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

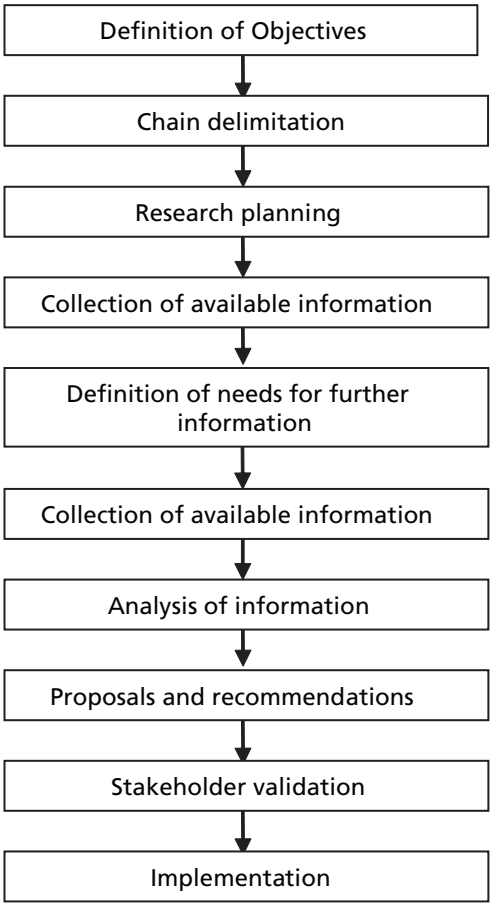
As we have already indicated, chain analysis might be performed for different ends. Regardless of the motivation, objectives should be clear and non-ambiguous. They must be thoroughly discussed and realistically set, as they ultimately determine the scope of the analysis, the choice of methods and the 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.

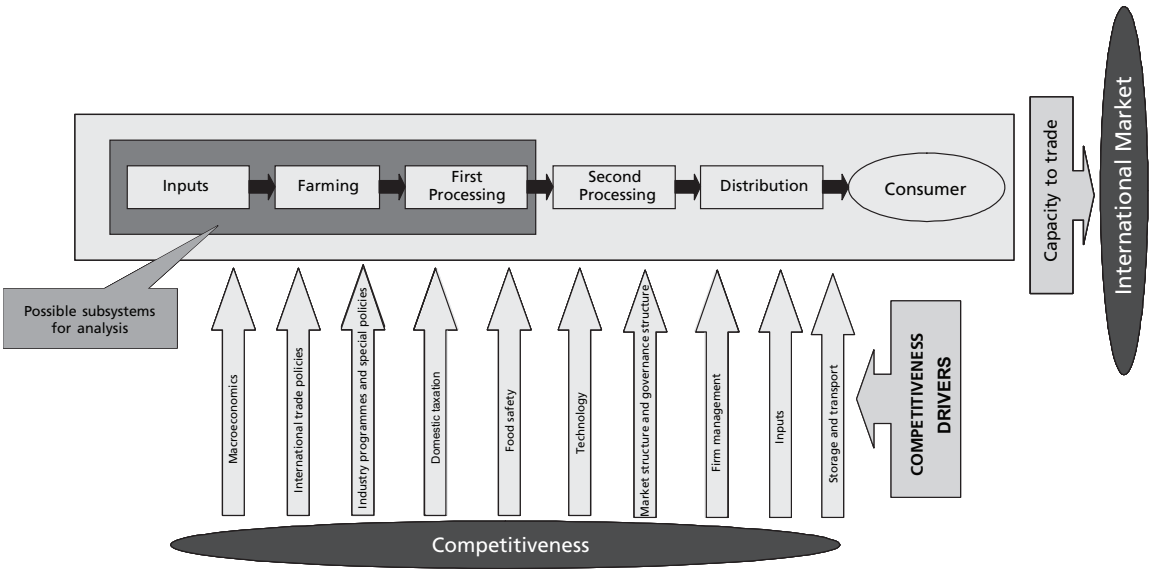
The 'components' dimension

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.

