"EU-Mercosur agriculture competitiveness and trade agreement impacts: Preliminary results for Argentina and Brazil"[1]

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1. Introduction

The Mercosur custom union was established and formalized in 1991. Since then, Bolivia and Chile have entered as associate members (1996). Subsequently, the union was referred to as Mercosur expanded/enlarged or Mercosur-6. Since 2006, associate membership has also been extended to Venezuela, creating a Mercosur-7[3]. Hence, today the expanded Mercosur constitutes a geo-politically very important region and as such, it is partner in the principal multilateral trade negotiation dialogues (Chibbaro, 2006; European Commission, 2006).

The Mercosur is an important agrifood producer and net exporting region. 31% of the region's total exports are from agriculture, valued at around 47 billion US$ in 2004 (COMTRADE). Principle agricultural products are soybean, sunflower, rice, wheat, maize, beef, pork, chicken meat, (fish), milk products, fruits, citrus (juice) and honey (Drogué et al, 2004).

Principle export destinations are NAFTA, EU, China, Russia, Japan, Saudi Arabia and intra Mercosur trade. The region is also the main trading partner of the EU in the Latin American continent. Mercosur-6 agro-food exports in 2004 to the EU-25 amounted to one third of total Mercosur-6

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[3] Throughout this paper the MERCOSUR that is discussed, refers to MERCOSUR-6.

agricultural exports. While the historic bi-regional trade balance was in favour of the EU, only since 2002-03 the balance has tipped over in favour of the Mercosur, helped by increased soybean, chicken, orange juice, coffee and grains export volumes. Nonetheless, while since that time the absolute value of exports may have increased, the EU share as a trading partner has decreased (COMTRADE). It needs to be noted that the positive trade balance applies only to Brazil, Argentina and Chile.

As mentioned before, the Mercosur, because of it's size (as producer and consumer) and future potential, plays an increasing important role from a geopolitical point of view. Most of the region's earlier trade agreements have been with fellow Latin countries i.e. Mexico, Peru, Andean Community (European Commission, 2006). Currently the principal ongoing negotiations regard (i) Free Trade Area of the Americas, and (ii) The EU. While the Mercosur and EU have signed earlier and more "light" agreements in 1992 and 1995, the current ongoing trade negotiation was initiated in 2000. Since then, numerous negotiation rounds and technical meetings have taken place. The current position, has not significantly moved from that reached in early 2004. The current impasse is the combined result of many conditions and new developments among which are the large difference on especially agriculture positions, bilateral negotiations in parallel, internal Mercosur complications, WTO agenda relative priority, …. (EC DG-Trade, personal communications)

Given the overriding role played by agricultural products in the ongoing negotiations, strategic information that support negotiations and negotiating teams, has been much in demand. During 2004-05, several useful research documents were published i.e. Drogué et al (2004), Mulder (2004), Sc-Po Chair Mercosur (2005), Mulder et al. (2005), Jank et al. (2004), etc. In addition, the EC, through its 6th Framework Programme, launched a project call for additional detailed studies between the two regions. Consequently, the EC project EUMercoPol was launched.

This paper focuses on the initial results of this project. Two project objectives will be discussed regarding methodology and preliminary findings. A discussion on baseline scenarios dynamics follows. The paper concludes with lessons learnt and future research themes.

2. Research objectives - the EC project FP6 SSP EUMercoPol

The need for accurate and forward looking data on both regions economies and especially their agriculture sectors has led to the formulation and financing of an EC FP6 STREP project called EUMERCOPOL (contract No.6516) titled *"Analysis of the competitiveness of Mercosur's key agro-food sectors, comparison of policies and the ex-ante impacts of EU-Mercosur trade liberalization"* (European Commission, 2004). The 3-year research project, started in April 2005, is being executed by a consortium consisting of 13 Latin, European and International research partners. Its coordination is based with the French CIRAD-ProsPER team in Buenos Aires.

The project aims to provide the necessary data, parameters and to expand the necessary tools for a comprehensive (i) assessment of comparative advantages of key commodities and their sectors in the EU and the Mercosur, (ii) assessment of agri-food policies in the two regions, and (iii) impact assessment of free-trade agreements between the EU and Mercosur countries. 10 principal agri-sectors were pre-selected as foci for the research i.e. wheat, rice, maize, soybean, orange (juice), apples, cane sugar, beef, chicken meat, and milk products. Figure 1 depicts the different research tasks of the project.

Given the production potential and possible comparative advantages of countries as Brazil, Uruguay and Argentina in products as beef, sugar, cereals and oilseeds compared to the EU, a free trade agreement could lead to substantial imports into EU markets and thus lower prices in the EU as markets for beef or sugar are still to a certain extent insulated from world market prices by rather high MFN tariffs.

