Informe sobre *la participación argentina* en el Foro de Agricultura y Alimentos del Pacific Economic Cooperation Council.

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Presentación.

El Pacific Economic Cooperation Council, PECC, es una institución no gubernamental apoyada en los esfuerzos voluntarios de una red de dirigentes empresarios y funcionarios gubernamentales, académicos y especialistas en investigación de 20 economías de la Cuenca del Pacífico.

En el marco de una estrategia de acercamiento al Este de Asia, ejecutada por la Secretaría de Comercio e Inversiones del Ministerio de Economía, la Argentina ha estado participando en las actividades de la organización desde 1994, cuando una delegación tripartita asistió al X General Meeting en Kuala Lumpur, Malasia.

Entre los Foros y Grupos de Trabajo del PECC se cuenta el Foro de Agricultura y Alimentos, cuya coordinación está a cargo del Comité PECC de los Estados Unidos, siendo presidente del Foro, Ms. Carol Brookings, conocida consultora y especialista internacional en temas de agricultura.

A partir de nuestro interés en participar en las tareas específicas del Foro de Agricultura y Alimentos, se gestionó y obtuvo la invitación para asistir como observadores, único carácter estatutario en el que puede participar un país extraregional, y se acordó que un representante del sector privado argentino expusiera sobre la vinculación del Mercosur con el sistema alimentario de Asia. Estas acciones se llevaron a cabo durante el Seminario que el Foro organizara en Beijing a fines de septiembre de 1995.

Para ese evento, el INTA y la Subsecretaría de Comercio Exterior presentaron sendos documentos acerca del potencial de la Argentina y el Mercosur como proveedores de productos agrícolas y alimentos al Asia.

Estos documentos y una selección de los trabajos presentados durante el Foro por sus miembros, integran la recopilación que se publica, como un aporte al mayor conocimiento de los investigadores y operadores de nuestro país acerca de los temas de principal preocupación y análisis en un área geográfica que sin duda determinará el curso de los mercados de productos agrícolas y alimentos en los próximos años.

Síntesis de las exposiciones y debates.

La Argentina fue invitada a participar en el panel sobre "El impacto de la OMC, APEC y las iniciativas de Comercio del Hemisferio Occidental en la seguridad alimentaria del Asia". La delegación argentina presentó trabajos sobre el potencial productivo de la Argentina y el Mercosur hacia el año 2000 (Ing. Eugenio Cap, INTA) y sobre el Mercosur como socio estratégico para la seguridad alimentaria en Asia (Subsecretaría de Comercio Exterior). El Sr. David Vázquez, Presidente de la Bolsa de Cereales participó como expositor en el panel.

Las perspectivas de la situación granaria de China dominaron el tono de las discusiones en el transcurso del Foro. El grado de autosuficiencia que alcance China determinará el curso de los mercados agrícolas hasta bien entrado el próximo siglo. Se hizo notar (Coyle) que en dos años China pasó de ser un exportador neto de cereales (8 millones de Tm en 1993) a importar 16 millones de Tm en 1995, un cambio de 24 millones de Tm, o sea el 10 por ciento del comercio mundial de granos.

Las estimaciones menos dramáticas (excluyendo por ejemplo, las de Lester Brown) hablan de importaciones totales de granos para el 2000 de entre 12 y 40 millones de Tm Los investigadores chinos hablan de no más allá de un 10 % del consumo total de granos de ese país, lo que podría significar hasta 50 millones de Tm de importaciones anuales .

La opinión generalizada es que China no "hambreará al mundo" pero tampoco volverá a una posición exportadora. Según Ke Bingsheng (Beijing Agricultural University), el consenso incluye los siguientes puntos: 1. la demanda china aumentará continuamente en las próximas tres décadas; 2. la oferta interna no se incrementará al mismo paso; y 3. las importaciones aumentarán sostenidamente.

Existe también consenso acerca de la posibilidad de incrementos en la productividad, tanto por aplicación de avances tecnológicos como por la subestimación de áreas efectivamente bajo cultivo (alrededor de un 15%).

El abanico de posibilidades, que habla de un serio desconocimiento tanto de los propios chinos como de observadores extranjeros -como el USDA- surge de los informes presentados en el Foro, que se anexan a este trabajo. Las diversas proyecciones incluidas en los papers presentados cierran la discusión sobre el principal desafío tanto para China como para el mundo: cómo satisfacer la creciente demanda de alimentos del 23 por ciento de la población mundial durante los próximos treinta años. Las estimaciones son coincidentes en lo fáctico: China redefinirá el comercio mundial de productos agrícolas en el próximo siglo, en razón de convertirse en neto importador de productos agrícolas y alimentos procesados. Las divergencias se expresan en términos de estimación de montos de demanda.

También se hizo notar el cambio en los perfiles de dieta de una población china -y en general asiática- crecientemente rica: mayor consumo, mayor diversificación, con menor participación de arroz y trigo en favor de productos de la ganadería y alimentos preparados. Esto determinará mayores importaciones de granos forrajeros, pero en países con severas restricciones en recursos agrícolas incrementarán los costos de la producción ganadera, determinando una mayor competitividad para las importaciones de carnes.

Los investigadores chinos de la Academia de Ciencias Agrícolas, especialmente Li Weimin, no ven a China incrementando en gran escala sus importaciones de carne, pero sí las de granos forrajeros, para producir carne localmente. De todas maneras reconocen que "China no tiene buenas ventajas comparativas para la producción de granos. Debió producirlos básicamente por condiciones de política económica".En términos de oportunidades comerciales presentes y futuras para alimentos en general, se destacaron dos franjas:

1.- la de provisión de insumos para la alimentación tradicional asiática, ya sea a través de la adaptación productiva (por ej. "carnes marmoladas") como del aprovechamiento de ítems no consumidos en otras regiones, pero de gran demanda en mercados asiáticos (el caso de partes de aves u otros animales: garras de pollo, librillo).

2.- la ofrecida por la mayor demanda de platos "a la occidental", -hamburguesas, papas fritas, carnes a la parrilla, berries- y de las llamadas tres F (Fast, Frozen, Foreign).

Una conclusión repetida (Chu Hon-Fai, Director de Dah Chong Hon, Ltd, Hong Kong) fue la de la necesaria cooperación entre productores y gobiernos para trabajar conjuntamente en comprender y satisfacer la demanda de los países importadores. El modelo de trabajo de promoción de sus productos agropecuarios, por parte de Australia, Nueva Zelanda, Canadá y más recientemente Chile, constituyen un acervo informativo de gran importancia a tener en cuenta en el diseño de una política de penetración en la zona Asia Pacífico.

En países que han sufrido, hasta épocas todavía recientes, cíclicos déficits alimentarios, de características catastróficas algunas veces, el tema de la seguridad alimentaria reviste la mayor importancia y es objeto de cuidadoso planeamiento. En los momentos actuales, cuando varias de estas economías están volcándose a intensificar la producción industrial, con la consiguiente urbanización de buena parte de su población, la problemática de asegurar el abastecimiento alimentario pasa fundamentalmente por dos ejes:

* la diversificación de las fuentes de aprovisionamiento, y
* la celebración de acuerdos de compra a largo plazo.

Propuestas.

La Secretaría de Comercio e Inversiones, en colaboración con el Ministerio de Relaciones Exteriores y la Secretaría de Agricultura, prevé mantener una participación regular en el Foro de Agricultura y Alimentos del PECC, como medio de poder presentar el punto de vista de la Argentina en su rol de uno de los principales proveedores mundiales de alimentos y hacer aportes en términos de investigaciones e ideas acerca de la seguridad alimentaria en Asia.

Se trata además de mantener la presencia argentina en un Foro en que se proponen normas de comercialización de alimentos que son presentadas a otras organizaciones, éstas de carácter ejecutivo, del Pacífico. Es en estos ámbitos donde se gestan las pautas que han de regular el comercio agrícola en el futuro: la posibilidad de seguir de cerca su evolución y a través de una presencia activa y hacer conocer el punto de vista argentino permitirá anticipar las adecuaciones que con el tiempo serán necesarias para mantener e incrementar nuestro comercio.

Simultáneamente se continuará la tarea de transmitir a los interesados argentinos información sobre la evolución de la situación alimentaria del Asia y de las oportunidades que se presentan para nuestra producción y exportación.

Para llevar adelante estas tareas se ha formado un Grupo de Trabajo Argentina / PECC sobre Agricultura y Alimentos que funciona según la práctica de los Foros del PECC, es decir es tripartito, ya que cuenta con participantes del sector oficial, empresario y académico y se integra en cada tema a estudiar, con especialistas en condiciones de hacer aportes sustantivos.

En la actualidad se está trabajando en los temas de estudio del próximo Foro PECC planeado para 1996 pero aún sin fecha precisa. Los estudios versarán sobre la construcción del Sistema Alimentario del Pacífico, y serán designados -según el Comité PECC de los Estados Unidos, que oficia de coordinador- con vistas a transferir tecnología, proporcionar información financiera y estimular el desarrollo de recursos humanos en la dirección y desarrollo de una producción moderna de alimentos y de sistemas de procesamiento y distribución.

Para el primero de los grupos de trabajo, el Comité Coordinador PECC / EE.UU. seleccionó el tema de Refrigeración y Distribución, por su impacto en todos los aspectos de la comercialización de alimentos, ya que la falta de frío adecuado dificulta la expansión del comercio de alimentos, en los casos en que se presentan fallas en los puertos, la infraestructura de transportes y las cadenas de distribución, tanto mayoristas como minoristas.

