofessional association claiming to be the legitimate interlocutor for one or more of its segments - this is a particularly frequent situation when consumer groups are to be brought in as stakeholders in a chain analysis exercise. There might be political divergences or other motivations for antagonism within a chain segment or even among different government ministries that impact the enabling environment of a chain. If not properly considered, these disagreements may jeopardize the information collection activities or lead to other forms of resistance to the analytical efforts.

But the challenges notwithstanding, chain analysis can and should make a contribution to agrifood systems development in lower income countries. It is hoped that the concepts and methodologies here discussed can represent a contribution toward this goal.

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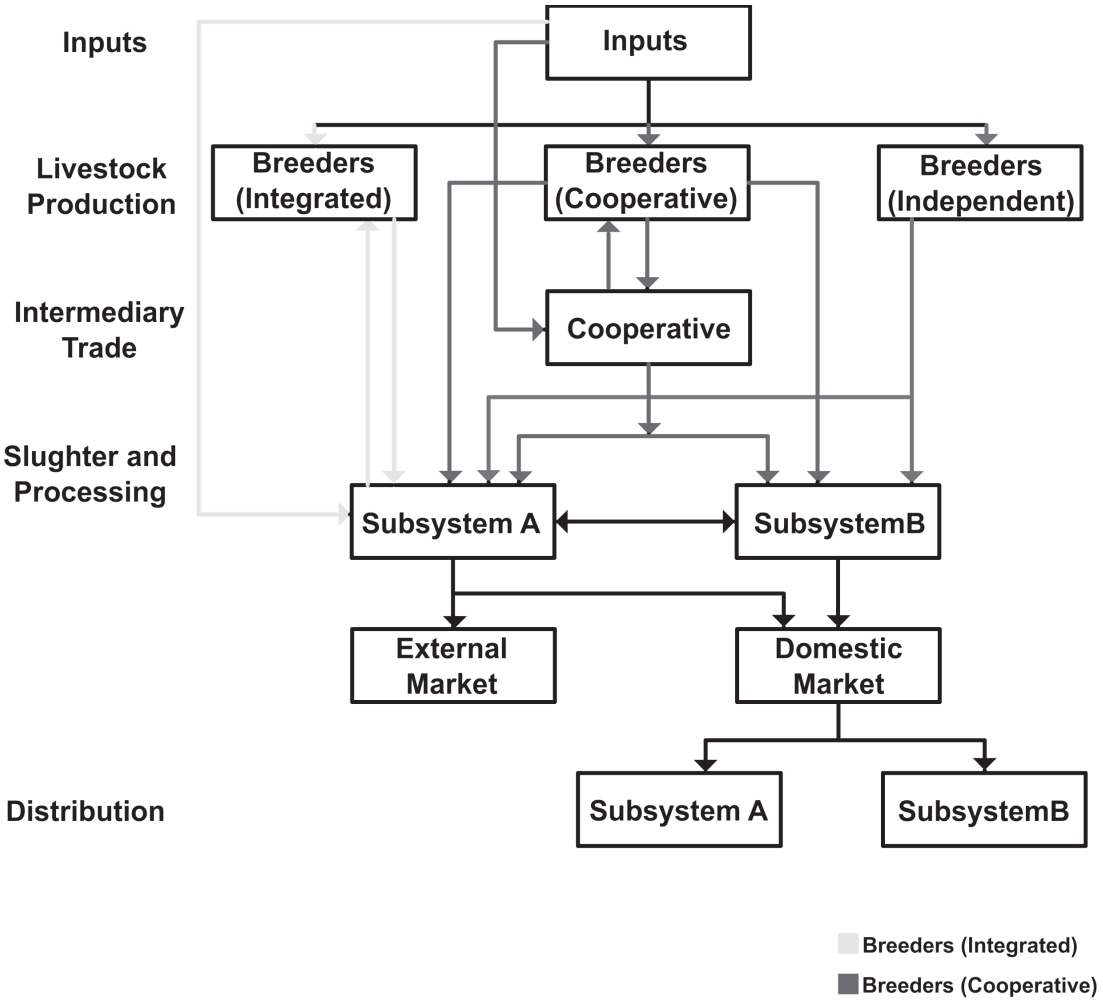
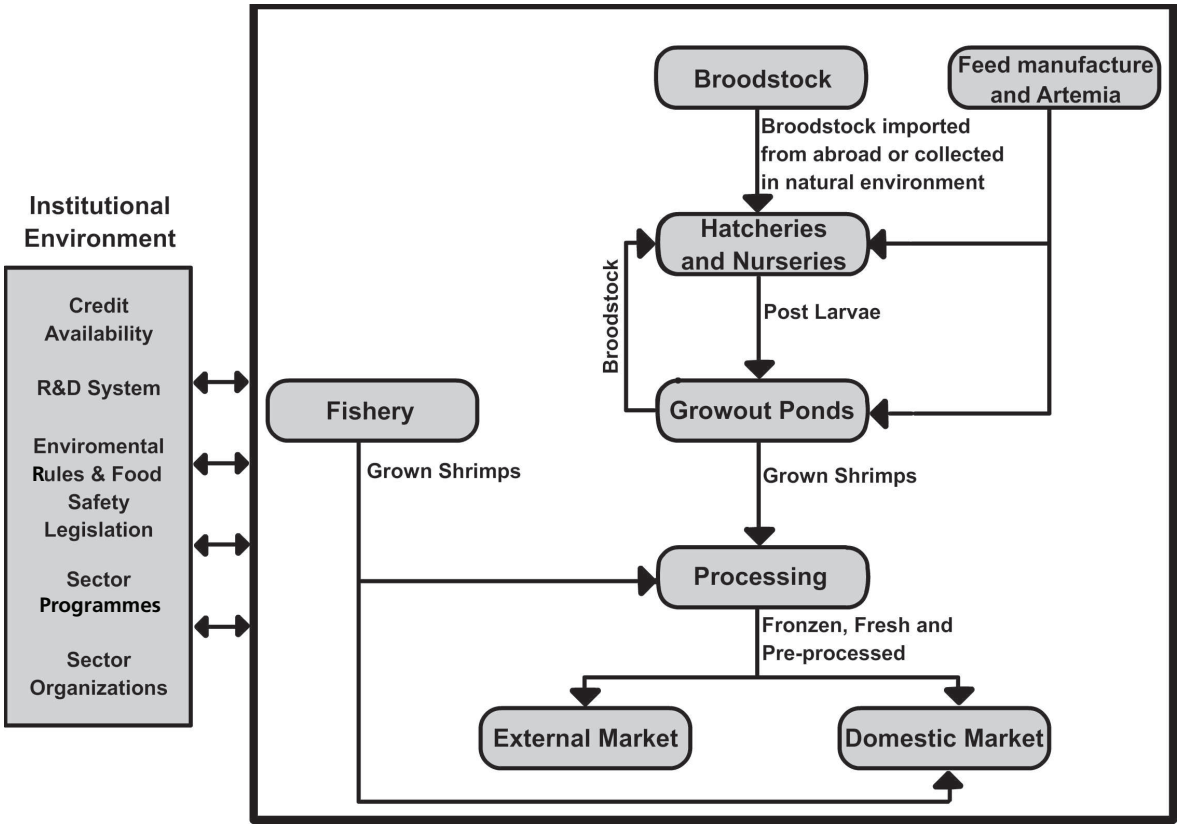
Annex 1. Examples of chain diagrams