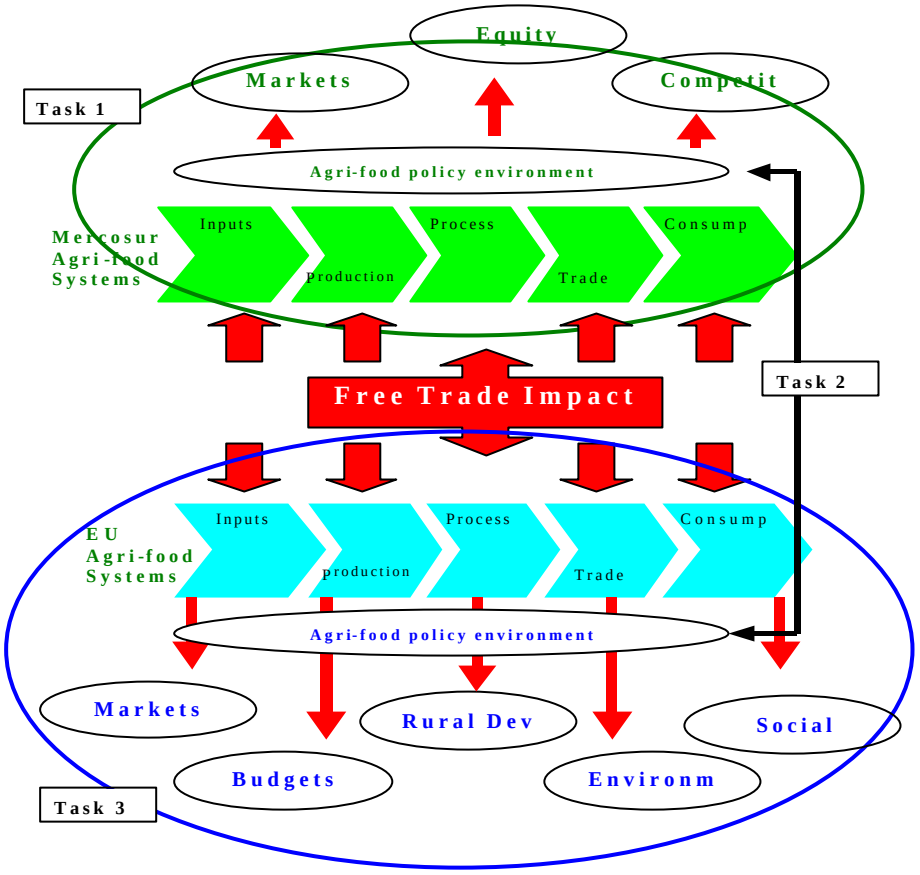

Figure 1: Schematic depiction of EUMercoPol project research tasks

Possible price changes resulting from Mercosur imports could impact on the functioning of some of the Common Market Organisations, as the probability of EU market prices undercutting administrative prices could increase, with consequences on subsidised exports and intervention stocks, and thus WTO agreements. Further on, increased budget costs for such market stabilizing measures would trigger decreases in the new farm premiums under the financial discipline regime. Changes in farm premiums and market prices lead to adjustments in EU production patterns which in turn may impact on positive and negative externalities of EU agriculture

From the Mercosur perspective, a free trade agreement could open up export chances and thus improve investment and technology adoption for agriculture and the food processing industry. However, this export-led growth could rapidly generate a high cost of increased environmental pressure and subsequent damage, e.g. by conversion of rain forests into agricultural lands (as is already the case for soybeans, especially in Brazil, Paraguay and Bolivia), and by increasingly more intensive production system (soil degradation and fertiliser leeching problems). Furthermore, already there is a major political discussion, regarding the increasing exclusion of small farmers from "growth markets", hence a welfare distribution assessment is called for.

In this paper, given scope and briefness requirements, the authors will discuss only the competitiveness and ex-ante impact subjects, focusing on the applied methodologies and presenting some preliminary and partial results. The first section on Brazilian beef competitiveness is an example of the applied methods to analyze the Brazilian beef sector's ability to trade. This is followed by two sections focusing on the trade model and it's impacts.

3. Brazilian beef sector competitiveness to trade – preliminary results[4]

The approach for analyzing Mercosur's agrisystems competitiveness for trade with the EU region is divided into 3 parts that are presented and discussed in the following sections, using the beef sector as a case in point.

3.1 Drivers of competitiveness and SWOT methodological approach

The methodological approach relies on the concept of agri-system and competitiveness to build up 3 sub analyses that are fully integrated:

a. An agri-system analysis with a trade perspective, fed by key explanatory themes, explaining systems' capacity to trade.
b. SWOT (Strengths, Weaknesses, Opportunities and Threats) analyse of Mercosur agri-systems, identifying the 4 SWOT themes.
c. Analysis of the these agri-systems capacity to fill possible future export opportunities, following EU policy trade changes, starting from the SWOT analysis and focusing on qualitative indications of policies, investment areas and other needs.

3.1.1. The systemic approach to the analysis

According to its classic definition, a system is made up of two different aspects: a set of elements and a network of functional relationships, which work together to reach an objective. These elements interact through dynamic links that involve the exchange of stimuli, information or other non-specific factors. The interdependence of the elements is recognized and stressed in the systemic approach. Moreover, the general aspect of this perspective allows for analysis of many issues, making it possible, in theory, a better understanding of the factors that affect global performance criteria. These factors can be part of any component of the system. For instance, problems of quality in food products that may be observed by consumers at the counters of supermarkets may have been caused by inadequate storing or even by inadequate manufacturing processes.

The systemic approach for the analysis of production systems is guided by five key concepts (Staats, 1997):

(1) **verticality** – the conditions (economic, productive, social, etc.) in a element of a production system (also referred as link in a production chain) are probably strongly influenced by conditions found in another element of the system, located above or below;

(2) **demand driven** – the demand conditions generate information that determines the vertical flow of products and services. These conditions bring unique dynamics to a production system;

(3) **coordination within channels** – the relationships (governance structure) established by supply channels, including alternative forms of coordination, such as contracts, spot market, etc., are particularly important determinants of the system efficiency;

(4) **competition between (among) channels** – a system may involve more than one supply or distribution channels (for example, different channels for international and domestic markets), leaving it up to the systemic analysis to understand the competition between (among) the channels and to examine how other channels may be created or modified to improve the economic performance of the system;

[4] The authors are grateful to Moacir Scarpelli (GEPAI, Ufscar) for his collaboration in the SWOT analysis of beef agri-system in Brazil

(5) **leverage** – systemic analysis aims to identify key points in the production-distribution-consumption sequence where actions may be taken to enhance the efficiency of a large number of participants. This synergy effect may come not only from technical, management and logistic operations, but also from public policies that have been developed in the institutional environment.

In summary, the systemic approach provides part of the theoretical framework required in order to understand the way in which agri-systems work. It also suggests variables that can affect the performance of these same systems. Also, the theory of industrial organization and the new institutional economics provide theoretical tools of utmost importance to take into account issues of coordination, redistribution of responsibilities, the new trends in consumption, etc.