Dos trabajos técnicos sobre el tema de Carnes Refrigeradas preparados para el Grupo Argentina / PECC sobre Agricultura y Alimentos están siendo estudiados por el sector frigorífico para enmarcarlos en un contexto de práctica exportadora argentina. Se está preparando el material de base para ampliar el espectro de productos a estudiar, incluyendo eventualmente lácteos, frutas y hortalizas, mostos de uva y jugos de fruta. Esta inclusión depende del interés de los distintos sectores tanto oficiales como privados, y su capacidad para preparar los informes.

Lista de Documentos Anexos - Foro de Agricultura y Alimentos.

Beijing, R.P. China, Septiembre de 1995.

1. Presentados por la Argentina.

"An Overview from the perspective of an efficient producer: the role of MERCOSUR as a long term partner for the food security in Asia".
Unidad Analítica Asia Pacífico, Subsecretaría de Comercio Exterior.

"Argentina: the sustainable growth potential of the production possibilities frontier in the agricultural sector. An outlook."
Eugenio CAP, INTA.

2. Presentados por los países asiáticos.

"Opportunities for growth in the Pacific Food System".
Mr. CHU Hon Fai. Dah chong Hong, Ltd. Hong Kong.

"Food security and market reform".
Dr. FUNING Zhong. College of Economics and Trade. Nanjing Agricultural University. P.R. of China.

"Meeting´s Asia´s changing food requirements".
Prof. LI Weimin. Institute of Agricultural Economics. Chinese Academy of Agricultural Sciences. P.R. of China.

"Sustainable food production an food security in China"
Prof. FANGQUAN, Mei. Vice-president, State Food & Nutrition consultation Commission. Director, Macro Agriculture Research Department, Teh Chinese Academy of Agricultural Sciences.

"Food and agriculture outlook for mainland China".
Prof. KE Bingsheng. Beijing Agricultural University. P.R. of China.

"Vietnam agriculture-achivements and suggestions on calling development investment".
Mr. NGO The Dan. Vice Minister of the Ministry of Agriculture and Food Industry. Vietnam.

"PECC overview speech".
Mr. COYLE William. Leader Asia Iniciative Commercial Agriculture Division. Economic Research Service. United States.

3. Otros documentos de interés disponibles para consulta en la Biblioteca del Ministerio de Economía: Hipólito Yrigoyen 250 Piso 2do..

"The Outlook for U.S. Agriculture"
Federic SURLS. Economic Research Service. U.S. Department of Agriculture. United States.

"Canadian agriculture and Asia Pacific Trade".
Bruce HUFF. Agriculture and Agrifood Canadá. Canadá.

Anexo 1

Documentos presentados por la Argentina en el Foro de Agricultura y Alimentos del PECC, Beijing, Septiembre 1995.

"An Overview from the perspective of an efficient producer: the role of MERCOSUR as a long term partner for the food security in Asia".
Unidad Analítica Asia Pacífico, Subsecretaría de Comercio Exterior.

"Argentina: the sustainable growth potential of the production possibilities frontier in the agricultural sector. An outlook.", Eugenio CAP, INTA.

AN OVERVIEW FROM THE PERSPECTIVE OF AN EFFICIENT PRODUCER: THE ROLE OF MERCOSUR AS A LONG TERM PARTNER FOR THE FOOD SECURITY IN ASIA.

September, 1995.

Prepared by the East Asia Analytical Unit, Undersecretary of Foreign Trade, Ministry of Economy, Argentina, to be submitted to the Food & Agriculture Forum, PECC, Beijing Sept.1995.

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AN OVERVIEW FROM THE PERSPECTIVE OF AN EFFICIENT PRODUCER: THE ROLE OF MERCOSUR AS A LONG TERM PARTNER FOR THE FOOD SECURITY IN ASIA. [1]

The main food and feed needs of Asia at the gates of the millenium: a new reliance on the international market and the role for MERCOSUR.

The capacities to expand food production in MERCOSUR. A quantitative forecast.

MERCOSUR as a surplus area in food and agricultural products.

The qualitative scenario: a subsidies-free, chemicals-free production.

Notes on complementarities, obstacles and requirements for a long term partnership. What to do to fully develop the partnership scenarios.

Feeding their people has been one of the main tasks in history for the countries of East Asia. Still is. In the past, particularly in China, production shortages caused famines and millions of deaths. Up to now it seemed prudent, reasonable -and supposedly less risky- for such huge populations to base their food supply in their own production and in productivity gains. Today, most of those economies and notably China, are embarked in a long term strategy of industrialization. They face a choice: to proceed with this capital and land-intensive strategy together with a fully self-reliant food system or to count more and more on efficient suppliers to base their industrial growth and competitiveness.

The new rules on international trade set up after the Uruguay Round and in general the new global environment are laying the appropriate field to play the second game. That game could improve significantly the chances of industrial growth by 1) reducing the food expenditure as a share of their global income, and 2) at the same time guaranteeing not only the basic food needs of the Asian economies but also the enrichment and diversification of their people's diet, *pari passu* with the growth of their *per capita* income.

Argentina and Mercosur, together with other efficient producers in the region such as Chile could be reliable and long-term partners to share in those efforts. Production and export programs are being put in place within a framework of more stable economic fundamentals. Local and foreign investment is flowing in to extend both, horizontally and vertically, the production frontier. That is one side of the coin.
The other side is the opportunity for Asian companies, capitals and managers to get on the driver's seat in enterprises producing for their own markets. Asian firms are familiar with their markets, their distribution networks, consumer tastes and particularities. We should now act together to adapt our South American products to Asian needs. Joint Asian-Mercosur ventures and more involvement of Asian companies and Asian people in the production and marketing of latinamerican products could be the right solution for an enhanced reliability of South America as a long term partner and supplier of food and agricultural products. All along the agribusiness chain, from grains to fast food, from adapting varieties of rice to preparing dishes suitable to Asian tastes, a mutually advantageous partnership could be established.

Mercosur in terms of food and agriculture: an introduction.

[1]The present is a preliminary draft, prepared by the East Asia Analytical Unit, Undersecretary of Foreign Trade, Ministry of Economy, Argentina to be submitted to the Food & Agriculture Forum, PECC, Beijing Sept.1995. Most of the tables are not attached.

MERCOSUR, the Southern Common Market, comprising Argentina, Brazil, Paraguay and Uruguay was established in 1991. The four countries decided to start a step by step process of regional integration aimed at the creation of a common market. As of January 1, 1995, Argentina, Brazil, Paraguay and Uruguay began to operate as a customs union: intra regional tariffs were eliminated and a common external tariff was established.

With almost 12 millions km^2 of continental area, from the North of the Equatorial line to the southern tip of South America, this trade bloc enjoys a wide range of climates, from the tropical to the temperate and cold. The continental part of the four member customs union covers two thirds of South America and 8,5% of the world land area.

The four countries have together more than 12% of the world land suitable for crops with only 3,8% of the world population.

Regarding environmental concerns, South America has 200 millions ha available without edaphic constraints, which means 10% of its total surface. Only 74% of this area is currently under cultivation. A considerable potential for new production exists, specially in Argentina and Uruguay.[2] The region is self-sufficient in foodstuffs and is a main exporter of many agricultural products, besides being one of the best endowed regions in the world in natural resources, with a world class agroexport base.

Due to agricultural and agroindustrial developments in the 90's, Mercosur has now a highly diversified production and export pattern. (Tables on pages 10 and 11). The region produces and exports to the rest of the world, a wide diversity of products, ranging from meat, grains, oils, wool, dairy products and fruit products in temperate areas of Argentina and Uruguay to tropical products, like cocoa and coffee from Brazil and citrus from the four countries, including the processed, intermediate and final products in each case.

Mercosur economies are clearly food exporters: 20% of the regional exports are food and agricultural products: In 1993, they reached a value of approximately 20 billions dollars: only 8,5% of this figure was shipped to East Asian markets. At the same year East Asian imports of those products were 100 billions dollars but only 1.7% were originated in Mercosur. (Table on pages 12 and 13).

Food and agriculture exports from Mercosur to East Asian economies and share of each market.

Market	Exports u$s 'mill	Market share
Asia Pacific	1705.5	1.7
P.R. of China	76.3	1.6
R. of Korea	145.4	1.6
Indonesia	132.3	5.1
Hong Kong	140.0	1.5
Thailand	33.3	0.9
Malaysia	94.8	3.0
Philippines	39.2	2.2
Singapore	54.3	1.0
Japan	989.8	1.7

Source: Ministry of Economy, Argentina, based on COMTRADE, U.N.

Chinese Taipei not included due to lack of data. Figures for other economies not significant. (Tables on pages 14 to 31).

[2] Sammarchi and Lara, University of El Salvador. "Trade and Environment management in the framework of the integration schemes", Apr. 95.

In 1993 East Asian imports of **beef** were more than 3 million t. Mercosur exports to the world were 780 thousand t. But Mercosur share in East Asia **imports** was **only 1.1%**

Production figures for 1993 for seven major agricultural products show a surplus position of Mercosur *vis a vis* a deficit of East Asian economies, except in the case of rice.

The share of Mercosur in some of the agricultural imports of East Asia are nonetheless significant:

Product	Share of Mercosur in East Asian imports.
Processed meat	5.2
Secondary cereals	13.9
Fruit Juices	16.0
Coffee and substitutes	17.4
Oil seeds	5.4
Pulp and waste paper	6.5
Fixed vegetable oils	16.1

Source: Table on pages 12 and 13.