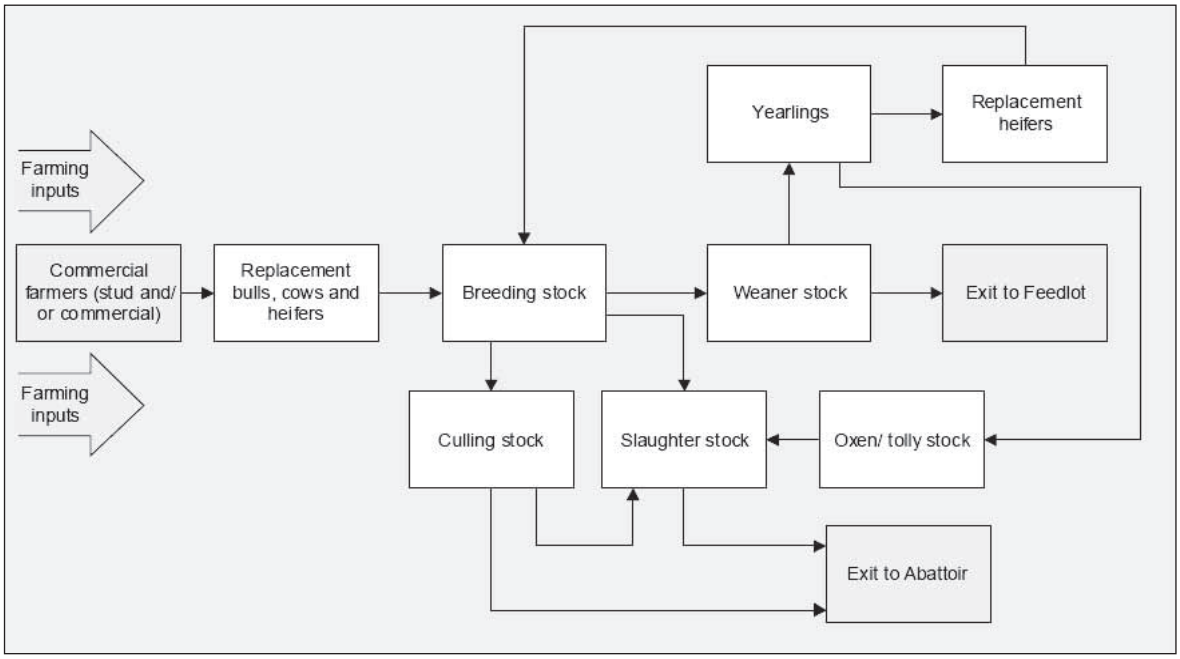
The agrifood chain can be assessed, considering what it can do and what it cannot do, in the presence of future favorable and unfavorable conditions. Information is taken from the environmental analysis and separated into current influences and potential future developments. The analysis should help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