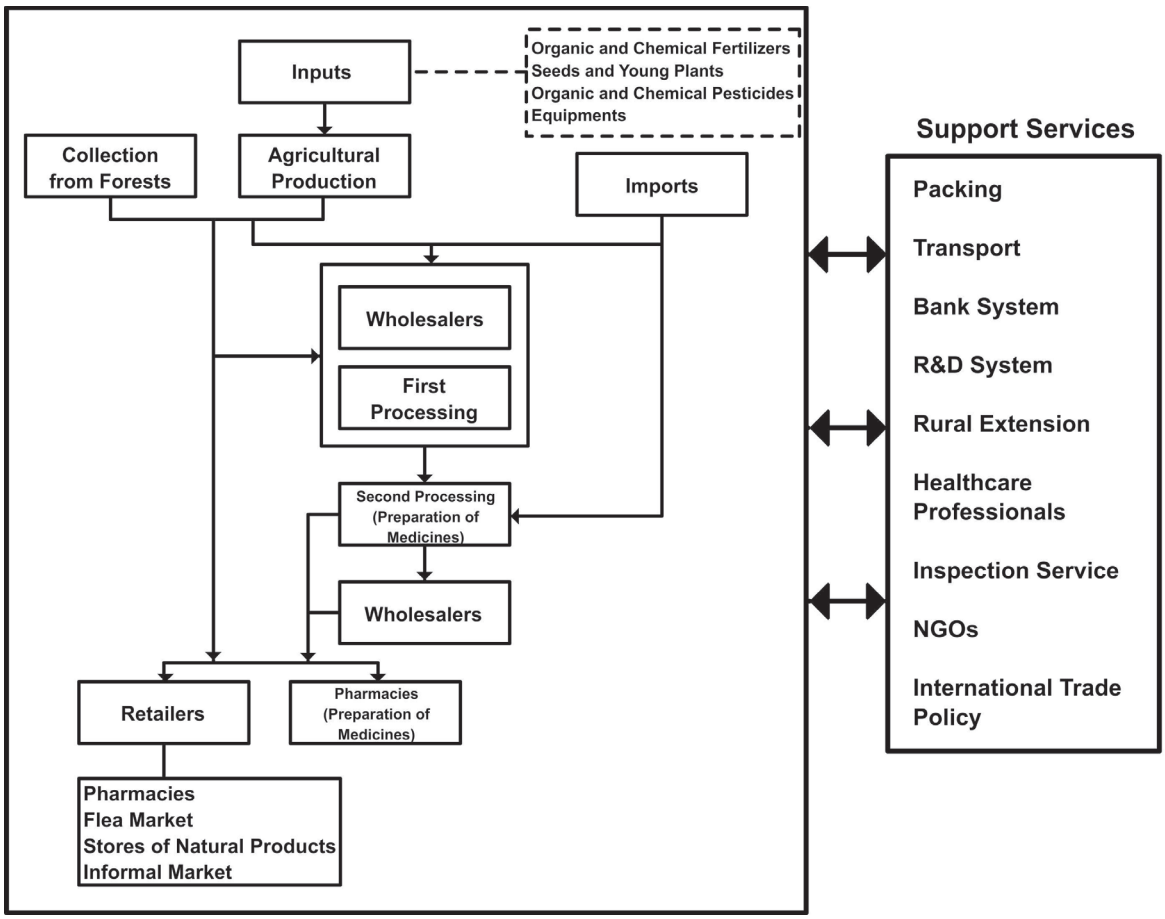
Chain map of swine production in the State of Paraná, Brazil



MAP OF A MARINE SHRIMP CHAIN



Map of a medicinal plant chain



Annex 2. Farming contracts in agrifood chains

In agrifood chains, integration mechanisms via contracts or even full integration are increasingly being adopted worldwide. They prove to be more efficient in various institutional environments. In several countries, chicken and pork producing farms have become integrated with processing firms by strict contracts. Large processing firms strictly coordinate such integration systems. For some commodities, such as orange juice and sugar, major processing companies adopt a dual strategy of obtaining their supplies through full vertical integration (producing oranges or sugar-cane in their own farms) and formal contracts with independent farmers.

For many companies, success in the market may be attributed to this integration system, under which contracts are signed annually with thousands of small farmers. Why processing companies of areas as different as tobacco, chicken, pork, orange or sugar-cane do not buy all their raw material in the spot market, as do the wheat, corn and soy processing companies, for example? Why go through the trouble of setting up an often complex and costly integration system, bearing the cost of maintaining teams of specialists to provide technical assistance to farmers, supplying inputs, monitoring the evolution of farm production, entering into contracts that guarantee advance purchase of crops, providing surety for bank loans to farmers and so forth? And on the other hand, why don't farmers simply take their produce to the spot market, sell it for the best price and use market mechanisms to assure the financial viability of production?