Main trends in Asia and prospects for Mercosur.

The 1990/94 period was one of increasing consumption of foodstuffs in Asia, not always matched by increasing production. In the case of wheat, even though yields improved by 9%, total production at the end of the period was only 4% higher than five years earlier. Meanwhile wheat consumption increased by 10%.

Corn consumption grew 19%, in the same period 1990-94, while production grew by 4,4% and yields decreased by more than 3%. Production of beef almost doubled, but it was not enough: the volume of imports went up 62%, and they are expected to remain strong during the coming years[3].

Rice yields improved dramatically in East Asia but growing areas and production diminished. Consumption is growing at almost the same pace of population. It is worth to observe that at the same time Mercosur production of rice grew 12%.

One of the most likely scenarios[4] allow us to forecast an excess supply capacity of Mercosur of almost 6,7 millions t of wheat, almost 12 million t of corn, 15,8 million t of soybeans, 5 million t of sunflower and 550 thousand t of beef by the year 2,000.

Mercosur is also a net supplier of secondary cereals, sunflower seeds, apples, peaches, pears, potatoes, onions, garlic and tomatoes. The same thing happens with fisheries products, pork meat, sugarcane, coffee, cotton, cocoa, tobacco and forestry products and by products.[5]

The APEC Free Trade Area : a view from South America.

One of the most striking features of the current discussion about the ways and the timing to set up an APEC free-trade area is the across the board, homogeneous and with a very few exceptions, unqualified allegiance to the free trade- fair competence approach.

[3]USDA, cit. Pacific Economic Development Report, 1995.
[4]Eugenio Cap, National Institute of Agricultural Technology, Argentina. "Argentina: The sustainable Growth Potential of the production possibilities frontier in the agricultural sector: an
[5] Secretariat of Agriculture, Livestock and Fisheries " Mercosur agropecuario" jan, 1995.

This support comes from what Asians call "activists" and "gradualists" alike, and from people representing very different societies, with a diversity of economic policies and development paths, even if many of these economies are still evolving under a strong government involvement and a widespread use of trade barriers and regulations.

But from the point of view of Argentina, an agricultural and food efficient producer, a significant number of real issues are absent in the analysis. Therefore they don't count in the proposals for future actions to be taken (*eg* implementation of the Bogor Declaration).[6]

The real world appears in many discussions about a free-trade area, to resemble an ideal one, with no subsidies and no dumping involved. It is a legitimate question to ask why subsidies and dumping practiced in the agriculture and food trade (not a minor one) by major countries are very seldom raised as an issue to deal with.

In those cases dumping improves the welfare of consumers at the destination markets, but only in the short term. Asian consumers for instance. May be that is an explanation why the subject is so blatantly omitted in the discussion about free and fair trade.

Nevertheless it has to be noted that by wiping out efficient and subsidies-free producers through those unfair policies, today low prices could mean high prices and even shortages tomorrow. Today's consumer surplus will be compensated then, may be in excess, when fiscal policies gradually or not so gradually restrain subsidies to otherwise non-competitive production and in the meantime, competitive producers have not been allowed to fully develop their potential or have succumbed to the awesome task of fighting against Goliath size dumpers.

In a similar way we should be able to raise the question of the protection of the interests and the way of living of farmers and rural workers in many Asian societies, without damaging at the same time the need for a long term, reliable and efficient supply of foodstuffs, to cope with the growing needs of industrialization and competitiveness.

Towards a East Asia-South America partnership

Current agreements on fisheries negotiated between Argentina and Japan through which joint ventures are promoted to fish in argentine waters and to process and ship the catch to the Japanese market, provide a useful framework for investment, technology transfer and cooperation, that can be applied also in other areas of food production.

Common concerns in MERCOSUR and PECC regions deal with finding the right environmental policies to promote efficient natural resource uses. This should be the basis for joint inter-governmental efforts directed at finding ways to reach sustainable development without damaging the integrity of our ecosystems.

One of the main problems to establish such a kind of joint ventures is the lack of mutual knowledge, including the difficulties associated to manage a project with people who do not speak the same language. Cooperation agreements on training should be enhanced as a way to overcome those barriers. But first of all, increased trading, improved shipping frequencies and specific freight equipment (only a few airlines currently serve the South America-Asia Pacific route) will spread the personal knowledge required to set up common ventures.

To deal with these kind of issues Mercosur and East Asian countries should make explicit and public their commitment to **a long-term strategy of food and agriculture partnership**. This step-adequately published and guaranteed-, could very well call the attention of Asian investors,

[6] See for instance the discussions at the last PECC Trade Policy Forum, Taipei, Apr. 1995.

trading companies, supermarkets and transport companies, and make more attractive further efforts in productivity enhancement, implementation of new technologies, adaptation of products and directing commercial networks to the Asian needs.

Both the European Union and Mercosur began signing agreements in specific sectors: why not follow the same path between two regional blocs already committed to free and fair trade?. Why not think of such a framework, coached by governments and the private sector helped by institutional research on technologies and market trends: a partnership based on enhanced productivity and volume and on a mutual reliability on the ability of both sides to accomplish production and trade aims?.

ARGENTINA: THE SUSTAINABLE GROWTH POTENTIAL OF THE PRODUCTION POSSIBILITIES FRONTIER IN THE AGRICULTURAL SECTOR. AN OUTLOOK.

Eugenio J. Cap

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ARGENTINA: THE SUSTAINABLE GROWTH POTENTIAL OF THE PRODUCTION POSSIBILITIES FRONTIER IN THE AGRICULTURAL SECTOR. AN OUTLOOK.

Eugenio J. Cap[7]

XECUTIVE SUMMARY

Should all farmers implement all currently available technologies, the agricultural sector of Argentina would increase its output by not less than 60%, measured by its total production value. That figure represents an additional 16 million tons of grains and oilseeds and 5 million tons of beef (liveweight) per year[8]. A significant number of restrictions that slow down the rate of adoption of productivity-enhancing innovations are being steadily eased, either as a consequence of deliberate government policies or due to the dynamics of the private sector itself. The most resilient of those restrictions is the lack of operating capital. Innovative arrangements are making it possible for groups of farmers to achieve, through resource and factor-pooling, economies of scale that drive down operating costs and allow for a higher level of input utilization, with no significant increases in the cash-flow requirements. The government plays a catalytic role in this process. In addition, it provides highly skilled technical assistance to optimize the farmers' production functions. Simultaneously, new actors, most of them with good access to sources of capital, are getting into intensive precision-farming. Innovative farmers, banks, food processing industries, supermarkets and other investors (domestic and foreign), are changing the picture of the sector at an increasing rate. Should this trend continue, and there is every reason to support this assumption, the potential for a major shift in the supply schedule of foodstuffs will be well within reach by the end of this century.The startup of MERCOSUR, on January 1st 1995, has created a free-trade and customs union zone that integrates four economies (Argentina, Brazil, Paraguay and Uruguay) that make up a combined gross product of about one trillion US dollars. MERCOSUR is made up of food exporters, and after accounting for intra-zone trade, the block still shows a very large net surplus, which it is likely to grow over the long run, as a consequence of both, domestic productivity increases due to technological innovations at the domestic level and as a result of MERCOSUR-wide specialization and market-driven divisions of labor in the agricultural sector.

By early next century MERCOSUR will have, under a moderately optimistic scenario[9], a sustainable yearly excess supply of 6.7 million tons of wheat, 11.8 million tons of corn, 15.8 million tons of soybeans, 5 million tons of sunflower and 550 thousand tons of beef.

For decades and due to the stiff competition from the treasuries of the US and Western Europe, coupled with domestic macroeconomic policies strongly biased in favor of protected industrial sectors, Argentine farmers were in no position to embark in high-input schemes. That means that their production systems have traditionally been (not always by choice), ecologically sensitive, especially with regard to soil and water pollution and toxic residues on foodstuffs. The world agricultural trade picture is slowly changing in favor of non-protectionist producers (Uruguay GATT Round, progressive dismantling of subsidies due to high fiscal costs, etc.). Thus, in search of competitiveness on a more leveled playing field, and learning from other nations' errors, Argentina will very likely become a dependable large scale supplier of high quality (nutrition- and health-wise) food products, ranging from commodities to sophisticated processed goods, on a sustainable basis, thanks to its state-of-the-art resource base management capabilities. To that effect, unprecedented institutional innovations are in the process of being implemented within its agricultural research and development system, involving a wide array of actors, from farm input suppliers to the food industry. These new arrangements will

[7] Ingeniero Agrónomo, Ms.Sc., Ph.D. Director of Strategic Planning. INTA (National Institute of Agricultural Technology).
[8] For a summary of estimations on selected commodities, see Table 1.
[9] Scenario **C** as defined in Table 1.

enhance the industry's global competitiveness, given that the consumer (domestic and foreign) has become the subject around whom the generation and transfer of new agricultural technology will revolve.

Table 1.a: Impact on six selected crops of the adoption by farmers of currently available technology in three alternatives scenarios, for a simulation horizon of 5 years.