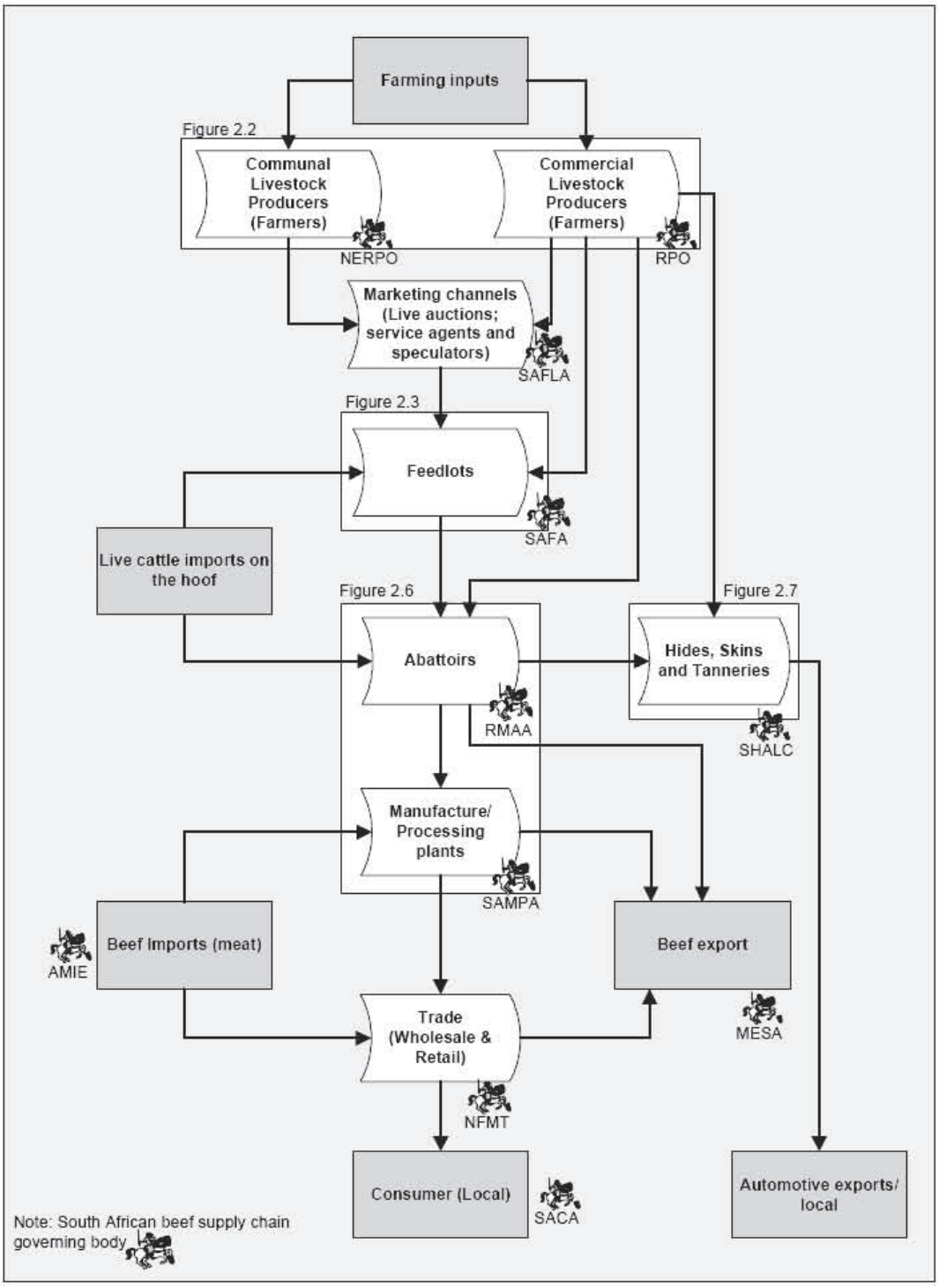
Source: Olivier (2004) *An analysis of the South African beef supply-chain: from farm to fork*. Rand Afrikaans University.