3.1.2. Drivers of competitiveness

The competitiveness drivers come from the theoretical framework suggested above. Taking the economic, organizational and technological environments, ten drivers of competitiveness can be set: Macroeconomics, International trade policies, Industry programs and special policies, Domestic taxation, Food safety and inspection services, Technology, Market structure and governance structure, Firm management, Inputs, and Storage and transport (see Figure 2). These drivers will guide a SWOT analysis:

Macroeconomics. A set of variables from macroeconomics consists of indicators of competitiveness. Interest rates, exchange rates and inflation are variables of the monetary and exchange rate policies of a country. These policies are important factors in determining growth of a country's GDP and its own domestic market. Size and growth of domestic market allow for economies of scale and increase competitiveness of an agri-system. Changes in Interest rate and exchange rate cause changes in relative prices, with an impact on firms' costs and revenues.

International trade policies. The variables of this indicator determine threats and opportunities created by a country's international trade policies and by its trade partners. For most agri-chain products, there are many tariff and non-tariff barriers that hamper access to important markets. A country agrisystem can be highly competitive in terms of production costs, quality, product diversification, and other aspects of competitiveness. Trade agreements, whether bilateral or between (among) economic blocs, open doors to new trade flows and make room for market share growth. However, firms may find difficulties in getting access to markets because protectionism, as non-tariff barriers are increasing.

Industry programs and special policies. The negative impact of the variables of the macroeconomic environment can be compensated by government sector policies. For instance, firms may have access to financial resources under special conditions (credit, investment funds, etc.) that are offered by a State agency. Firms can get low-cost financial resources to adopt innovations, expand their range of new products, obtain economies of scale and increase productivity. Programs and policies can affect both agricultural/livestock production at farm level and processing firms.

Domestic taxation. Country's fiscal system is an important factor in determining the competitiveness of an agri-system. High level of taxation decreases competitiveness, if suitable policy instruments do not exist to compensate firms for high taxes. Both cumulative taxation at intermediary stages of production and export levies have impact on cost of final products. These taxes triggers changes in relative prices and restrain competitiveness. In many countries, the fiscal system may allow for special regimes and tax exemption for export products.

Food safety. Food safety has become a crucial issue for firms and agri-systems. Sanitary and phytossanitary barriers has grown significantly, preventing agri-systems from participating on the international market if they fail to meet the standards established in international trade agreements and/or fail to comply with the legislation of importing countries. Participation in the international market depends on a domestic legislation that keeps up with increasing level of requirements of the international market, as well as an inspection service that ensures compliance with the legislation. An

efficient inspection service enforces legislation and fosters investment, which, in turn, increases competitiveness.

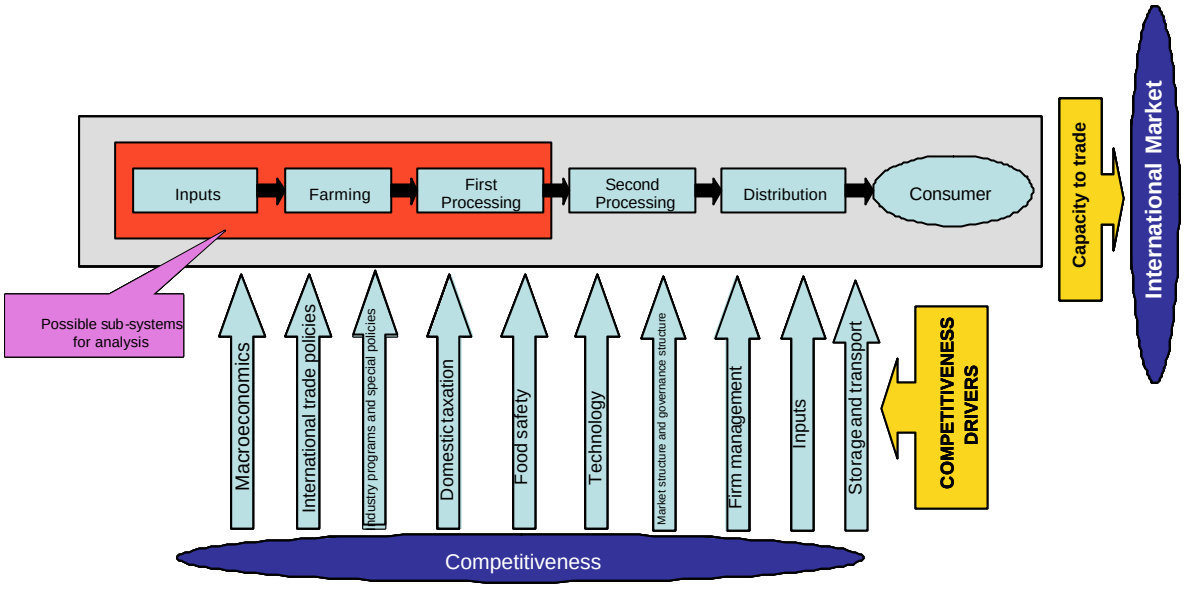

Figure 2. Drivers of competitiveness in an agri-system

Technology. Technological standards and ability to develop and adopt innovations are crucial factors for maintaining sustained competitiveness in agri-systems. Generation and diffusion of key technologies is important to reduce cost, increase productivity, increase quality of products, add value to products and meet consumers' needs. The set of indicators of the technology driver can be split into three groups. The first group comprises indicators of technology diffusion. It is important to identify key technologies in each agri-system, and the level of diffusion of these technologies at both processing industry and farm. The second group comprises indicators of the level of public and private support to R&D and diffusion of a key technologies. The third group comprises indicators of yields.

Market structure and governance structure. Market structure and governance structure are important determinants of competitiveness. Competition and cooperation between (among) the agents of an agri-system, both vertically as well as horizontally, affects prices, supply, production efficiency, economies of scale, adoption and diffusion of innovations, etc. Firms may coordinate governance structures (vertical integration, spot market, contractual arrangements, etc.) in order to manage their network of suppliers, to reduce transaction costs, facilitate traceability and create conditions that increase systemic competitiveness. Horizontal coordination is also a determinant of competitiveness. The state and/or agri-system's agents can create organizations that play a crucial role in establishing or fostering public and private sector policies.

Firm management. Firm's ability to respond to market changes is strongly influenced by adoption of key management tools (certification schemes, HACCP, cost systems, strategic planning). First of all, it is necessary to identify which main management tools have a strong impact on the competitiveness of firms in each agri-system. Generally, these tools enable firms to control and monitor their production and financial processes, find out bottlenecks, take decisions, build up strategies, reduce costs, etc. Second, it is also important to identify the level of diffusion of these tools at different segment of an agri-system.