The answers are not straightforward. Let's take the standpoint of first stage processing companies. They act as an intermediary between farmers and second stage processors, such as retailers, with whom they have more stable contractual relationships. These relationships call for continuous product supply to established customers, for trust and reputation building on both sides, and for implicit partnerships to comply with standards and meet requirements of the consumer market. This means that the processors enter into commitments well before farmers start their production activities - to fulfill these commitments they must plan for raw material supplies. A challenge faced by processors is how to meet demand from their priority markets and how to create markets for their product varieties that lack the desired properties. It is important to note that an agrifood chain can maintain its market position with mechanisms for direct control of the supply chain. In this case, an integration system via contracts can be seen as necessary SCM strategy to meet demand with greater economic efficiency than would be possible under a coordination system based on spot markets. In cases where agricultural raw material comes from many farms, contracts between first processors and second processors (retailers or wholesalers) could hardly be maintained by spot purchasing of raw material. The solution is to plan the supply of raw material, so that farmers produce the volumes, quality, timing of delivery and other properties required.

Contract growers and processors formalize their reciprocal commitments and define rights and obligations of each party in a sale and purchase contract signed before the start of the crop

year. From the processor's standpoint, the contract is the key instrument to reduce uncertainty, plan raw material supply and to control quality, quantity and other specifications necessary to ensure that customer demands are met. To assure the flow of raw material supplies, the processor commits to provide services and technological information, and to provide support in obtaining credit to finance production and investment in infrastructure and equipment. The processor can also bear some of the costs of transportation and establishes relations with suppliers of inputs for use in production via its intermediation.

From the farmer's standpoint, a coordination system based on formal or informal contracts can address difficulties they face in many developing countries, such as lack of capital, credit, and technical assistance, as well as the high market risks. A contract can guarantee selling of the crop for a price agreed in advance, as well as the supply of inputs and the access to credit and technology. The contract can also reduce economic risk associated with weather (adoption of insurance policies) and may enable participation of farmers who otherwise would not be engaged in the activity (because of size or other restrictions).

Annex 3. List of information / variable indicators

Information/variable indicators	Description
Macroeconomics	
• Domestic interest rate	• Recent evolution of the Treasury bill rate or equivalent.
• Nominal and real exchange rate	• Recent evolution of US or Euro nominal and real exchange rate.
• Inflation	• Recent evolution of consumer price index or equivalent.
• Gross Domestic Product	• Recent evolution of GDP and per capita GDP.
• Agricultural Production Value	• Recent evolution of agricultural production value.
• Macroeconomic policy	• Description of main macroeconomic policies (fiscal, monetary and exchange rate) and how they affect GDP, agriculture, and agri-chain competitiveness.
Domestic Market	
• Domestic production	• Recent evolution of domestic production in quantity unit.
• Domestic consumption	• Recent evolution of apparent consumption of the agrifood chain products. • Main use of products (feed, seed, manufacturing, waste, food) • Importance of domestic market for the agrifood chain (domestic consumption/domestic production)
• Production regions	• Identification of main production (farming and processing) regions of the country.
• Importance of the agrifood chain	• Agrifood chain's shares of GDP and total agricultural production value.
International Market	
• World production	• Recent evolution of world production and indication of main producer countries. • Domestic production's share of world production.
• World consumption	• Recent evolution of world consumption and main consumer countries. • Domestic consumption's share of world consumption.
• World exports	• Total world exports and main export countries. • National exports' share of world exports.
• World imports	• Recent evolution of world imports and main import countries. • National imports' share of world imports.
• Destination of exports	• Main destinations of the agrifood chain exports and share of main import countries.
• Origin of imports	• Main origin of the agrifood chain imports and share of main export countries.
• Importance of the agrifood chain	• Agrifood chain's share of total national exports and imports. • Agrifood chain's share of total national agricultural exports and imports.

International trade policies	
• Tariff barriers	• Identification of relevant *ad valoren* tariffs on agrifood chain relevant products in the main world markets.
• Non-tariff barriers	• Quotas, technical barriers to trade, SPS barriers, barriers related to human rights, labour and environment on agrifood chain relevant products in the main world markets.
• Trade agreements	• Bilateral and multilateral trade agreements on tariffs, SPS agreements, and their observed impact on the agrifood chain trade flow.
Industry programmes and special policies	
• Sector resource allocation	• Annual amount of resources allocated to credit and other development programmes for agriculture and processing sectors.
• Agrifood chain resource allocation	• Annual amount of resources allocated to credit and other agrifood chain development programme.
• Support policies	• Subsidies, minimum prices, intervention prices, public purchases and other relevant support policies for farmers. • Crop insurance programmes. • Description of special conditions of programmes: loans; interest rate for farmers and processing firms, average interest rate for the sector compared to market interest rates, long-term repayment, rebates, collateral, subsidies, etc.
Domestic Taxation	
• Taxes on sales, cascade taxes and other taxes	• List of the taxes and how they affect costs. • Share of taxes in the final price or total cost. • Identification of tax exemption for agrifood chain products.
Food Safety	
• International food safety regulation	• Description of internationally recognized standards, codes of practice, guidelines and other recommendations (FAO-WHO Codex Alimentarius).
• National food safety regulation and policies	• Description of relevant regulation on the agrifood chain and how it matches international standards.
• Inspection service system	• Description of the national system and its effectiveness
• Private certification	• Identification of private certification systems, and their importance and effectiveness.
• Food safety infrastructure	• Laboratorial capacity for certification, inspection service infrastructure, including staff.
Technology	
• Key technologies	• Identification of relevant technologies for competitiveness (cost reduction, quality, aggregate value, etc.). • Level of diffusion of key technologies.
• Yields	• Yields on relevant farming and processing systems. • Comparison with benchmarks.
• Public and private R&D	• Resource allocation to R&D, R&D organizations, firms' R&D, partnership, human resources availability, infrastructure, and patents.
• Technology diffusion infrastructure	• Evaluation of public and private capacity to diffuse technologies (public and private extension service systems), availability of private consultants and other human resources.