Item	Base year (1995)		Scenarios for year 2000		
			A [1]	B [2]	C [3]
WHEAT (4,887,000 ha)	Production (000 t) Yield (t/ha) Increase in production (000 t)	9,651.8 1.98 0	11,941.6 2.44 2,289.8	13,893.3 2.84 4,241.5	20,448.3 4.20 10,796.4
CORN (2,756,480 ha)	Production (000 t) Yield (t/ha) Increase in production (000 t)	10,281.7 3.73 0	12,707.6 4.61 2,420.4	14,758.8 5.35 4,471.6	18,378.4 6.70 8,091.3
SOYBEAN (5,664,811 ha)	Production (000 t) Yield (t/ha) Increase in production (000 t)	11,408.9 2.01 0	14,131.4 2.49 2,722.5	16,410.7 2.90 5,001.8	16,948.1 3.00 5,539.2
SUNFLOWER (2,135,951 ha)	Production (000 t) Yield (t/ha) Increase in production (000 t)	3,876.7 1.82 0	4,819.2 2.26 942.5	5,208.3 2.44 1,331.5	5,544.9 2.60 1,668.2
COTTON (710,594 ha)	Production (000 t) Yield (t/ha) (unprocessed fiber) Increase in production (000 t)	1,041.6 1.47 0	1,290.4 1.82 248.8	1,499.5 2.11 457.9	1,700.4 2.40 658.8
POTATO (103,305 ha)	Production (000 t) Yield (t/ha) Increase in production (000 t)	2,362 22.87 0	2,967 28.72 604	3,431 33.21 1,069	4,489 43.90 2,126

The average yield increases by:

[1] Scenario A: 10% in LTL (Low tech level), 20% in MTL (Medium tech level) and 30% in HTL (High tech level).

[2] Scenario B: 30% in LTL, 40% in MTL and 50% in HTL (for sunflower: 20, 30 and 40 % respectively).

[3] Scenario C: The productivity gap is closed. The average national yield reaches the values currently observed in demonstration plots or equivalent (weighted averages).

Table 1.b: Impact on productivity indicators of the predominant beef production systems of the adoption by farmers of currently available technology in three alternatives scenarios, for a simulation horizon of 10 years.

Item	Base year (1995)		Scenarios for year 2005		
			A (1)	B (2)	C (3)
BEEF Breeding	Production (000 t)	1,472.6	1,837.6	2,139.4	3,421.8
	Yield (kg/ha/year) (liveweight)	50	63	73	118
(29,018,129 ha)	Increase in production (000 t)	0	364.9	666.7	1,949.2
BEEF Breeding & fattening	Production (000 t)	2,188.4	2,742.4	3,194.4	4,791.7
	Yield (kg/ha/year) (liveweight)	70	88	103	155
(30,927,539 ha)	Increase in production (000 t)	0	554.0	1,006.0	2,603.3
BEEF Fattening	Production (000 t)	1,141.1	1,417.7	1,652.6	2,535.9
	Yield (kg/ha/year) (liveweight)	149	185	215	331
(7,656,460 ha)	Increase in production (000 t)	0	276.6	511.5	1,394.8

The average yield increases by:

(1) Scenario A: 10% in LTL (Low tech level), 20% in MTL (Medium tech level) and 30% in HTL (High tech level).
(2) Scenario B: 30% in LTL, 40% in MTL and 50% in HTL.
(3) Scenario C: The productivity gap is closed. The average national yield reaches the values currently observed in demonstration plots or equivalent (weighted averages).

INTRODUCTION

The agricultural sector of Argentina can be characterized (globally) as an underperformer when comparisons are made on the basis of physical productivity (yields) with other large producers. A combination of failed past domestic macroeconomic policies and the gross distortions introduced in the world markets by protectionism should be assigned most of the blame.

However, things are changing rather rapidly in both arenas. Radical reforms have been implemented by the National Government, including wide deregulation, virtual elimination of both tariff and non-tariff barriers to free-trade, structural reform, fiscal discipline and price stability. At the same time, the subject of trade in agricultural products, a virtual taboo in international negotiations for decades, was finally included in the Uruguay Round agreements that lead to the implementation of the World Trade Organization. The relevant issue is no longer **if** but **when** will the web of government interventions in the international markets of agricultural goods be eased to the point where it will no longer play a significant role in world trade.

The concept of "underperformance" is closely associated with that of unrealized potential. A previous study on the subject[10] estimated the magnitude of that potential. The results are astonishing: by simply adopting currently available technologies (field tested and adjusted to the pertinent

[10] Cap, E., Castronovo, A. and Miranda, O. (1993). **Competivitidad del Sector Agropecuario Argentino. Análisis comparativo de niveles de producción y de rendimiento** (Competitiveness of the Argentine Agricultural Sector. A national and international comparative analysis of production levels and yields). INTA. Dirección Nacional Asistente de Planificación. Dirección de Planificación Estratégica. Buenos Aires, Argentina.

agroecological regions), the total output of the agricultural sector would increase by some 60% in value[11]. When the generation and implementation of **new** productivity-enhancing technology (currently in different stages within the R&D "pipeline") is introduced into the picture, those numbers reach significantly higher levels.

A PROSPECTIVE ANALYSIS

The above mentioned study on unrealized potential was based on a previous one[12], which made it possible to characterize production systems based on the technological level of farms, classified into three distinctive groups: low-, medium- and high-tech. The dynamics of the adoption of productivity-enhancing technologies was studied with some detail and a simulation model (Surplus by Adoption of Technology -SAT-), and a computer program (SIGMA V 1.1) were developed for the specific purpose of estimating the potential impact on total output of the generation and diffusion of technology at the farm level[13]. The theoretical details of the model have been summarized in Annex I. A number of simulations was run using SIGMA v 1.1 for some selected tradable commodities, under three alternative scenarios. The most optimistic one (C), assumes that after 5 years[14], farm productivity will reach, on average, the level currently reported for demonstration plots. In all cases and to keep the analysis on the conservative side, it is assumed that no new technologies will be made available during that period. The results of the runs have been summarized in Tables 2 through 10

WHEAT

Table 2a. Estimated increases in yield, in three scenarios for the year 2000.

Technological Level	Yield (t/ha)			
	Base Year (1995)	Scenarios for year 2000		
		A (1)	B (2)	C (3)
LTL	1.40	1.54	1.82	4.20
MTL	2.10	2.52	2.94	4.20
HTL	2.70	3.51	4.05	4.20
National Avrg.	1.98	2.44	2.84	4.20
Increment (%)		23.72	43.95	111.86

(1) Scenario A: The average yield increases (in 5 years) by 10% in LTL, by 20% in MTL and by 30% in HTL.

(2) Scenario B: The average yield increases (in 5 years) by 30% in LTL, by 40% in MTL and by 50% in HTL.

(3) Scenario C: The productivity gap is closed. The average national yield reaches (in 5 years) the values currently observed in demonstration plots or equivalent (weighted averages).

[11] This estimate was made using 1993 world prices for tradable commodities and it would very likely be higher should current prices be used.

[12] Cap E. et al (1993). **Perfil Tecnológico de la Producción Agropecuaria Argentina** (Technological Profile of the Argentine Agricultural Production). INTA. Dirección Nacional Asistente de Planificación. Dirección de Planificación Estratégica. 2 Vol. Buenos Aires, Argentina.

[13] Cap, E. and Miranda, O. (1994). **Un modelo de simulación para estimar el impacto de la investigación y transferencia de tecnología agropecuaria** (A simulation model for impact assessment of the generation and diffusion of agricultural technology). INTA. Dirección Nacional Asistente de Planificación. Dirección de Planificación Estratégica. Buenos Aires, Argentina.

Table 2b. Impact flow (total output and average national yield).

Year	Output [4] (000 t)			Increment (000 t)			Yield (t/ha)		
	A	B	C	A	B	C	A	B	C
Year 0=1995	9,651.8	9,651.8	9,651.8	0	0	0	1.98	1.98	1.98
Year 1=1996	10,247.9	10,777.2	12,619.9	596.1	1,125.4	2,968.1	2.10	2.21	2.58
Year 2=1997	10,780.7	11,774.9	15,207.1	1,128.9	2,123.1	5,555.3	2.21	2.41	3.11
Year 3=1998	11,324.1	12,791.6	17,824.9	1,672.3	3,139.8	8,173.1	2.32	2.62	3.65
Year 4=1999	11,710.9	13,497.0	19,566.4	2,059.1	3,845.2	9,914.6	2.40	2.76	4.00
Year 5=2000	11,941.6	13,893.3	20,448.3	2,289.8	4,241.5	10,796.4	2.44	2.84	4.20

[4] *Estimates for 4,887,000 ha.*

CORN

Table 3a. Estimated increases in yield, in three scenarios for the year 2000.

Technological Level	Yield (t/ha)			
	Base Year (1995)	Scenarios for year 2000		
		A [1]	B [2]	C [3]
LTL	2.90	3.19	3.77	6.70
MTL	3.70	4.44	5.18	6.70
HTL	4.50	5.85	6.75	6.70
National Avrg.	3.73	4.61	5.35	6.70
Increment (%)		23.53	43.47	78.65

[1] Scenario A: The average yield increases (in 5 years) by 10% in LTL, by 20% in MTL and by 30% in HTL.

[2] Scenario B: The average yield increases (in 5 years) by 30% in LTL, by 40% in MTL and by 50% in HTL.

[3] Scenario C: The productivity gap is closed. The average national yield reaches (in 5 years) the values currently observed in demonstration plots or equivalent (weighted averages).

Table 3b. Impact flow (total output and average national yield).