Inputs. The availability and costs of the main inputs directly affect competitiveness. This driver comprises a set of indicators of availability, level of dependence on the foreign suppliers, and prices of main inputs (land, labour and capital inputs). While prices of land and rural labour may be

the same for all agri-systems in a given country, labour price at processing units and prices of input and capital goods may vary according to agri-system. Critical inputs, their availability and constraints should be identified.

Storage and transport. Deficient transport and storage infrastructure increases post-harvest cost, hence reducing competitiveness. High transportation and storage costs may take firms out of market, although production cost is low, either at farm level or at processing units. Storage deficiency may also reduce the bargaining power of farmers, who will then have to face low prices in the harvest.

3.1.3. SWOT analysis

Drivers of competitiveness will be used as a guide for a SWOT analysis. The agri-system will be accessed, considering its strengths (what an agri-system can do) and weaknesses (what an agri-system cannot do) in addition to opportunities (potential favourable conditions for an agri-system) and threats (potential unfavourable conditions for an agri-system). The role of SWOT analysis is to take information from the environmental analysis and separate it into current influences (strengths and weaknesses) and potential future developments (opportunities and threats). SWOT analysis determines whether the information indicates something that will assist an agri-system in being successful in an environment of increasing trade flow, or if it indicates obstacles that must be overcome or minimized. The intention is to provide information base to support policy[5] recommendations in a scenario of increasing trade flow, with opportunities and threats to Mercosur agri-system. Opportunities and threats will be set in accordance with the focus of the research: the impact of an EU-Mercosur free trade agreement. In this case, opportunities and threats will be set to accommodate a scenario that an agri-system of a Mercosur country will face: the opportunity for increasing exports, or the threat that will come from increasing import substitution.

An variation of SWOT analysis is the TOWS matrix, in which opportunities and threats are paired with strengths and weaknesses. The analysis starts with the listing of opportunities, threats, strengths and weaknesses. The TOWS matrix will indicate 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 four set of variables combination:

- The WT Policies. The aim of WT policies is to minimize both weaknesses and threats.
- The WO Policies. WO polices attempts to minimize the weaknesses and to maximize opportunities. External opportunities may be identified, but the agri-system has weaknesses which prevent it from taking advantage of these opportunities.
- The ST Policies. These policies are based on the strengths of the agri-system that can deal with threats in the environment. The aim is to maximize strengths while minimizing threats.
- The SO Policies. SO policies aim to maximize both strengths and opportunities. An agri-system in this position can lead from strengths, taking advantage of the market for its products.

3.2. Drivers of competitiveness and SWOT analysis for the beef agri-system in Brazil

This section provides the main results from the analysis of the Brazilian bovine meat agri-system. The analysis followed the drivers and SWOT methodological approach suggested above. Table 1, presents the list of strengths and weaknesses of the agri-system. The list of opportunities and threats is presented in the TOWS matrix of Table 2. The approach provides a very rich set of information on the agri-system's capacity to take advantage of possible future opportunities of the international trade, specially a free trade agreement. From the analysis, researchers were able to suggest policies, investment areas and other agri-system needs (Table 3).

[5] In this discussion "policies" need to be interpreted as being a combination of policies and other (technology, investment) interventions from either public or private sectors;

Table 1. Strengths and Weaknesses of Bovine Meat Agri-system in Brazil

Strengths	
S1	Large and increasing domestic market
S2	Availability of special credit programs and self-financing farmers
S3	Sanitary legislation complies with international standards
S4	Availability of R&D system
S5	Diffusion of innovations can increase land productivity to a great extend
S6	Processing industry is able to rapidly adopt innovations.
S7	Farms and processing plants have economies of scale.
S8	High diffusion of information technology and processes management in processing plants.
S9	Availability of cheap land, labor, and feed.
S10	Availability of adapted breeding.
Weaknesses	
W1	High basic interest rate
W2	Meat production has been relocated to regions that are far from main domestic and external markets.
W3	Bilateral agreements and international trade negotiations are difficult
W4	Inspection service for domestic market products is deficient
W5	Large internal and external borders make inspection of in-transit animals difficult
W6	Incomplete traceability.
W7	Government budget resources are insufficient to sustain sanitary programs.
W8	Low diffusion of farming key technologies and management tools
W9	Processing plants lack a good vertical coordination of their supply chain.
W10	Deficient transport and ports infra-structure.

Table 2. TOWS matrix for Bovine Meat Agri-system in Brazil

	Strengths	**Weaknesses**
Opportunities 1. Increasing of exports due to Mercosur-EU free trade agreement.	**SO Policies** ▪ P1 (S1, S3, S9, O1) ▪ P2 (S7, S8, O1) ▪ P3 (S5, S6, S8, S10, O1) ▪ P6 (S4, O1) ▪ P7 (S2, S8, O1)	**WO Policies** ▪ P1 (W4, W5, W6, W7, O1) ▪ P2 (W1, W9, O1) ▪ P3 (W8, O1) ▪ P4 (W2, W10, O1) ▪ P5 (W3, O1) ▪ P7 (W1, O1)

Table 3. Policies, investment areas and other needs of Bovine Meat Agri-system in Brazil

Policies, investment areas and other needs	
P1	Resources for inspection service, inspection of in-transit animals, traceability, and certification systems should be increased.
P2	Diffusion of forms of vertical coordination of the agri-system should be speeded up.
P3	Public and private services of technology diffusion need investment.
P4	Transport, energy and communication infrastructure needs investment.
P5	Development of human resources and organizations with ability to support international trade negotiations.
P6	R&D system needs sustainable sources of resources.
P7	Funds for special credit programs should be increased.

3.3 Conclusions from preliminary results

The beef sector shows a wide variety of strengths and weaknesses. Once these are analyzed (and prioritized) in a trade perspective, the picture becomes much clearer. The list of needs concentrate very much on FQ&S issues, technology diffusion, organization and credit.