Market Structure	
• Number of firms in the market	• Number of farms, processing companies and/or trading companies
• Level of concentration	• Participation of small, medium and large farms in total production; CR2, CR4, Herfindahl for processing industries. • Identification of barriers to entry.
• Number of processing plant units	• Number of processing facilities and their production capacity.
• Average size of processing units	• Average processing capacity, distribution of units according to capacity. • Identification of economies of scale.
• Average size of farms	• Average area of production. • Identification of economies of scale.
• Product differentiation	• Identification of firms' capacity to differentiate products.
• Asymmetry of market power and information	• Identification of asymmetry of market power and information among agrifood chain segments.
Coordination	
• Chain main coordination system	• Description of prevailing coordination systems and their efficiency: vertical integration, spot market, contract farming, etc.
• Sector organizations	• Representative sector organizations and their role in public/private sector policies
• Partnerships	• Strategic partnerships as a way to reach market objectives and policy implementation.
Firm management	
• Key managerial tools	• Identification of relevant key managerial tools for competitiveness (cost control, quality control, certification, traceability, strategic planning, production planning and control, etc.).
• Diffusion of key managerial tools	• Level of diffusion of key technologies.
Inputs	
• Farm input prices	• Prices paid by farmers for main production inputs: labour, capital, land, fertilizers and other.
• Prices of inputs for processing	• Prices paid by processing firms for main production inputs: labour, capital, and other strategic inputs.
• Availability of land	• Land used for agriculture and available land (agricultural area, arable land, grazing land, forests and woodland, etc.)
• Availability of labour	• Availability of skilled and non-skilled labour for both farming and processing.
• Availability of other strategic inputs	• Other strategic inputs, such as electricity and water.
• Farm total cost	• Total production cost of adopted production systems.
• Processing cost	• Total production cost of adopted processing systems
Transport and Storage	
• National storage capacity	• Quantity that can be stored in public and private storage facilities
• Transport infrastructure	• State and availability of roads, railways, waterways, and port infrastructure.
• Cost of transport and storage	• Freights, port and storage expenses.

Annex 4. Example of an Info-gap matrix

DRIVERS	SOURCE	INDICATORS DESCRIPTION	PRODUCTS	YEARS	DEADLINE
I - INSTITUTIONAL ENVIRONMENT					
I.1. Macroeconomics					
Interest rate	IMF, International Financial Statistics	Treasury bill rate or equivalent	Total economy	2000-2004	July 2006
Nominal exchange rate	IMF, International Financial Statistics	National currency per US dolar and Euro, period average	Total economy	2000-2004	July 2006
Real exchange rate	CEPAL Macroeconomic indicators	Index number, vis à vis main trade partners (exports and imports)	Total economy	2000-2004	July 2006
Inflation	IMF, International Financial Statistics	Consumer prices or equivalent	Total economy	2000-2004	July 2006
GDP	WB, World Development Indicators; Anuário Estadístico de América Latina, CEPAL	Total gross domestic product and Gross domestic product per capita	Total economy	2000-2004	July 2006
Agricultural GDP	WB, World Development Indicators; Anuário Estadístico de América Latina, CEPAL	Sector gross domestic product	Total agriculture	2000-2004	July 2006
I.2. International Trade Policy					
Tariff barriers	WITS/TRAINS data bases, World Bank/ UNCTAD	Ad valoren/ specific tariffs applied to the country in the main world markets and main country's export markets	Selected products	2000-2004	July 2006

DRIVERS	SOURCE	INDICATORS DESCRIPTION	PRODUCTS	YEARS	DEADLINE
Non-tariff barriers	WTO notifications, WITS/TRAINS, World Bank/UNCTAD	Price and quantity control, technical measures, etc applied to the country in the main world markets and main country's export markets; NTBs applied by the country	Selected products	One point year in 2000s	July 2006
Trade agreements	WITS/TRAINS, World Bank/UNCTAD	Tariff preferences in the main world markets and main country's export markets	Selected products	2004 or the most recent available year in 2000s	July 2006
I.3. Industry programs and special policies (Special conditions of programs and credits)					
Sector resource allocation	ALIDE Database	Loans of the main financial institutions to the agricultural sector (US$)	Total agriculture	2000-2003	July 2006
Product resource allocation	National sources/ interviews	Special public and private loans to farmers: special conditions compared to the sector and to the whole economy	Selected products	Most recent available year in 2000s	May 2006
Sector effective disbursement	IICA Policy Matrix	Amount of public and private loans to agricultural sector	Total agriculture	2003	July 2006
Product effective disbursement	National sources/ interviews	Amount of public and private loans to producers	Selected products	Most recent available year in 2000s	May 2006
Sector special interest rates	IICA Policy Matrix	Average interest rate to the sector compared to market interest rates	Total agriculture	2000-2003 (not all years are available to every country)	July 2006
Product special interest rates	National sources/ interviews	Interest rate of public and private loans to farmers	Selected products	Most recent available year in 2000s	May 2006
Agricultural insurance	National sources/ interviews	Insurance programmes to farmers	Selected products	Most recent available year in 2000s	May 2006

DRIVERS	SOURCE	INDICATORS DESCRIPTION	PRODUCTS	YEARS	DEADLINE
Main support policies	National sources/ interviews	Subsidies, minimun prices, public purchases and other relevant support policies to farmers	Selected products	Most recent available year in 2000s	May 2006
I.4. Domestic taxation					
Export tax	National sources/ interviews	Domestic tax as a % of the final value of the product	Selected products	Most recent available year in 2000s	Aug 2006
I.5. Food safety and inspection service					
Food safety policy	National sources/ interviews	Description of the food safety problems afecting exports, food safety legislation (national, supranational)	Selected products	Most recent available year in 2000s	Aug 2006
II - TECHNOLOGY					
Product specific indicators	National sources/ interviews	Yields, chain's key technologies, R&D	Selected products	Most recent available year in 2000s	Aug 2006
III - MARKET STRUCTURE					
Number of firms in the market	National sources/ interviews	Number of farms, processing companies and/or trading companies	Selected products	Most recent available year in 2000s	Aug 2006
Level of concentration	National sources/ interviews	% of small, medium and large farms in total production; CR2, CR4, Herfindahl indexes for processing industries	Selected products	Most recent available year in 2000s	Aug 2006
Number of processing plant units	National sources/ interviews	Number of processing facilities and their production capacity	Selected products	Most recent available year in 2000s	Aug 2006
Average size of processing units	National sources/ interviews	Average processing capacity, distribution of units according to capacity	Selected products	Most recent available year in 2000s	Aug 2006