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

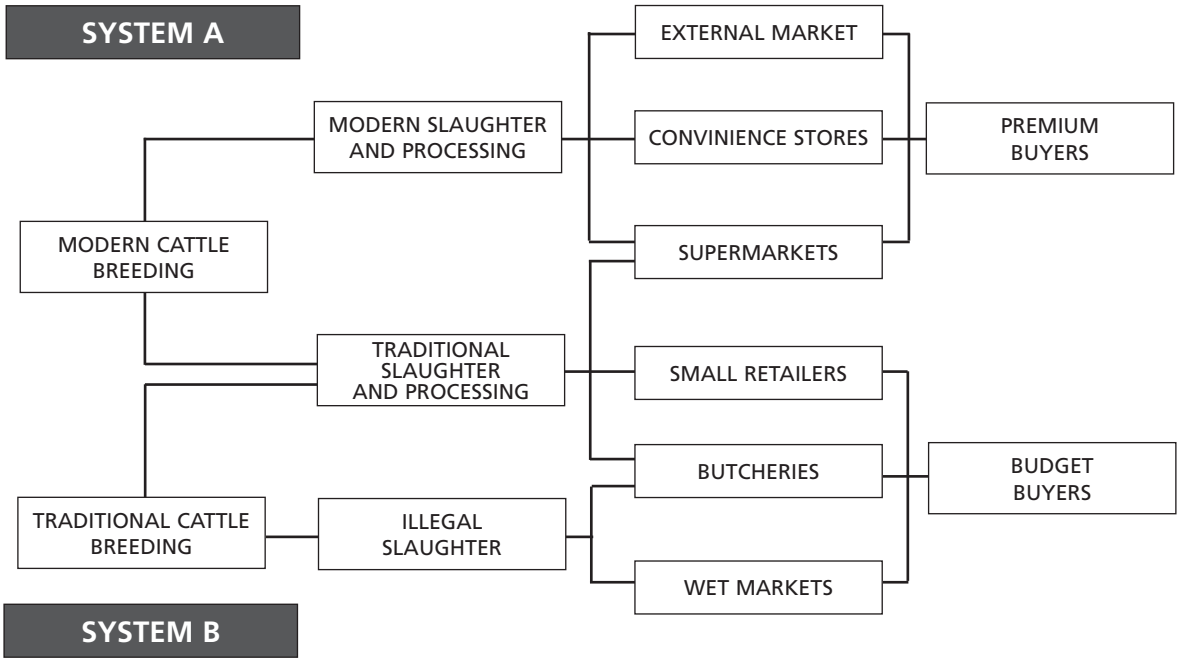
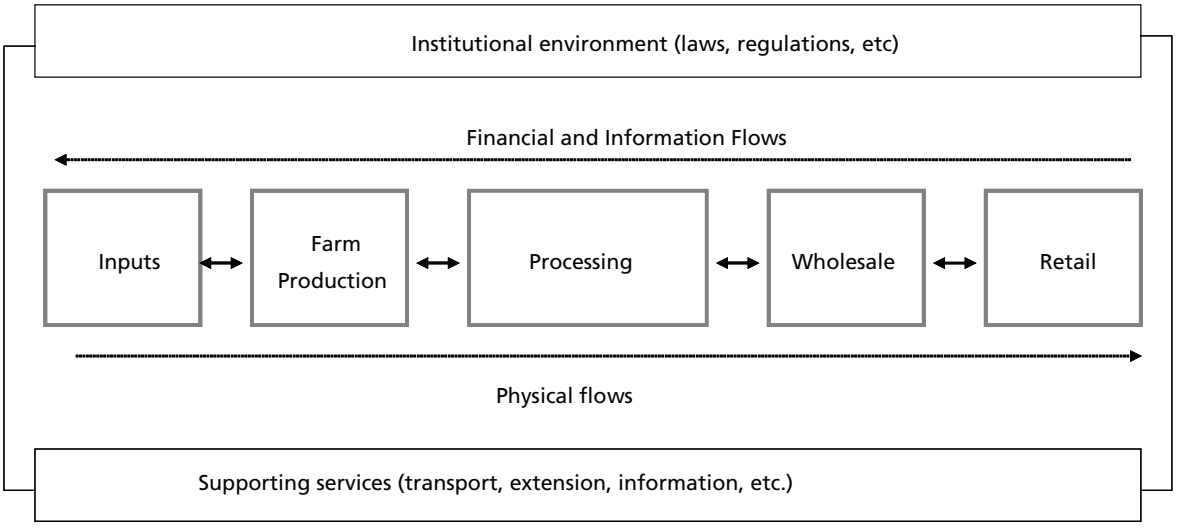