What is important to note is the dynamic character of the analysis. In a first instance, the sector's current strengths and weaknesses are analyzed, and at a second point, these elements then are then analyzed in light of future expanded trade opportunities, caused by EU-Mercosur trade liberalization.

This analysis, together with the sector's stakeholders, focuses very much on the question "What would the sector need to expand its exports to X level in Y years (overcoming identified weaknesses)?". The final results are a list of needed elements regarding (i) technologies, (ii) policies, and (iii) investments. The preliminary list shown here (table 3) was constructed by sector experts, the next step is it's validation by a wider range of sector stakeholders.

The TOWS matrix relates the strengths and weaknesses of the sector in light of expanded trade opportunities. The latter scenario, of expanded trade (due to trade liberalization positions) represents the link with the CAPRI model that will be discussed in the next section.

4. Ex-ante trade liberalization impacts – first experiments

4.1 - The CAPRI Modelling System

In order to assess the possible impact of a free trade agreement between the Mercosur countries and the EU, the CAPRI (Common Agricultural Policy Regionalised Impact) modelling system is used. CAPRI covers interactions on agricultural markets with a focus on EU agriculture by linking non-linear mathematical programming models for about 250 regions covering the whole of EU25, Norway, Bulgaria and Romania with a global market model for agricultural products.

In the market model, the world is split up into 26 countries or country blocks[6]. The market model is a comparative static, spatial multi-commodity model for about 40 primary and secondary agricultural products. The parameters of the behavioural functions are borrowed from literature, but calibrated in a way that homogeneity, curvature, symmetry, and adding-up restrictions are fulfilled globally. New estimation of the parameters for the Mercosur countries is part of the EUMercoPol project.

Policy instruments in the market model include bilateral tariffs (specific and *ad valorem*) and price wedges based on OECD's producer and consumer support estimates. For the EU25, additionally a representation of intervention sales and subsidised exports under WTO commitments is realised. The model captures several dozen TRQs worldwide and the remaining flexible levies in EU cereal markets.

Substitution between imports and domestic production is modelled based on the Armington assumption with the well known shortcoming that trade flows that where zero in the baseline cannot become positive in the simulation. The EU-wide supply module and the worldwide market module are linked by an iterative procedure converging to market clearing prices and quantities. Equally, in

[6] Argentina, Brasil, Uruguay, Paragauy, Chile, Bolivia, Venezuela, Canada, USA, Mexico, China, Japan, India, Turkey, Morocco, EU, Other mediterranen countries (Algeria, Egypt, Israel, Tunesia), Western Balkans, Bulgaria&Romania, Russia&Belarus&Ukraine, Australia&New Zealand, Rest of South America, Rest of Europe, LDC, ACP, Rest of the World.

between iterations, specific modules define EU-wide market clearing prices for young animals and adjust CAP premiums to comply with ceilings in values or quantities. Further details of the model can be found in Britz et al. (2005).

4.2 - Reference Scenario

The reference scenario represents a probable future situation on agricultural markets – currently the year 2013 - under a no-change in policy assumption. It thus includes at EU-level the implementation of (partial) decoupling as expected for 2012, capping of export subsidies and EU preferential trade agreements with several countries. It comprises specific and *ad-valorem* tariffs as currently applied by the different WTO members.

4.3 – Trade liberalization impact Scenarios

Lacking more accurate and recent information[7], the EU´s offer to the Mercosur dating back to 2004 (USDA, 2005) was used as a possible liberalisation the scenario. In the proposal, agricultural goods are grouped into three categories according to their sensitiveness. For each category, the EU offered different liberalisation steps. Taking into account the product aggregation in the current model version, this leads to the following scenario definition for the simulation year 2012:

- Abolishment of all tariffs for barley and eggs
- 50% tariff reduction for olive oil and tobacco
- Introduction of new TRQs and expansion of existing ones according to the table below, with the in-quota tariff at a level of 50 % of the lowest in-quota duty rate bound in the WTO[8].

Table 4 – EU-Mercosur trade liberalization scenario

	Addtional quota quantities (tons)			
	Argentina	**Brasil**	**Uruguay**	**Paraguay**
Corn	105645	288276	942	5137
Wheat	76472	20829	1305	1394
Rice	1444	16248	2095	214
Cheese	4469	5324	207	0
Butter	756	1052	193	0
Skim milk powder	2451	0	799	0
Whole milk powder	1207	1925	118	0
Beef	34739	6203	7816	1241
Poultry	4606	32369	246	279
Pork	333	5393	33	241

Source: Own calculation based on USDA 2005

4.4 - Preliminary results

In the following, some selected preliminary model results will be presented. It should be kept in mind that the model currently still operates with older parameters for the Mercosur countries´ behavioural functions, a shortcoming that is to be removed in the course of the project. Moreover, countries can only either import into the EU under a bilateral *or* a multilateral TRQ, which represents a rather strong

[7] As was mentioned earlier, the negotiation positions of early 2004, is still the most concrete and realistic scenario up to date. This was recently confirmed by EC DG-trade in Brussels (personal communications).

[8] The quota quantities in the proposal are offered to Mercosur as a whole, and no information was available on how these where going to be distributed among the Mercosur countries. For this reason, the quantities where distributed according to shares of total Mercosur production. In the case of beef, the existing TRQs where used as weights. One of the research objectives of the project is to disaggregate the Mercosur by country and even by sub-regions. Hence, in the near future the impact results will show more disaggregated detail.

assumption and might bias the results[9]. Again, changes in the representation of TRQs are foreseen during the project.

In Table 5, the changes of imports, exports, supply, demand and producer prices in the EU are shown. Due to space limitations, only four major product groups, that is cereals, oilseeds, meat and dairy products will be considered.