DRIVERS	SOURCE	INDICATORS DESCRIPTION	PRODUCTS	YEARS	DEADLINE
Average size of farms	Agricultural Census / Household Surveys Microdata	Average area of production	Selected products	Agricultural Census / Household Surveys years	July 2006
Product differentiation	Comtrade, United Nations	Share of product value in total chain export value, 6 digit level HS96	Selected products	2000-2004	July 2006
IV - GOVERNANCE STRUCTURE					
Main chain governance structure	National sources/ interviews	Prevailing governance structure: vertical integration, spot market	Selected products	Most recent available year in 2000s	Aug 2006
Sector organizations	National sources/ interviews	Representative sector organizations and their role in public/private sector policies	Selected products	Most recent available year in 2000s	Aug 2006
V - FIRM MANAGEMENT					
Diffusion of key managerial tools	National sources/ interviews	Description and level of diffusion of main managerial tools (ISO, certification quality, HACCP)	Selected products	Most recent available year in 2000s	Aug 2006
VI - INPUTS AND INFRASTRUCTURE					
Prices paid by farmers for inputs	National sources/ interviews	Prices paid by farmers for main production inputs	Selected products	Most recent available year in 2000s	Aug 2006
Rural labour price	National sources/ interviews	Prices paid by farmers to workers	Selected products	Most recent available year in 2000s	Aug 2006
Processing plant labour price	Household Surveys Microdata	Wages received by workers in the food industry	Total food industry	Agricultural Census / Household Surveys years	July 2006
Land price	National sources/ interviews	Prices paid by farmers for land	Selected products	Most recent available year in 2000s	Aug 2006

DRIVERS	SOURCE	INDICATORS DESCRIPTION	PRODUCTS	YEARS	DEADLINE
Availability of land for future expansion	FAOSTAT Database	Land use (Total area, land area, agricultural area, arable land, permanent crops, permanent pasture, forests and woodland, all other land)	Total agriculture	1995-2004	July 2006
Farm total cost	National sources/ interviews	Methodology to be defined	Selected products	Most recent available year in 2000s	Aug 2006
Final commodity cost	National sources/ interviews	Methodology to be defined	Selected products	Most recent available year in 2000s	Aug 2006
National storage capacity	National sources/ interviews	Quantity that can be stored in national storage facilities	Selected products	Most recent available year in 2000s	Aug 2006
Transport and domestic port costs to main ports	National sources/ interviews	Cost of freights and port expenses	Selected products	Most recent available year in 2000s	Aug 2006
VII - DESCRIPTIVE INDICATORS					
VII.1. Domestic production and consumption					
Domestic production	FAOSTAT Database	Domestic production in Tons; Stock in Heads	Selected products	1995-2004	July 2006
Domestic consumption	FAOSTAT Database	Domestic use (feed, seed, manufacturing, waste, food)	Selected products	1995-2004	July 2006
Domestic consumption / Domestic production	FAOSTAT Database	Domestic utilization (feed, seed, manufacturing, waste, food) / Domestic Supply (%)	Selected products	1995-2004	July 2006
Regional production	National sources/ interviews	National production by administrative regions	Selected products	1995-2004	Aug 2006
Value of domestic production / Agricultural GDP	FAOSTAT Database	Value of production / Total agricultural value of production or Agricultural GDP (%)	Selected products	1995-2004	July 2006

DRIVERS	SOURCE	INDICATORS DESCRIPTION	PRODUCTS	YEARS	DEADLINE
VII.2. International trade					
World consumption	FAOSTAT Database	World utilization (feed, seed, manufacturing, waste, food)	Selected products	1995-2004	July 2006
Domestic production / World production	FAOSTAT Database	Domestic Production / World Productionn (%)	Selected products	1995-2004	July 2006
Domestic exports / World exports	Comtrade, United Nations	Domestic exports / World exports (%)	Selected products	1995-2004	July 2006
Production of main countries	FAOSTAT Database	Main countries, domestic production in Tons; Stock in Heads	Selected products	1995-2004	July 2006
Destination of exports	Comtrade, United Nations	Share of main import countries in the country's exports (%)	Selected products	1995-2004	July 2006
Origin of imports	Comtrade, United Nations	Share of main export countries in country's imports (%)	Selected products	1995-2004	July 2006
Domestic exports of chain products / Domestic agricultural exports	Comtrade, United Nations	Domestic exports of selected products / agricultural domestic exports (%)	Selected products	1995-2004	July 2006
Domestic imports of chain products / Domestic agricultural imports	Comtrade, United Nations	Domestic imports of selected products / agricultural domestic imports (%)	Selected products	1995-2004	July 2006
Domestic exports of chain products / Domestic total exports	Comtrade, United Nations	Domestic exports of selected products / Total domestic exports (%)	Selected products	1995-2004	July 2006

Annex 5. Example of questions for an interview guide

This annex draws from the already cited study of the Brazilian Beef chain (Silva & Batallha, 2000). A set of guides was designed for respondents from the three major chain segments, namely cattle farmers, slaughterhouses / processors and distribution (wholesalers and retailers). A separate guide was prepared to cover issues related to the enabling environment. It was used in interviews with chain analysts, government officials and other key respondents.

A – INSTITUTIONAL (ENABLING) ENVIRONMENT

Impacts of the exchange rate devaluation and the interest rate increase on slaughterhouses and processing companies[6]

1. How do you expect the demand (domestic and external) to behave after the exchange rate devaluation and the economic recession?