Year	Output [4] (000 t)			Increment (000 t)			Yield (t/ha)		
	A	B	C	A	B	C	A	B	C
Year 0=1995	10,287.1	10,287.1	10,287.1	0	0	0	3.73	3.73	3.73
Year 1=1996	10,931.6	11,492.5	12,516.1	644.4	1,205.3	2,228.9	3.97	4.17	4.54
Year 2=1997	11,501.6	12,553.0	14,457.0	1,214.5	2,265.8	4,169.9	4.17	4.55	5.24
Year 3=1998	12,081.1	13,630.3	16,419.5	1,793.9	3,343.1	6,132.3	4.38	4.94	5.96
Year 4=1999	12,482.4	14,364.0	17,722.1	2,195.3	4,076.8	7,434.9	4.53	5.21	6.43
Year 5=2000	12,707.6	14,758.8	18,378.4	2,420.4	4,471.6	8,091.3	4.61	5.35	6.70

[4] *Estimates for 2,756,480 ha.*

[14] In the case of beef, the same process is assumed to take 10 years.

SOYBEAN

Table 4a. Estimated increases in yield, in three scenarios for the year 2000.

Technological Level	Yield (t/ha)			
	Base Year (1995)	Scenarios for year 2000		
		A[1]	B [2]	C [3]
LTL	1.50	1.65	1.95	3.00
MTL	2.00	2.40	2.80	3.00
HTL	2.40	3.12	3.60	3.00
National Avrg.	2.01	2.49	2.90	3.00
Increment (%)		23.86	43.84	48.55

[1] Scenario A: The average yield increases (in 5 years) by 10% in LTL, by 20% in MTL and by 30% in HTL.

[2] Scenario B: The average yield increases (in 5 years) by 30% in LTL, by 40% in MTL and by 50% in HTL.

[3] Scenario C: The productivity gap is closed. The average national yield reaches (in 5 years) the values currently observed in demonstration plots or equivalent (weighted averages).

Table 4b. Impact flow (total output and average national yield).

Year	Output [4] (000 t)			Increment (000 t)			Yield (t/ha)		
	A	B	C	A	B	C	A	B	C
Year 0=1995	11,408.9	11,408.9	11,408.9	0	0	0	2.01	2.01	2.01
Year 1=1996	12,132.0	12,754.4	12,936.7	723.1	1,345.5	1,527.8	2.14	2.25	2.28
Year 2=1997	12,772.6	13,939.7	14,265.9	1,363.6	2,530.8	2,857.0	2.25	2.46	2.52
Year 3=1998	13,424.4	15,144.7	15,607.9	2,015.5	3,735.8	4,198.9	2.37	2.67	2.76
Year 4=1999	13,876.8	15,967.0	16,498.7	2,467.9	4,558.1	5,089.7	2.45	2.82	2.91
Year 5=2000	14,131.4	16,410.7	16,948.1	2,722.5	5,001.8	5,539.2	2.49	2.90	3.00

[4] *Estimates for 5,664,811 ha.*

SUNFLOWER

Table 5a. Estimated increases in yield, in three scenarios for the year 2000.

Technological Level	Yield (t/ha)			
	Base Year (1995)	Scenarios for year 2000		
		A[1]	B [2]	C [3]
LTL	1.30	1.43	1.56	2.60
MTL	1.80	2.16	2.34	2.60
HTL	2.30	2.99	3.22	2.60
National Avrg.	1.82	2.26	2.44	2.60
Increment (%)		24.31	34.35	43.03

[1] Scenario A: The average yield increases (in 5 years) by 10% in LTL, by 20% in MTL and by 30% in HTL.

[2] Scenario B: The average yield increases (in 5 years) by 20% in LTL, by 30% in MTL and by 40% in HTL.

[3] Scenario C: The productivity gap is closed. The average national yield reaches (in 5 years) the values currently observed in demonstration plots or equivalent (weighted averages).

Table 5b. Impact flow (total output and average national yield).

Year	Output [4] (000 t)			Increment (000 t)			Yield (t/ha)		
	A	B	C	A	B	C	A	B	C
Year 0=1995	3,876.7	3,876.7	3,876.7	0	0	0	1.82	1.82	1.82
Year 1=1996	4,125.2	4,231.2	4,337.5	248.5	354.5	460.8	1.93	1.98	2.03
Year 2=1997	4,346.1	4,544.9	4,738.0	469.3	668.2	861.2	2.03	2.13	2.22
Year 3=1998	4,570.9	4,864.1	5,141.5	694.1	987.4	1,264.8	2.14	2.28	2.41
Year 4=1999	4,728.4	5,084.9	5,409.4	851.7	1,208.2	1,532.7	2.21	2.38	2.53
Year 5=2000	4,819.2	5,208.3	5,544.9	942.5	1,331.5	1,668.2	2.26	2.44	2.60

[4] Estimates for 2,135,951 ha.

COTTON

Table 6a. Estimated increases in yield, in three scenarios for the year 2000.

Technological Level	Yield (unprocessed fiber: t/ha)			
	Base Year (1995)	Scenarios for year 2000		
		A [1]	B [2]	C [3]
LTL	1.00	1.10	1.30	2.40
MTL	1.50	1.80	2.10	2.40
HTL	1.80	2.34	2.70	2.40
National Avrg.	1.47	1.82	2.11	2.40
Increment (%)		23.89	43.97	63.25

[1] Scenario A: The average yield increases (in 5 years) by 10% in LTL, by 20% in MTL and by 30% in HTL.

[2] Scenario B: The average yield increases (in 5 years) by 30% in LTL, by 40% in MTL and by 50% in HTL.

[3] Scenario C: The productivity gap is closed. The average national yield reaches (in 5 years) the values currently observed in demonstration plots or equivalent (weighted averages).

Table 6b. Impact flow (total output and average national yield).

Year	Output [4] (000 t)			Increment (000 t)			Yield (t/ha)		
	A	B	C	A	B	C	A	B	C
Year 0=1995	1,041.6	1,041.6	1,041.6	0	0	0	1.47	1.47	1.47
Year 1=1996	1,107.2	1,164.1	1,223.1	65.5	122.5	181.4	1.56	1.64	1.72
Year 2=1997	1,165.5	1,272.3	1,381.1	123.9	230.7	339.5	1.64	1.79	1.94
Year 3=1998	1,224.9	1,382.5	1,540.7	183.3	340.9	499.1	1.72	1.95	2.17
Year 4=1999	1,266.5	1,458.1	1,646.8	224.9	416.5	605.2	1.78	2.05	2.32
Year 5=2000	1,290.4	1,499.5	1,700.4	248.8	457.9	658.8	1.82	2.11	2.40

[4] *Estimates for 710,594 ha.*

POTATO

Table 7a. Estimated increases in yield, in three scenarios for the year 2000.

Technological Level	Yield (t/ha)			
	Base Year (1995)	Scenarios for year 2000		
		A [1]	B [2]	C [3]
LTL	17.70	19.47	23.01	43.90
MTL	20.90	25.08	29.26	43.90
HTL	25.50	33.15	38.25	43.90
National Avrg.	22.87	28.72	33.21	43.90
Increment (%)		25.61	45.26	90.04

[1] Scenario A: The average yield increases (in 5 years) by 10% in LTL, by 20% in MTL and by 30% in HTL.

[2] Scenario B: The average yield increases (in 5 years) by 30% in LTL, by 40% in MTL and by 50% in HTL.

[3] Scenario C: The productivity gap is closed. The average national yield reaches (in 5 years) the values currently observed in demonstration plots or equivalent (weighted averages).

Table 7b. Impact flow (total output and average national yield).

Year	Output [4] (000 t)			Increment (000 t)			Yield (t/ha)		
	A	B	C	A	B	C	A	B	C
Year 0=1995	2,362	2,362	2,362				22.87	22.87	22.87
Year 1=1996	2,526	2,655	2,951	164	292	589	24.46	25.70	28.57
Year 2=1997	2,670	2,910	3,463	308	548	1,101	25.85	28.17	33.52
Year 3=1998	2,816	3,168	3,979	454	806	1,617	27.26	30.67	38.52
Year 4=1999	2,914	3,341	4,319	552	979	1,957	28.22	32.35	41.82
Year 5=2000	2,967	3,431	4,489	604	1,069	2,126	28.72	33.21	43.90

[4] *Estimates for 103,305 ha*

BEEF
(Breeding)

Table 8a. Estimated increases in yield, in three scenarios for the year 2005.

Technological Level	Yield (kg/ha/year) (liveweight)			
	Base Year (1995)	Scenarios for year 2005		
		A [1]	B [2]	C [3]
LTL	36	38	41	77
MTL	51	56	61	85
HTL	74	85	93	97
National Avrg.	51	57	62	85
Increment (%)		12.40	22.77	67.97

[1] Scenario A: The average yield increases (in 10 years) by 10% in LTL, by 20% in MTL and by 30% in HTL.

[2] Scenario B: The average yield increases (in 10 years) by 30% in LTL, by 40% in MTL and by 50% in HTL.

[3] Scenario C: The productivity gap is closed. The average national yield reaches (in 10 years) the values currently observed in demonstration plots or equivalent (weighted averages).

Table 8b. Impact flow (total output and average national yield).