Table 5 – Preliminary CAPRI impact results for selected products

EU25	**Baseline**					**Partial liberalisation**	**EU-Mercosur**			
Year : 2012	**absolute values and difference to baseline**									
1000 t	*Net production*	*Demand*	*Imports*	*Exports*	*Producer Price*	*Net production*	*Demand*	*Imports*	*Exports*	*Producer Price*
Cereals	261514	239304	30105	52314	100.90	261184	239182	30354	52356	100.61
						-0.1%	-0.1%	0.8%	0.1%	-0.3%
Oilseeds	20929	49292	29341	978	196.36	20965	49269	29292	988	195.99
						0.2%	0.0%	-0.2%	1.0%	-0.2%
Meat	42695	42258	4489	4926	1640.09	42679	42270	4533	4942	1633.54
						0.0%	0.0%	1.0%	0.3%	-0.4%
Dairy products	57933	64802	10192	3322	1400.06	57918	64772	10190	3336	1401.17
						0.0%	0.0%	0.0%	0.4%	0.1%

Source: CAPRI Modelling System, preliminary results

Imports of cereals rise as a consequence of the partial liberalisation by nearly 250 000 tons or 0.8%. With producer prices dropping by -0.3%, EU production decreases slightly. Exports increase slightly following the price reduction which increases competitiveness of European production. Despite the price decrease total demand decreases as well, which can mainly be attributed to less demand for feeding.

Changes on oilseeds markets can only be explained by cross effects from other markets, because in the scenario no changes for oilseeds where specified. However, imports and producer prices decrease slightly, and net production and exports increase.

Imports of meat increase due to the expansion of TRQs, and the producer price falls by -0.4%. Production of meat as an aggregate is unaffected, however, production of beef and poultry decrease by -0.2% and -0.1% respectively (not shown in Table 5). That decrease is offset by higher production of pig meat. Demand is unaffected in percentage whereas the EU can increase its exports slightly due to lower prices.

On dairy markets, there are hardly any changes in percentage terms, only exports of the EU and the producer price increase slightly[10].

4.5 Discussion

[9] This is especially true in the case of cereals, where this model design might lead to an underestimation of the effects of trade liberalisation.

[10] Imports of dairy products are zero in the baseline from Mercosur countries, so no changes can occur in the simulation. Changes in prices and exports thus can only be explained by cross effects from other markets.

The mode so far seems to simulate impacts that are intuitively in the appropriate directions. A conclusions that seems to come to mind is that the impacts seem relatively small. However, this obviously needs to be seen in light of the relatively small trade policy scenario.

These preliminary (or test results) still lack significant refinement and disaggregation. Furthermore, the impact results shown only concern the impacts from trade liberalization scenarios, on the EU region. In the near future, the extended CAPRI model will also simulate impacts in the Mercosur.

5. Construction of base-line scenarios – possible scenarios

5.1 – Production dynamics and productivity gaps

As was discussed in the previous section, the CAPRI model works with a base-line scenario per commodity. In that section a single base-line scenario was used to generate first impact results. In this section of the paper, the possibility of different scenarios is discussed, in an attempt to better reflect and simulate production dynamics over time. At the same time, different scenarios offer added opportunities for sensitivity analysis.

As an example, following are two Graphs, that show commodity production growth over time (15 year period). As can be seen, in these cases the situation seems to be closer to a strong growth path, than to a steady-state equilibrium. One strong reason to generate different base line scenarios.

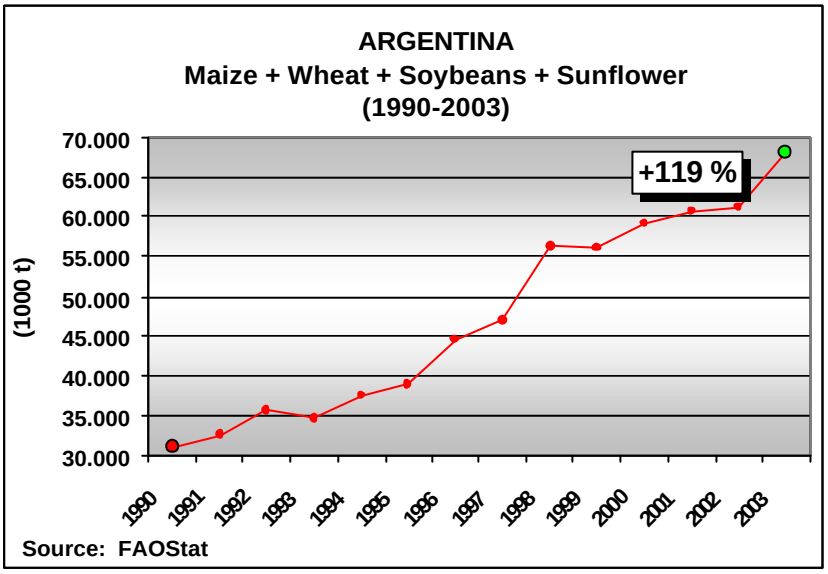

Figure 3 – Argentine grains and oilseeds production, 1990-03

As can be seen in Fig 5, at least in the case of soybeans in Argentina, the 3-fold increase in total output over the 1990-2004 period cannot be explained on the basis of product price changes alone. This becomes most evident for the 1997-2001 period: although FOB prices plunged from 297 USD7/t in 1997 to 172 USD/t in 2001, total production increased from 11 million tons to 27 million tons. The adoption of new cost-reducing technologies (transgenic herbicide-tolerant soybeans + no-till practices), more than made up for the price drop.