2. What is the level of firm indebtedness? Are there debts related to the exchange rate? What is the effect of the interest rate increase on indebtedness?

3. Will the increase of costs (mainly of cattle) eliminate profits? Is the increase of costs being entirely transmitted to the product prices?

Credit availability

4. How are companies financing their operations or investments (self-financing or bank credit)?

5. If companies have not access to credit, specify the reasons. (risk perceptions by banks, have high level of indebtedness, other).

6. What are the financial agencies/banks providing access to credit (National Development Bank, provincial state commercial banks, private banks, others)? Are there special credit conditions offered under government credit programmes?

6 The interviews were held a few months after major changes in macroeconomic policy took place, in particular the sharp exchange rate devaluation and a marked increase of interest rates. Also, new sanitary legislation had been recently enacted in the beef sector. Many questions were designed to capture stakeholders' perceptions of the effects of these changes.

7. What types of credit does the firm need most or has had more access to? (working capital, investments, export financing)

Taxation and exemptions

8. Which were/are the tax exemptions conceded to slaughterhouses/processing?

9. What is the importance of these exemptions in the location decisions?

10. Do slaughterhouses have accumulated VAT credits?

11. How do VAT regulations affect the trade of live cattle and carcasses between agents of different states?

12. What are your expectations about the impending reform of national the tax system and proposals you have for it?

Sector programmes

13. Are there sector support or incentive programmes in you region? If so, what is the level of participation of the chain's agents?

14. What are the real advantages of participating in the programmes? Are tax exemptions the main motivation or are there other advantages (access to technology, increase of market-share through product differentiation, reduction of underutilized capacity, other)?

15. What are the producers' perceived advantages of the programmes?

16. What are the reasons for the success or failure of the sector support programmes?

Sanitary legislation and Foot and Mouth Disease

17. How have companies been adapting to the new rules on food safety and animal health? (refurbishing and expanding industrial plants, packing, distribution/logistics, out-sourcing transport and distribution)

18. Do retailers prefer to buy boneless beef from slaughterhouses or do they prefer to invest in new facilities and equipments for boning and packing beef themselves?

19. How do wholesalers intend to supply small municipalities under the new regulations, given the high transport costs of the small volumes typically bought by butcheries and small supermarkets?

20. What is the expected impact (in terms of cattle trade and price) of the possible certification of this state (or neighboring States) as a foot and mouth disease free area?

The next questions should be answered by respondents from the Ministry of Agriculture (Department of Inspection, and Federal Inspection Service) and State agencies of agricultural policies (adapt the questions according to the agent)

Economic restructuring (public expenditure reduction)

21. Which meat chain policies were affected by the recent public sector restructuring and budget cuts? (hiring of inspectors, reform of the Federal Inspection Service, combat of foot and mouth disease, other)

Reform of the Federal Inspection Service

22. The Ministry of Agriculture plans to transform the Federal Inspection Service into an independent Agency. What exactly is this Agency? What will its duties be?

23. What is the new policy regarding food safety?

24. What is the Ministry's proposition for the new inspection service policy (inspection of retailers versus inspection of processing companies)?

Certification and the 'Baby Beef' Programme

25. What is the 'Baby Beef' Programme of the Ministry of Agriculture? Which are the participating States? How does the programme articulate with the provincial state programmes? Characterize its present stage (regions and percentage of production attained).

26. What is the Programme of Certification of the Brazilian Association of Baby Beef Farmers? Characterize its present stage (regions and percentage of production attained). How does it articulate with provincial state programmes?

Food safety and sanitary legislation

27. In which way did the different agents of the chain participate in the design of the recent regulations that affect the sector, especially regulations 304 and 145?

28. Have the agents been complying with the regulations? If not, what are the reasons for non-compliance?

29. Do the regulations converge to a common legislation for Mercosur countries? Is there any move towards harmonization of the food safety regulations of Mercosur countries?

30. Regulation 145 opens a possibility for the Federal System of Inspection (FSI) to coordinate the inspection of operations in all slaughterhouses installed in the country. Is FSI prepared to assume this task?

31. Concerning the agreement between FSI and FUNDEPEC for training inspection personnel in the State of São Paulo, how is it progressing? What are the perspectives for similar agreements in other provincial states?

32. In which implementation stage is the programme aiming at the creation of a new carcass classification system?

Foot and Mouth Disease

33. Given the last cases of foot and mouth disease in the state of Mato Grosso do Sul, how is the issue of inspection at the borders (state and international) being dealt with?

34. How the combat against foot and mouth disease is being planned in the provincial states of the north and northeast regions, where infrastructure is poor?

35. Have special funds for disease prevention and combat programmes, including the support to acquisition of equipment, been established? If so, how is the implementation progressing?

International trade

36. How are the discussions in preparation the next WTO conference progressing? Are the beef sector's entrepreneurs participating in these talks? If so, how? What will be the stance of Brazil? Is there a common position being articulated among Mercosur countries regarding beef trade?

37. What are the quotas currently available for Brazilian exports into key international markets (Hilton quota, quotas for other cuts, quotas for fresh beef)?

38. Are the negotiations to increase Brazilian quotas in international markets advancing? If so, how?

39. How are the quotas distributed among the different slaughterhouses / exporters? What are the selection criteria?

Taxation

40. How are the different chain products (live cattle, calf, carcasses, other) taxed in the State of the respondent?

B – Interview guide for cattle farmers

General issues, including technology

1. What are the general perspectives of the cattle farming business in your region?

2. What is the average age of animal termination?

3. Is planted or natural pasture predominant in your State/region? What are the predominant varieties?

4. What are the main breeds used? Zebuine? European? Mixed breeds Zebuine-European? Indigenous breeds?

5. What are the advantages and disadvantages of the breeds used in your region?

6. What is the importance and what are the perspectives of the following production systems in your state/region: baby beef; intensive; semi-intensive (supplemented feeding); winter pasture?