Year	Output [4] (000 t)			Increment (000 t)			Yield (kg/ha/year)		
	A	B	C	A	B	C	A	B	C
Year 0=1995	1,472.6	1,472.6	1,472.6	0	0	0	50	50	50
Year 1=1996	1,483.2	1,489.0	1,509.9	10.6	16.3	37.2	51	51	52
Year 2=1997	1,497.4	1,512.3	1,569.8	24.8	39.7	97.1	51	52	54
Year 3=1998	1,524.9	1,561.7	1,713.5	52.2	89.1	240.8	52	53	59
Year 4=1999	1,577.1	1,659.3	2,012.1	104.4	186.7	539.4	54	57	69
Year 5=2000	1,655.3	1,807.9	2,473.6	182.6	335.2	1,000.9	57	62	85
Year 6=2001	1,734.3	1,957.9	2,937.8	261.6	485.2	1,465.2	59	67	101
Year 7=2002	1,788.2	2,058.6	3,242.7	315.5	585.9	1,770.0	61	70	111
Year 8=2003	1,817.6	2,111.5	3,393.4	344.9	638.8	1,920.7	62	72	116
Year 9=2004	1,829.8	2,129.5	3,418.0	357.1	656.9	1,945.4	63	73	117
Year 10=2005	1,837.6	2,139.4	3,421.8	364.9	666.7	1,949.2	63	73	117

[4] *Estimates for 29,018,129 ha.*

BEEF
(Breeding/Fattening)

Table 9a. Estimated increases in yield, in three scenarios for the year 2005.

Technological Level	Yield (kg/ha/year) (liveweight)			
	Base Year	Scenarios for year 2005		
	(1995)	A [1]	B [2]	C [3]
LTL	46	48	53	101
MTL	78	86	94	118
HTL	109	126	137	133
National Avrg.	71	80	87	114
Increment (%)		12.66	23.10	61.28

[1] Scenario A: The average yield increases (in 10 years) by 10% in LTL, by 20% in MTL and by 30% in HTL.

[2] Scenario B: The average yield increases (in 10 years) by 30% in LTL, by 40% in MTL and by 50% in HTL.

[3] Scenario C: The productivity gap is closed. The average national yield reaches (in 10 years) the values currently observed in demonstration plots or equivalent (weighted averages).

Table 9b. Impact flow (total output and average national yield).

Year	Output [4] (000 t)			Increment (000 t)			Yield (kg/ha/year)		
	A	B	C	A	B	C	A	B	C
Year 0=1995	2,188.4	2,188.4	2,188.4	0	0	0	70	70	70
Year 1=1996	2,206.0	2,214.7	2,239.3	17.5	26.2	50.8	71	71	72
Year 2=1997	2,228.8	2,251.3	2,320.5	40.3	62.9	132.0	72	72	75
Year 3=1998	2,270.9	2,326.3	2,513.3	82.5	137.8	324.9	73	75	81
Year 4=1999	2,349.1	2,472.4	2,912.8	160.7	283.9	724.3	75	79	94
Year 5=2000	2,465.5	2,693.9	3,529.4	277.1	505.5	1,341.0	79	87	114
Year 6=2001	2,583.2	2,917.8	4,149.4	394.8	729.3	1,961.0	83	94	134
Year 7=2002	2,664.3	3,069.2	4,556.7	475.9	880.7	2,368.3	86	99	147
Year 8=2003	2,709.7	3,150.0	4,758.3	521.2	961.6	2,569.9	87	101	153
Year 9=2004	2,729.2	3,178.0	4,788.2	540.7	989.6	2,599.8	88	102	154
Year 10=2005	2,742.4	3,194.4	4,791.7	554.0	1,006.0	2,603.3	88	103	154

[4] Estimates for 30,927,539 ha.

BEEF
(Fattening)

Table 10a. Estimated increases in yield, in three scenarios for the year 2005.

Technological Level	Yield (kg/ha/year) (liveweight)			
	Base Year	Scenarios for year 2005		
	(1995)	A [1]	B [2]	C [3]
LTL	103	108	118	217
MTL	165	182	199	250
HTL	217	251	274	278
National Avrg.	149	167	183	243
Increment (%)		12.14	22.56	62.90

[1] Scenario A: The average yield increases (in 10 years) by 10% in LTL, by 20% in MTL and by 30% in HTL.

[2] Scenario B: The average yield increases (in 10 years) by 30% in LTL, by 40% in MTL and by 50% in HTL.

[3] Scenario C: The productivity gap is closed. The average national yield reaches (in 10 years) the values currently observed in demonstration plots or equivalent (weighted averages).

Table 10b. Impact flow (total output and average national yield).

Year	Output [4] (000 t)			Increment (000 t)			Yield (kg/ha/year)		
	A	B	C	A	B	C	A	B	C
Year 0=1995	1,141.1	1,141.1	1,141.1	0	0	0	149	149	149
Year 1=1996	1,149.6	1,154.1	1,168.1	8.5	13.0	27.0	150	150	152
Year 2=1997	1,160.8	1,172.5	1,211.3	19.7	31.4	70.2	151	153	158
Year 3=1998	1,181.8	1,210.5	1,314.4	40.7	69.4	173.3	154	158	171
Year 4=1999	1,221.1	1,285.2	1,528.4	79.9	144.0	387.2	159	167	199
Year 5=2000	1,279.6	1,398.6	1,858.8	138.5	257.4	717.7	167	182	242
Year 6=2001	1,338.9	1,513.2	2,191.3	197.8	372.1	1,050.1	174	197	286
Year 7=2002	1,379.7	1,590.6	2,409.7	238.6	449.5	1,268.6	180	207	314
Year 8=2003	1,402.4	1,631.8	2,517.9	261.3	490.7	1,376.8	183	213	328
Year 9=2004	1,411.6	1,645.0	2,534.0	270.5	503.9	1,392.9	184	214	330
Year 10=2005	1,417.7	1,652.6	2,535.9	276.6	511.5	1,394.8	185	215	331

[4] Estimates for 7,656,460 ha.

A DISCUSSION ON THE LIKELIHOOD OF POSSIBLE OUTCOMES

Based upon the information available at this point in time, the pessimistic scenario (A) should be considered the least likely to occur. The dynamics of the ongoing transformation process referred to in an earlier section of this document suggest that scenario (C) should be associated with a high probability of occurrence, for all six field crops. This is so since the yields recorded for demonstration plots (or equivalent) are based on extensive farming systems. The yields associated with the "best practice" production function under intensive farming conditions (irrigation + fertilization) are considerably higher, reaching, for example, levels of up to 15 t/ha in corn and 7 t/ha in wheat. Thus this outcome would be the result of the combination of two processes developing simultaneously: an uneven (across tech levels) adoption of available technological innovations (in progress for some time) and the upward shift of the production function, associated especially with the HTL farms, beyond the present state-of-the-art possibilities frontier, due to new technologies either not yet available or not tested for all relevant agroecological conditions. This phenomenon is much more recent and thus its impact cannot be captured by time-series data. It is worth noting that simulations involving R&D processes are less dependable since one more dimension of uncertainty (the potential productivity increase) is added and for that reason they have not been included in this document. With that *caveat* in mind, it is worth noting that, should this variable be considered, an even more optimistic outlook than scenario (C) could very well be built.

In the case of beef, instead, the maximum likelihood should be associated with scenario (B). This is attributable to bottlenecks identified with installed capacity constraints at the industrial stage, that would prevent -through a price signals mechanism-, the full expression of the agroecological and technological potentials at the farm level. Should the rate of investments in export-oriented processing facilities increase significantly over the very near future, the whole sector would be in a position to improve its overall performance, which would be reflected in growth of its export potential.

IMPLICATIONS FOR ARGENTINA'S FOREIGN TRADE

Table 11 summarizes the impact in terms of excess supply (export capacity) at the national level for the year 2000, of the realization of the three scenarios (A, B and C). The figure on domestic consumption at that time has been calculated by assuming that demand will increase by 10% (from the values of 1995) over the relevant five-year period, for all items with the exception of beef, which stays at the 1995 level (although it is currently trending downward).

Table 11. **ARGENTINA**: estimated total output, domestic consumption and excess supply of selected commodities in the year 2000 for three scenarios (in 000t).

Item	Output			Domestic	Excess Supply		
	A	B	C	demand[1]	A	B	C
WHEAT	11,941	13,893	20,448	4,950	6,991	8,943	15,498
CORN	12,707	14,758	18,378	4,400	8,307	10,358	13,978
SOYBEAN	14,131	16,410	16,948	600	13,531	15,810	16,348[2]
SUNFLOWER	4,819	5,208	5,545	530	4,289	4,678	5,015[3]
BEEF [4]	2,970	3,245	4,324	2,250	720	995	2,074
COTTON [5]	430	500	566	110	320	390	456
POTATO	2,967	3,431	4,489	2,002	965	1,429	2,487

[1] Source: *Mercosur Agropecuario. Actualidad y Perspectivas*. SAGyP. Dirección de Economía Agraria y Asuntos Internacionales. Año 1. N^0 1. Buenos Aires, Argentina. January 1995 and Rodríguez, A., *CIARA Report*. Buenos Aires, Argentina, August 1995.

(2) Of this total approximately 9.5 million t of grain will be exported as flour and some 2 million as oil.
(3) Of this total approximately 4 million t of grain will be exported processed as flour and oil.
(4) Packing house-processed weight (a conversion factor of 0.55 x liveweight was used).
(5) Industrial fiber (a conversion factor of 0.33 x unprocessed fiber weight was used).

MERCOSUR AS A NET FOOD EXPORTER

To simplify the analysis, it will be assumed that the agricultural sectors of Argentina and Brazil are, once their outputs and domestic demands are added together, large enough in comparison to the other two partners (Paraguay and Uruguay) to set the trend in terms of excess supply of foodstuffs for the entire customs union. In fact, should it be an error, it would be more in the nature of an underestimation, since Brazil is the only significant agricultural commodity importer of the block.