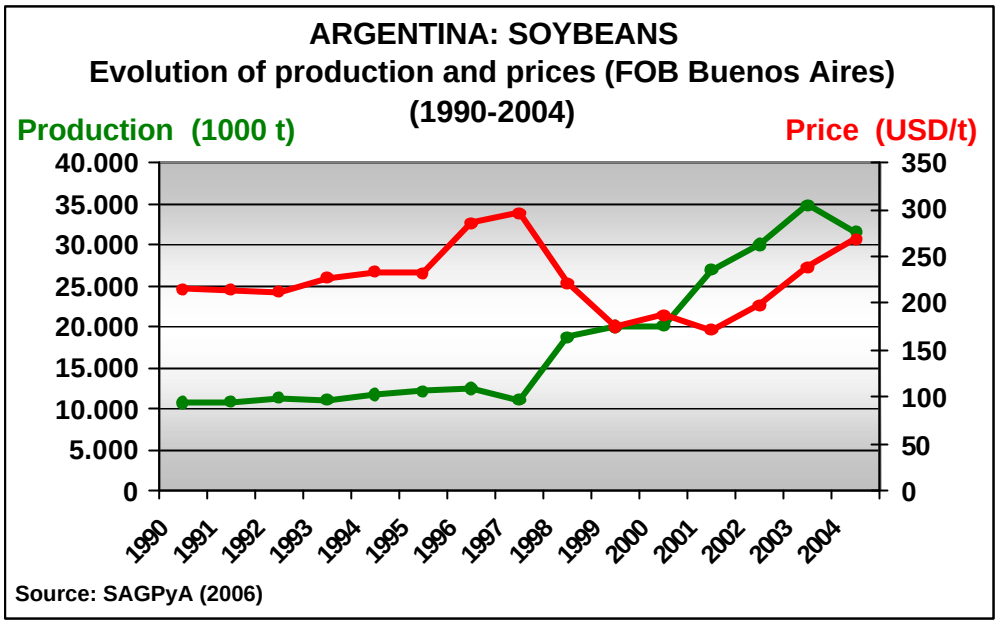

Figure 4 - Argentine soybean production and prices, 1990-04

Productivity differentials at the farm level, not attributable to agroecological determinants, play a very significant role on the supply of agricultural commodities. The widely accepted assumption that technological change occurs simultaneously and in the same magnitude across the entire farm sector is a particularly weak one when modeling LDCs´ agriculture. Averaging productivity indicators has proven to be an unsatisfactory option to handle estimations of supply responses to policy and/or input/output relative price changes. In LDCs, a large portion of farms operate well under the production possibilities frontier.

The question at this point should be whether this 15 year-long region-wide explosive growth of output is running out of steam and thus, would justify the use of trend analysis techniques to build the 2012 baseline. One possible answer to this question can be found studying the current productivity gaps numbers at the farm level, summarized below for selected commodities in Argentina.

Table 6. Soybean, maize and wheat Productivity gaps in Argentina

CROP	YIELD (t/ha/year)		PRODUCTIVITY GAP (%)
	Current	Potential	
Total soybeans	2.6	3.2	23.08
Soybean belt	3.3	4.0	21.21
Total planted maize	5.56	7.3	32.73
Maize belt	7.0	11.0	57.14
Total planted wheat	2.5	3.3	32.00
Wheat belt	3.7	5.2	40.54

Source: Inta (2002)

Given the large productivity gaps observable at the farm level, significant gains could be achieved closing them (partially or completely) through the adoption of available technology. If the results of

the CAPRI model runs, which are basically comparative static analysis for multiple trade-liberalizing options, are to be relevant for real-word decision-making, both at government and private sector levels, the 2012 baseline should allow for more than one path to be considered as possible when attempting to model the future of the agricultural sectors in the countries involved (without trade liberalization) as they make their way to the target date,

5.2 – Simulating technology adoption paths

The analytical tool to used in the development of at least some of the agreed-upon three 2012 supply baselines for Mercosur+2, is a dynamic mathematical simulation model (SIGMA), which has been developed and tested by INTA over the last 12 years to simulate multiple technology adoption paths (2002). It is applicable for both *ex-post* and *ex-ante* analyses of aggregate sector impact, measured as changes in the total output, of alternative R&D innovations and technology adoption scenarios. That is, SIGMA estimates how much more of a given commodity would be produced, compared to current levels, projected into a certain time horizon, if technologies that were either already available in the marketplace or in the the R&D system pipeline, were adopted by farmers (the latter ones, once they became available, should that be expected to happen within the simulation time horizon).

This approach has been used for Argentina (2004) and Uruguay (2004), since both countries have conducted a study known as "technological profile of the agricultural sector", that provides all the necessary data for the simulation runs. The extension of this methodology to the other participating countries will be contingent on the availability of data and the feasibility of resorting to extrapolations that would eventually make up for the lack of data at the level of specificity required.

The following assumptions are made:

- At least three distinct technological levels (TL) can be identified among farmers from relatively homogenous agroecological areas: low (LTL), medium (MTL) and high (HTL), associated, respectively, with a set of inputs and processes, which are represented empirically by productivity indicators (yield, costs and/or product quality). For a schematic representation, see Fig. 16.
- The path followed by the process of adoption by farmers of technology (both, available in the marketplace and in the R&D pipeline at t=0) is represented in the model by a non-linear function (modified logistic), the parameters of which are given by both the nature of the innovation and the socioeconomic profile of the potential adopters.

The model's key component is the simulation of the process of adoption, by farmers, of technological innovations that shift the isoquant that represents their production functions (as a combination of inputs and factors), achieving a more efficient use of resources, which, in turn, implies a reduction in unit costs and/or an increase in product quality (leading to higher output prices). The most significant implicit assumption that SIGMA makes is that the coexistence both in time and space of the three technological levels (TLs) cannot be satisfactorily explained resorting to the simple (non-restricted) profit maximization model provided by neoclassical economic theory, according to which, farmers should maximize profit and thus, migrate instantly to the production function represented by the "available" isoquant nearest to the origin (HTL), *i.e.*, they all would adopt the profit-maximizing technology. This does not imply that the rationality of farmers is being questioned. Instead, it recognizes the existence of multiple constraints faced by farmers (difficult if not impossible to capture using econometric techniques without dependable time-series or cross-sectional data sets at the farm level), associated with incomplete and/or non-existent markets, as well as with restrictions to the adoption of available technology and its optimization, caused by the undersupply of strictly public goods (such as infrastructure- public underinvestments-), strictly private ones (like refrigeration or storage capacity- private underinvestments-) or combined ones, such as entrepreneurial skills.

In DCs, the analysis of the process of adoption of technology implicitly assumes that farmers tend to converge rather rapidly to the same production function (state-of-the-art), once it becomes commercially available, whereas in the LDCs, a *continuum* of coexisting isoquants or farm-level

production functions can be identified, starting with the early adopting farmers (HTL) and, from there, moving outward farther and farther from the origin, until the production function shows efficiency levels low enough for them to be associated with the upper boundary of subsistence farming.

Assigning different values simultaneously to K and ∅, combined scenarios of alternative technology adoption paths can be constructed (for a graphical representation, see Fig 5).