7. What are the advantages and disadvantages of the adopted systems?

8. What is the level of diffusion of the following methods: artificial insemination, selected breeds, new reproduction techniques, and use of growth hormones?

9. What are the criteria used for discarding brood stock?

10. How do cattle farmers obtain technical assistance? (Hiring their own experts, commissioning private extension providers, accessing public sector providers, assisted through the farmers' associations, cooperatives, input suppliers, others)?

11. In your opinion, what are the main technological problems and what could be done to increase the efficiency of beef production in your region?

Government programmes

12. What are the existing support programmes in the region? What are the most important benefits perceived? What is the importance of tax exemption provisions for the success of the support programmes?

13. What are the reasons for the success or failure of the current and past programmes? How do these programmes affect(ed) the adopted production systems?

Taxes and exemptions

14. Which types of taxes are paid by farmers? In which way do these taxes interfere in cattle trade with agents of other States? What are your expectations regarding the forthcoming national tax system reform and what do you propose for it?

Credit availability and access

15. How are cattle farmers financing their operations and investments (self-financing or reliance on financial agents)?

16. If there is no access to credit, specify the reasons. (risk perceptions of the activity by the official lenders, level of indebtedness precluding further loans, etc.).

17. What are financial agencies/banks supplying credit (National Development Bank, provincial state commercial banks, private banks, other)? Are there special credit conditions under government programmes?

18. What types of credit do cattle farmers need most or have had more access to (working capital, investment credit, others)? What have been the main effective uses of credit resources?

Leather

19. Is any special care regularly taken in raising and transporting cattle in order to avoid skin? If not, why? (Ask new questions to ascertain the difficulties faced by the sector in order to obtain better quality leather).

20. Are premium prices paid for leather quality in sales for slaughterhouses and/or intermediaries?

21. Are there any sector programmes aiming to improve cattle leather quality? What are your views regarding this type of initiative? What would be the conditions to ensure farmers' participation?

Market

22. To which market agents (intermediaries, slaughterhouses, etc.) do cattle farmers usually sell their animals and what are the common payment conditions?

23. In your opinion, what are the advantages and disadvantages of the current system of pricing and payments?

24. Are the market decisions influenced by the type of commercial relationships slaughterhouses and or processors have with the retail sector?

Animal Health

25. What are the perceived threats regarding animal health prevention and combat in your region?

26. How does the animal health issue affect profits and competitiveness?

27. What is being done by the institutions (public and private) in order to improve animal health issues related to cattle farming in your region?

C – Interview Guide for Slaughterhouses and processors

Company's activities:
Sectors: ( ) slaughtering ( ) boning (partial or complete) ( ) processing
Number of years in business:
Number of years of the main industrial plant:
Time in use of major equipment lines:
Area occupied by plant:
Installed production capacity (per sector): ton./month
Current and projected production (per sector): ton/month
Number of employees:

Technology (current level; identification of bottlenecks; suggestion of policies)

1. Compare your installations/ equipment / processes with the top benchmarks you know.

2. Is there use of electrical stimulation for meat quality improvement

3. Is there use of ultra-sound; magnetic resonance; optical 'probes', or others, for evaluation of carcasses?

4. Are there regular investments in R&D? Are there partnerships for R&D?

5. The location issue (how your location influences your performance)

6. Which sectors/areas of the business have received new investments (automation, new facilities)?

7. Are there any foreseen investments?

8. Byproducts processing (if not processing, how are byproducts being disposed?)

9. The issue of leather quality: perceptions of the respondent

10. Level of idle capacity (how much and why)/scale issues (size versus operational costs). What is the ideal capacity of the plant, considering economies of scale?

Management

11. General issue: evaluation of the administrative efficiency in relation to the competition

12. Are there systems of quality management? (Which? HACCP, TQC, ISO, other) Are you satisfied with the systems in place? Emphasize aspects of food safety.

13. Are there managerial systems for cost control? Which? (direct, absorption, ABC, other)?

14. Are there systems for monitoring input usage, workforce (technical coefficients)?

15. The workforce issue (qualification, turn-over, absentness, ergonomics/ RSI-Repetition Strain Injury)

16. Is there formal strategic planning?

17. Level of diffusion of information technology, in management of information systems, decision support systems, chain linkages.

18. Financial controls (cash flow, investment analysis, other)

19. Credit (operating/investment/exports) availability and access.

20. Marketing strategies (brands, media, other)

21. Level of indebtness & investment capacity

Supply chain

22. General issue (general evaluation of system efficiency).

23. Forms of cattle acquisition, governance structure (spot market, contracts, other).

24. Payment practices (pricing, live weight, carcass evaluation, other, grace period).

25. Is there any programme/concern for improvement of cattle quality? (age, sex, breed, average weight, origin, other).

26. Average distances from suppliers, type and costs of transport (who is responsible for transport, supplier or buyer?).

27. Efficiency of transport system (type of vehicle, losses, out-sourcing versus own fleet).

28. Other inputs (electric power, water, other)

29. Are there monitoring/technical assistance programmes for cattle suppliers?

Market

30. General issue (trends, evaluations, other).

31. Main products (cuts, sausages, ready-to-eat, other).

32. Main markets (local, regional, national, international, institutional).

33. Governance structures (vertical integration, contracts, partnerships).

34. The effect of regulations 304 and 145 (mix of production, clients, prices, other).

35. Traceability (Are there any initiatives? How do you evaluate the system?).

Institutional issues

36. The issue of Federal/State/Municipal inspection service.

37. The taxes issue (tax exemptions, influence of location, issue of VAT credits).

38. Proposals and expectations of the reform in the tax system.

39. The effects of Illegal slaughter.

40. Effect of exchange rate devaluation and increase of interest rate on business.

Leather

41. Does the slaughterhouse / processor pay the cattle supplier any premium for leather quality? How? (Ask questions in order to obtain information on pricing, grace period, contracts).

42. Does the slaughterhouse / processor get any premium price for better quality leather? If yes, how is this premium shared with the cattle supplier?

43. In the slaughterhouse /processing facilities, what cares are taken in order to prevent damages to cattle skins (since arrival of the cattle until slaughter and skin storage)?