Table 12 summarizes the excess supply estimated for the year 2000 for Argentina + Brazil, under the three scenarios (A, B and C) as previously defined and for the seven commodities that have been studied with some detail in this document. The excess demand for Brazil in 2000 was estimated by assuming that its domestic demand would increase by 10% from its 1995 level, while its total output remains constant at 1995 levels throughout the 5-year period.

Table 12. MERCOSUR: estimated excess supply of selected commodities in the year 2000 for three scenarios (in 000t).

Item	Argentina Excess Supply			Brazil Excess demand(1)	MERCOSUR Excess Supply		
	A	B	C		A	B	C
WHEAT	6,991	8,943	15,498	8,800	-1,809	143	6,698
CORN	8,307	10,358	13,978	2,200	6,107	8,158	11,778
SOYBEAN	13,531	15,810	16,348	550	12,981	15,260	15,798(2)
SUNFLOWER	4,289	4,678	5,015	60	4,229	4,618	4,955(3)
BEEF (4)	720	995	2,074	440	280	555	1,634
COTTON (5)	320	390	456	330	-10	60	126
POTATO	965	1,429	2,487	220	745	1,209	2,267

(1) Source: *Mercosur Agropecuario. Actualidad y Perspectivas*. SAGyP. Dirección de Economía Agraria y Asuntos Internacionales. Año 1. N^0 1. Buenos Aires, Argentina. January 1995 and Rodríguez, A., *CIARA Report*. Buenos Aires, Argentina, August 1995.
(2) Of this total approximately 9.5 million t of grain will be exported as flour and some 2 million as oil.
(3) Of this total approximately 4 million t of grain will be exported processed as flour and oil.
(4) Packing house-processed weight (a conversion factor of 0.55 x liveweight was used).
(5) Industrial fiber (a conversion factor of 0.33 x unprocessed fiber weight was used).

Even in the least optimistic scenario -(A)-, MERCOSUR appears as a net exporter for 5 of the 7 commodities considered. Wheat would be in excess demand by some 1.8 million tons and cotton by 10 thousand tons. In the case of wheat, however, since Uruguay is a wheat exporter, the net result could be considered as neutral. Nevertheless, it must be kept in mind that (A) is also the scenario with the least likelihood, as discussed above. Considering the most likely scenario (B for beef and C for the rest), starting in the year 2000, MERCOSUR would be in a position to supply to the world markets some 40 million tons of cereals and oilseeds (grain + processed products), over 500 thousand tons of

beef, 126 thousand tons of cotton and almost 2.3 million tons of potatoes[15]. As mentioned above, total output for Brazil was assumed to remain constant at 1995 levels throughout the 5-year period. That is not a realistic assumption, since productivity gains at the farm level are being reported in Brazil for most crops. This again would induce to an error by underestimation. Hence, the prospects for MERCOSUR to become a major exporter of agricultural commodities are exceedingly promising.

ARGENTINE AGRIBUSINESS AND THE ENVIRONMENT

For decades and due to the stiff competition from the treasuries of the US and Western Europe, coupled with domestic macroeconomic policies strongly biased in favor of protected industrial sectors, Argentine farmers were in no position to embark in high-input schemes. That means that their production systems have traditionally been (not always by choice), ecologically sensitive, especially with regard to soil and water pollution and toxic residues on foodstuffs. The world agricultural trade picture is slowly changing in favor of non-protectionist producers (Uruguay GATT Round, progressive dismantling of subsidies due to high fiscal costs, etc.). Thus, in search of competitiveness on a more leveled playing field, and learning from other nations' errors, Argentina will very likely become a dependable large scale supplier of high quality (health-wise) food products, ranging from commodities to sophisticated processed goods, on a sustainable basis, thanks to its state-of-the-art resource base management capabilities. To that effect, unprecedented institutional innovations are in the process of being implemented within its agricultural research and development system, involving a wide array of actors, from farm input suppliers to the food industry. These new arrangements will enhance the industry's global competitiveness, given that the consumer (domestic and foreign) has become the subject around whom the generation and transfer of new agricultural technology will revolve.

[15] All estimates are based on 1992/93 distribution of agricultural land. Changes in the vector of output relative prices would induce substitution between items within the same production possibilities frontier (*e.g.* beef <=> grains; corn <=> soybean; etc.).

ANNEX I

EX-ANTE ANALYSIS OF AGRICULTURAL RESEARCH IMPACT:
THE SURPLUS BY ADOPTION OF TECHNOLOGY (SAT) MODEL.[16]

1.INTRODUCTION

The permanent desire to reduce the uncertainty associated with the future, has created a demand for tools to assist decision-makers at different levels in the process of agricultural research resource allocation.

There exists a significant body of previous work related to *ex-ante* evaluation of returns to investments in agricultural research (Piñeiro, 1984; Pinstrup-Anderson, 1977; Scobie, 1979; Davis, 1984; Davis, Oram and Ryan, 1987; da Cruz, de Castro, Tollini y Sugai, 1988; Evenson, 1988). The most commonly used approach is that of the estimation of the economic (producer + consumer) surplus attainable as a consequence of supply function shifts attributable to the adoption of technological innovations.

The study to be presented in this paper applies a methodology that differs considerably from the most commonly used ones. It assumes that a single aggregate supply curve for agricultural products does not accurately describe the reality, especially in LDCs. Should this assumption be correct, the observed variability in the universe of agricultural firms should be taken into account before attempting to evaluate the consequences of alternative decisions concerning investments in generation and transfer of agricultural technology.

2. THE MODEL.

SAT is a tool that consists of a mathematical simulation model that allows for *ex-ante* analysis of aggregate sector impact (measured as changes in total output) of alternative strategies for agricultural research resource allocation. **SAT** estimates how much more would be produced, compared to current levels projected into a given time horizon, IF SPECIFIC TECHNOLOGIES ARE GENERATED AND TRANSFERRED.

The following assumptions are made:

There exist three technological levels (TL) among farmers of homogeneous agroecological areas: low (LTL), medium (MTL) and high (HTL), respectively associated with a set of techniques, inputs and a resulting productivity indicator (average yield) (see Fig. 1).

16 Based on Cap, E.; Miranda, O.: "An<lisis "*ex-ante*" de impactos de la investigación agrícola en la Argentina para siete rubros productivos en escenarios alternativos" (*Ex-ante* analysis of agricultural research impacts in Argentina for seven productive activities under alternative scenarios). In: ***Actas del Simposio Internacional: La Investigación Agrícola en la Argentina. Impactos y Necesidades de Inversión*** (Proceedings of the International Symposium: Agricultural Research in Argentina. Impacts and Investment needs). Eds.: Cirio, F.; Castronovo, A. 1994. INTA, Bs. As., Argentina.

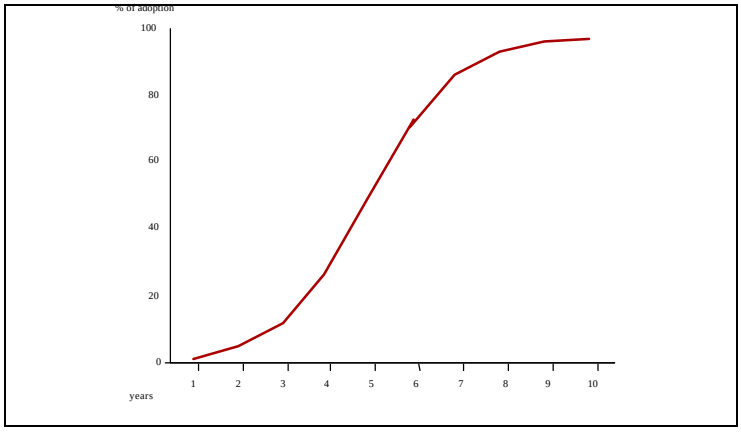

***Figure 1**. Stylized representation of technologies implemented by farmers, for 2 inputs (K and L).*

There exists "upward mobility" among TLs, which is made possible by the adoption of AVAILABLE techniques and inputs, together with the capacity to use them efficiently. This "inter-level mobility" (ILM) rate is defined as the percentage of the area[17] of a given TL that gets "promoted" each year to the next TL, in terms of productivity[18]. This process is represented by a linear function. This mobility is unidirectional, that is, promoted areas cannot be "demoted". The National Agricultural Research System, has the capacity to generate NEW technology. Its (future) adoption by farmers is represented by a non-linear function (sigmoid), its parameters given by the nature of the innovation and the socio-economic profile of the target audience (see Fig. 2).

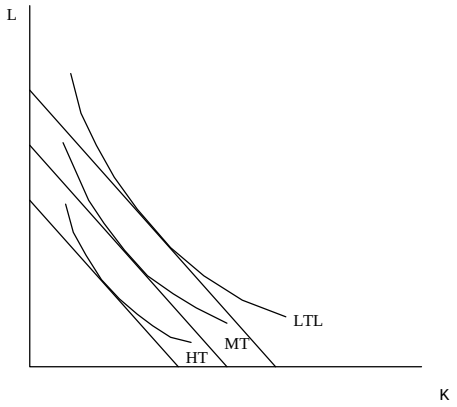

***Figure 2**. Cumulative adoption percentage for an adoption ceiling (K) of 0.99 and an adoption half-time (ƒ) of 4 years.*

[17] Or any other unit of measurement that would be suitable as an indicator of scale of production (i.e., "bee hives" for honey production).