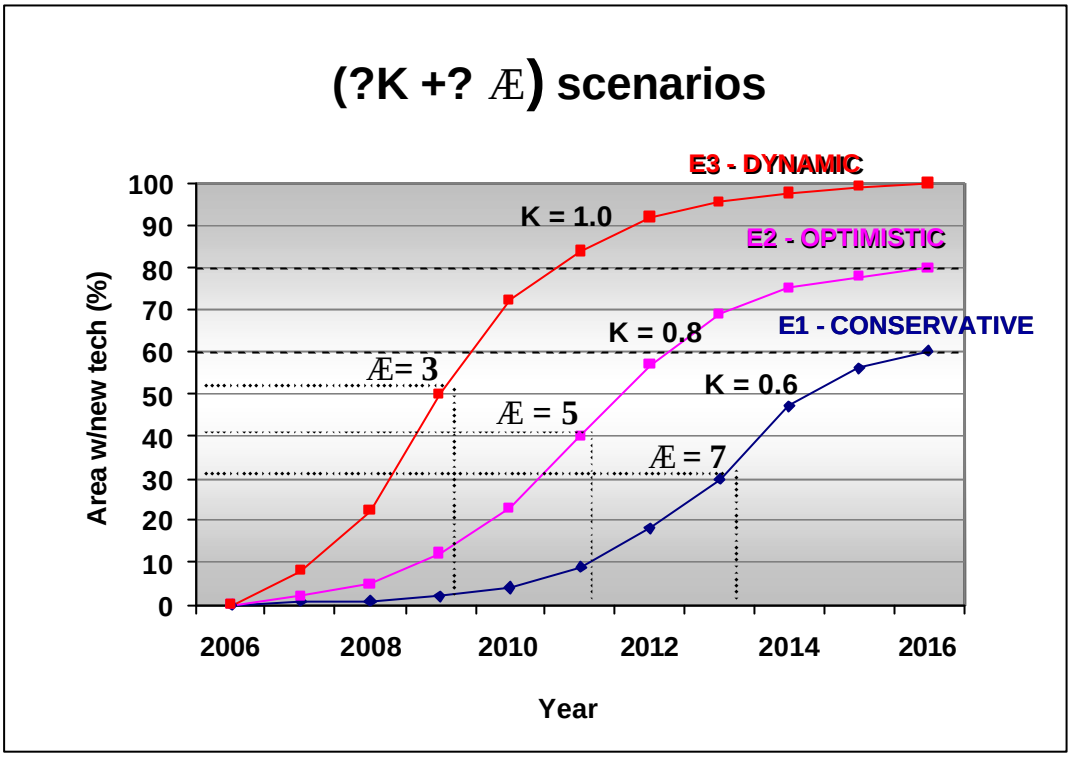

Figure 5 – example of adoption curves under different half-time and adoption ceiling levels

5.3 – Generating baseline scenarios – first results

Tables 7 summarizes the results of the SIGMA simulation runs for two of the six MERCOSUR+2 countries (Argentina, and Uruguay) and a limited number of commodities. Parameter values were drawn from previous empirical work.

Table 7. Argentina. 2012 baseline values for three scenarios and six commodities

COMMODITY	UNIT	SCENARIOS		
		E1-CONSERVATIVE	E2-OPTIMISTIC	E3-DYNAMIC
DAIRY	M liters	13533	14044	18026
MAIZE	000 tons	21054	21521	25723
APPLES	000 tons	433	475	682
SOYBEANS	000 tons	47275	48108	53736
WHEAT	000 tons	15222	15685	17788
BEEF	000 tons cwe	4730	4960	6183

These first results show already the significant differences made possible by graduating technology and adoption variables. Preliminary results for the same commodities in Uruguay and Brazil have also been generated to date (not shown here because of space constraints). It is of importance that this research will be further applied to the other commodities and countries in the project, to serve as a

very useful base for future sensitivity analysis. In turn this sensitivity analysis can prove very interesting for policy makers to test different future conditions and events.

6. Conclusions and future research directions

Preliminary findings of an agricultural competitiveness and policy project between the EU and the Mercosur trade blocks were discussed. The project was formulated to answer the Commission's need for full and "inside" information, to support ongoing trade negotiations between the two blocks. Therefore, the direct clients of the project's future results are the EC and Mercosur trade negotiation teams.

Likewise the project needs continuous feedback from the EC, in order to fine-tune its trade liberalization scenarios for econometric modelling activities, to subsequently, generate "realistic results". Seemingly, current negotiation positions do not differ significantly from those reached in 2004.

The paper discussed, as one of its specific objectives, the research approach and partial results of the analysis of trade competitiveness of the beef sector in Brazil as a case in point. It can be concluded that the research approach including SWOT analysis integrated with stakeholder assessment of future sector needs to trade scenarios, seems to generate the type of information that will be of interest to policy makers. The approach will be subsequently applied to the other commodity systems in the Mercosur-6.

The paper's second specific objective relates to ex-ante impact assessment. A (global) trade simulation model, CAPRI, is currently being enlarged with (i) a disaggregated MERCOSUR-6 sub model, allowing for impacts in that region and (ii) a detailed impact capacity on social, budget, economic and environmental parameters. First experimental impact runs, linked with the MERCOSUR still aggregated region, show low production, price and trade impacts, although with appropriate signs. The modelling work is far from complete. In the near future, the integration with a disaggregated (by country and region) MERCOSUR "arm" for 9 pre-selected commodities is foreseen.

Further to the modelling exercise, different base-line scenarios were discussed. It was argued that a single base-line scenario, as has been used in the initial CAPRI model, proved too static. It was shown with Argentine commodity time series, that different levels of productivity gaps (delta between actual and potential) explained by technology adoption times and ceilings, and fed into a simulation model, SIGMA, can generate very interesting different base-line scenarios. These in turn allow for sensitivity analysis opportunities for CAPRI runs.

The preliminary data from the various tasks of the project, seems in line with those from earlier studies, mentioned in the paper's introduction. The final project outcomes will generate the additional detail, depth and quantification that is much needed by policy makers in the two regions.

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