Figure 6. A generic, horizontally drawn chain map



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**

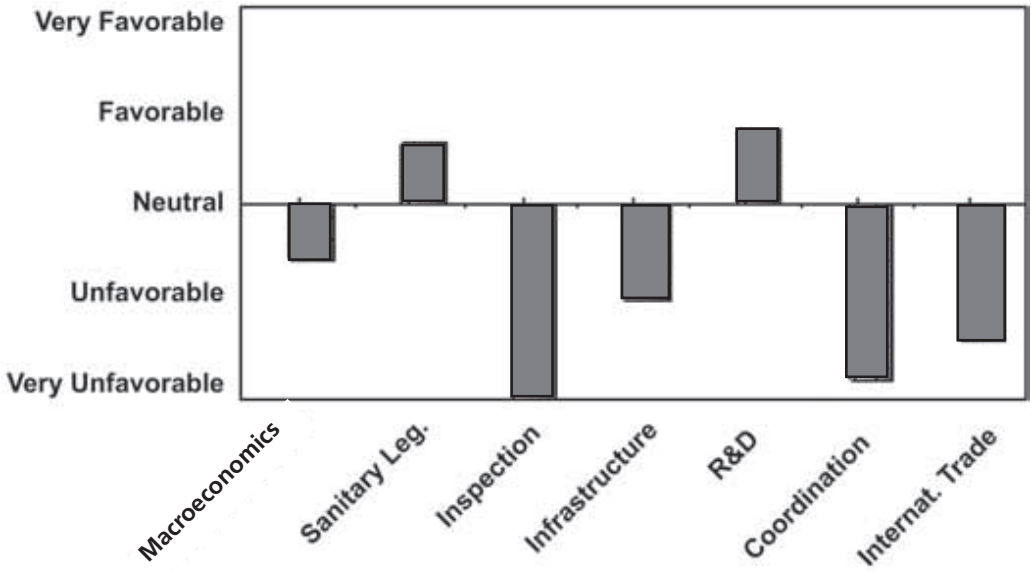
CF; CG-Controlled by government; QC-Quasi-controllable; NC-Non-controllable; VF-very favorable = 2; VU-very unfavorable = -2; F-favorable = 1; N-neutral = 0; and U-unfavorable = -1.
Source: Silva & Batalha, 2000

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

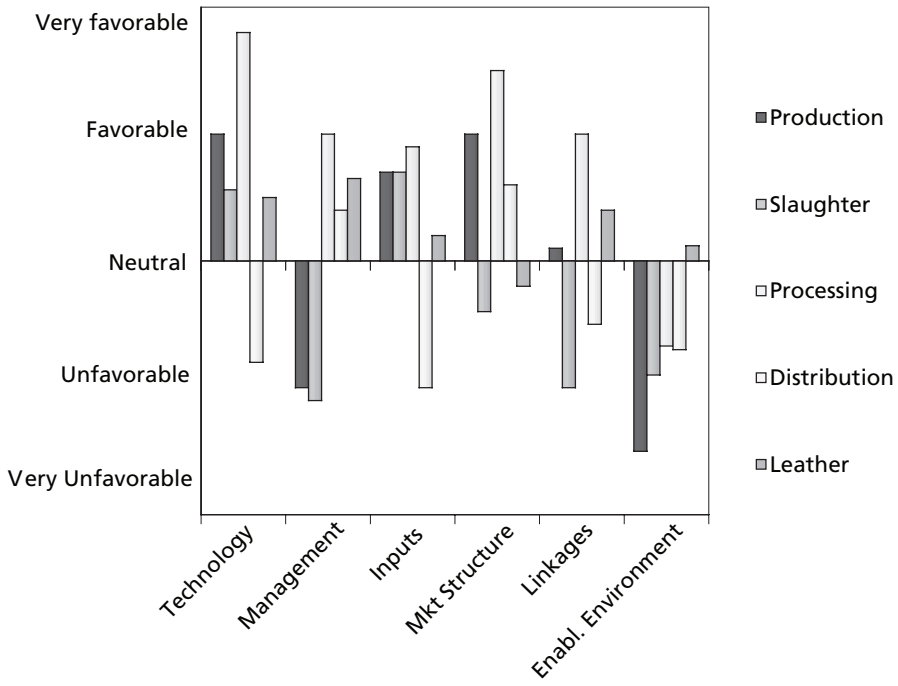
The SWOT (Strengths, Weaknesses, Opportunities and Threats) approach has often been used to identify the major factors affecting the performance of an agrifood chain. The

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