44. What is the slaughterhouse's final leather product?

    □ raw leather □ salted leather □ processed leather. What type of processing?

45. Does the slaughterhouse /processor execute any stage of leather processing in own facilities (classification, salting, wet blue, other)? Why?

46. Has the slaughterhouse / processor any experience of outsourcing or partnership with leather processors?

47. How are pricing and payment conditions of leather traded with processors and exporters set? (ask questions on pricing, grace period, contracts)

48. Is there any contract of exclusive supply between slaughterhouse and processor or exporter?

49. Have you ever heard of cattle leather improvement programmes? What do think of these initiatives? Under what conditions would you participate in such programmes?

D – Interview Guide for the Distribution Segment

If supermarket:
Number of stores of the supermarket chain:
Number of check-outs:
Area:

Retailer-slaughterhouse relationship

1. Supply logistics (transport, freight): how do you evaluate?

2. Forms of relationship (coordination) with suppliers (contracts, partnerships, marketing, other)

3. Influence of regulation 304/145 on forms of relationship (coordination)

4. Pricing

5. Frequency of supply

Technology

6. Are there projects to share information with suppliers?

7. Are you aware of 'Efficient Consumer Response' initiatives? Are you considering its adoption?

8. Do you adopt 'Electronic Data Interchange' in operations with suppliers?

9. Do you use 'intranet' or other networks for information interchange between branch stores, distribution center, stores, other?

10. How do you evaluate the traceability issue (impacts, need of investments, cost-benefit)?

11. Impact of regulation 304 on operational/technological issues for retailers (boning in slaughterhouse versus by retailer).

12. Are you planning adoption of new technologies to comply with regulation 304?

13. How do you compare your technological standard to a top benchmark (especially to cold chain, packaging, shelf product presentation, other).

Retailer-Consumer relationship

14. How does regulation 304 affect the supermarket-traditional butchery competition? What is the strategy to increase/maintain market-share?

15. Pricing (compare to other meat markets, price differentiation, margins)

Consumer's Perceptions

16. Consumers' perception of beef attributes (taste, health, appearance, preparation, price, food safety, convenience)

17. Which information do consumers consider important?

18. Is consumer willing to pay premium price for better quality and traceable beef?

19. Expectations of demand change, given recent exchange rate devaluation and increase in interest rates.

Annex 6. Components of an enabling environment

A) General aspects

1. General investment policies regarding property protection, non-discrimination among foreign and domestic investors, transparency, commitment to international treaties regarding protection of investments and contractual enforcement

2. Investment promotion and facilitation, covering the existence and effectiveness of promotion agencies, as well as the incentives offered at the central and provincial levels to attract international and domestic agribusiness investors

3. Public governance, with focus on the processes and institutions dealing with the formulation of policies and laws affecting the business environment as well as anti-corruption measures, institutional and political stability and mechanisms for public-private sector dialogue

4. Corporate governance laws and regulations, including those related to the observation of shareholders rights as well as to corporate disclosure, transparency and accountability

5. Human resource development, taking into account factors such as the availability of labour at different levels of skills and schooling, labour market regulations and laws and regulations affecting expatriate employees, child labour and gender equality.

6. Policies to promote responsible business conduct, considering the country's adherence to internationally recognised concepts and principles in this regard

7. Exchange rate policies, including regulations and controls on profit remittances

8. Tax policies at the central and provincial level, with emphasis on their effects on the costs of doing business in the country (corporate income tax, property taxes, sales taxes, etc.)

9. Competition policies, especially those affecting entry into specific industries, as well as non-discrimination among investors and anti-trust legislation

B) Specific issues for agribusiness and agro-industry development

1. Financial services, encompassing access to and conditions of short and long-term financing and risk management mechanisms for agriculture and agro-industry development

2. Trade policies, including tariffs and quotas for imports of inputs and equipment, costs of customs, regulatory and administrative procedures, as well as agro-export promotion and facilitation.

3. Policies, tariffs and quotas for imported products that compete directly with products manufactured by local industry, with particular attention to policies affecting the availability of inputs and equipment of relevance to agribusiness and agro-industries.

4. Simplicity and cost of licensing and business registration procedures

5. Infrastructure, covering aspects such as the availability and conditions of transportation networks, public storage, packing houses, processing and cold chain facilities, telecommunications and energy

6. Provision of Business Development Services (BDS) (including training and extension advice) to small and medium agro-enterprises, indicating who are the key providers (NGOs, government, private sector) and how successful are they

7. Business linkages between large and small agro-industries; are there incentives for large companies to develop linkages with small enterprises, thereby improving technology transfer, information flow, subcontracting arrangements and marketing opportunities?

8. Research and development institutions supporting technology transfer to agribusiness and agro-industrial enterprises

9. Norms, standards, regulations and services related to the production, processing and distribution of agri-food products, especially those related to quality and safety, taking into consideration the different requirements for domestic, regional or international markets

10. Laws and regulations regarding land tenure and access to land (for production and establishment of factories etc)

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Guidelines for rapid appraisals of agrifood chain performance in developing countries

International experiences have often demonstrated that chain analysis can be an important tool in enhancing the performance of agricultural, food and fibre systems. By revealing strengths and weaknesses, the analysis helps chain stakeholders and policy-makers to delineate corrective measures and to unleash the development of areas and activities where the potential for growth is identified. When properly conducted, it can also help create a shared vision among chain participants regarding challenges and opportunities, thus facilitating the development of collaborative relationships. Agrifood chain analysis is also used for other related purposes, these include; the promotion of enterprise development, the enhancement of food quality and safety, the quantitative measurement of value addition, the promotion of coordinated linkages among producers, processors and retailers and the improvement of an individual firm's competitive position in the market place, to name a few.

One of the main reasons for preparing these guidelines was the need to promote a pragmatic approach to agrifood chain analysis. Based on a set of fundamental principles, the paper proposes a rapid appraisal methodology that can be readily followed by field practitioners interested in examining agrifood systems with the purpose of understanding their organization and functioning and identifying possible areas for performance improvement.