[18] The rate of mobility, such as it has been defined, can be conceived as an indicator of the RATE OF ACCUMULATION OF HUMAN CAPITAL in the agricultural subsector which is being considered. This is so since, to have access to inputs and information on its optimal use is a necessary but not sufficient condition to attain the productivity levels associated with the top TL. To the acquisition of the needed KNOW-HOW (which is not the same thing as having access to the information), we must add an enhanced entrepreneurial ability (including the means to evaluate both downside risks and upside potential together with the willingness to take the risks). This implies a process which is unavoidably slow and accumulative, clearly linked to one of the least studied components of any economic system, which Hayami and Ruttan (1985) call "**cultural endowment**". This cycle of human capital accumulation adds credibility and support to the assumption of the unidirectionality of the phenomenon of inter-level mobility. Although it is acknowledged that micro (i.e., erroneous business decisions) or macroeconomic circumstances (i.e., changes in the price ratios) can lead to a drop in productivity due to the suboptimal utilization of inputs, that does not necessarily imply an involution in the process of human capital accumulation: if the environment returns to its *ex-ante* status, productivity would probably pick up after a brief lag. A parallel could be drawn between this situation and the unutilized capacity of an industry, augmented as a consequence of business cycle-related causes and its incidence on fixed costs.

The model key component consists of a reconstruction of the process of adoption by farmers of technological innovations that shift the isoquant that represents them (as a combination of inputs and factors), achieving a more efficient use of resources, which implies a reduction of production costs. The most significant **implicit** assumption that SAT makes is that the coexistence of the three isoquants or TLs, cannot be satisfactorily explained resorting to analytical tools provided by the neoclassical economic theory, since according to it, if farmers are profit-maximizers, they would all move to the isoquant nearest to the origin (the chosen point on that isoquant would depend on price ratios). This does not imply that the rationality of farmers is being questioned. Instead, it recognizes the existence of barriers associated with incomplete and/or non-existent markets, as well as of restrictions to the adoption of available technology and its optimum utilization, caused by the undersupply of public goods (like infrastructure) or pure private ones (like refrigeration or storage capacity) or mixed ones, like entrepreneurial skills or level of training of farmers.

The **SAT** model is not to be thought of as an alternative to the other ones proposed in the literature, but as a contribution that improves them. It tries to identify and explain the dynamics of two processes that take place at the same time. According to previous studies (Byerlee, D. and Hesse de Polanco, E., 1982), the adoption of a specific innovation occurs at a rate which is considerably higher than the values found for the inter-level mobility (Cap *et al*, 1993). There is another significant difference between these two processes: its mathematical representation (linear for the ILM and non-linear (sigmoid) for the adoption of a single innovation).

The **SAT** model treats the surplus produced in excess of the current output, as a function with the following general expression:

$$E_t = f \| \; x_t^d \; [w\,[\,R\,(Bp)]] \;,\; x_t^p \; [Y^p(tec^p),$$

$$p_t \; ((f(tec^p), K,\; a\,(Bp))], S(tec^d \; e\, D,\; tec^p)\;,\; z \; \|$$

where:

E_t: surplus attained at time **t**.

x_t^d: increase in productivity (yield) at time **t** by tapping into the stock of technology available at time $\mathbf{t_0}$.

w: annual rate of inter-level mobility.

R: restrictions to ILM.

B_p: supply of public goods (extension, infrastructure, macroeconomic policy, etc.).

x_t^p: increase in productivity (yield) at time **t** attributable to the adoption of new technology ($x_t^p > 0$ if $\mathbf{t} >= \mathbf{t_d}$, where $\mathbf{t_d}$ is the time of availability of the technology; $x_t^p = 0$ if $\mathbf{t} < \mathbf{t_d}$).

Y^p: potential productivity of the new technology.

tec^p: non-available technology (to be developed).

tec^d: available technology.

D: stock of available technology.

p_t: level of adoption of tec^p at time **t** ($p_t > 0$ if $\mathbf{t_d} \geq \mathbf{t}$).

f: parameter that measures the time it takes for 50% of farmers to adopt a specific new technology.

K: adoption ceiling, $K \in (0,1]$

a: restrictions to the adoption of a specific technology.

S_{TL}: correction factor for sustainability of the set of technologies used at TL, $S \in (0,1]$

z: vector of random variables.

The problem (**P**) that policy-makers face, can be formulated as follows:

(**P**) *max* E_t *(choosing* B_p, tec^p*)*

subject to restrictions, i.e., budgetary[19]

For this theoretical model, as $\mathbf{E_t}$ approaches its maximum from the left, its partial derivatives are associated with a sign (+ or -), which is consistent with explicit or implicit hypotheses of the model.

$$1.\ \frac{\partial E_t}{\partial x^d} - \frac{\partial x^d}{\partial w} x \frac{\partial w}{\partial R} x \frac{\partial R}{\partial Bp} > 0$$

$$2.\ \frac{\partial E_t}{\partial x^p} x \frac{\partial x^p}{\partial y^p} > 0$$

$$3.\ \frac{\partial E_t}{\partial x^p} - \frac{\partial x^p}{\partial p} x \frac{\partial p}{\partial f} < 0$$

$$4.\ \frac{\partial E_t}{\partial x^p} - \frac{\partial x^p}{\partial p} x \frac{\partial p}{\partial K} > 0$$

$$5.\ \frac{\partial E_t}{\partial x^p} - \frac{\partial x^p}{\partial p} x \frac{\partial p}{\partial a} x \frac{\partial a}{\partial Bp} > 0$$

$$6.\ \frac{\partial E_t}{\partial S} \geq 0 \ if\ S = 1;$$
$$> 0 \ if\ S < 1$$

2.1 EMPIRICAL MODEL

The empirical formulation of the **SAT** model is as follows:

$$VE_T = \sum_{t=0}^{T} \sum_{k=1}^{K} \sum_{i=1}^{3} (\| S_{ik} \ x \ [\ b_{ik}^{d} \ x ((w_{ik}) \ x \ A_{(i-1)kt})]$$

$$+ [\ b_{ik}^{p} \ x (K / (1 + e^{-a(t-f_i)} \ x \ A_{ikt})] \| x \ p_k^{FOB})$$

19 This optimization problem should be analyzed using a piecemeal/second best approach, since neoclassical economics cannot be used due to the violation of its fundamental assumptions. A viable alternative would be to use benefit/cost ratio (B/C) indicators or internal rates of return (IRR) PER RESTRICTION to the inter-level mobility for the available stock of technology and PER SUBJECT MATTER for technologies that are still in the development process.

where:

VE_T: value in US dollars of the additional output at time **T** (simulation horizon). Applying the discount rate to the sequence $\{VE_t\}_0^T$, the Net Present Value (NPV) can be calculated.

t: time period (year).

k: crop or productive activity (K: total # of items).

i: technological level, **i** ∈ [1,2,3], where 1=L, 2=M and 3=H.

S: correction factor for sustainability, **S** ∈ (0,1]

$\mathbf{b}^d$: productivity gap between actual and attainable yields using AVAILABLE TECHNOLOGY, per TL.

A: area dedicated to produce **k**.

$\mathbf{b}^p$: productivity gap between actual and attainable yields using TECHNOLOGY NOT YET AVAILABLE, per TL.

K: adoption ceiling. **K** in (0,1].

e: base of natural logarithms.

a: parameter of the sigmoid function, associated with restrictions to adoption of technology.

f: adoption half-time: number of years elapsed between availability of technology and its adoption by 50% of the farmers.

p^{FOB}: FOB price of item **k**.

NOTE: the first term of the equation allows the estimation of the increase in output, at time **T**, attributable to the adoption of available technology and its optimal use. The second term quantifies the pure effect of NEW TECHNOLOGY (net social benefit).

2.2 REQUIRED INFORMATION

The **SAT** model requires descriptive and prospective input data, as follows:

GENERAL (descriptive)

Yield per **TL**.
Area per **TL**.
Annual inter-level mobility rates (ILMR).
Price elasticity of supply (whenever possible, it should be discriminated by **TL**).

SPECIFIC (prospective)

Importance of the problem to solve or the technical innovation to produce, *i.e.*, yield losses in kg/ha due to a pest or disease (in these cases, information on frequency of occurrence is also required).

Geographical area affected by the problem or to benefit from the new technology.

New state-of-the-art of production technology, should the research be successful, measured in productivity or quality.

Year of availability of the new technology.

Research costs (direct, indirect and labor).

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ANEXO 2

Documentos presentados por los países asiáticos en el Foro de Agricultura y Alimentos del PECC, Beijing, Septiembre 1995.
"Opportunities for growth in the Pacific Food System".
Mr. CHU Hon Fai. Dah chong Hong, Ltd. Hong Kong.
"Food security and market reform".
Dr. FUNING Zhong. College of Economics and Trade. Nanjing Agricultural University. P.R. of China.
"Meeting´s Asia´s changing food requirements".
Prof. LI Weimin. Institute of Agricultural Economics. Chinese Academy of Agricultural Sciences. P.R. of China.
"Sustainable food production an food security in China"
Prof. FANGQUAN, Mei. Vice-president, State Food & Nutrition consultation Commission. Director, Macro Agriculture Research Department, Teh Chinese Academy of Agricultural Sciences.
"Food and agriculture outlook for mainland China".
Prof. KE Bingsheng. Beijing Agricultural University. P.R. of China.
"Vietnam agriculture-achivements and suggestions on calling development investment".
Mr. NGO The Dan. Vice Minister of the Ministry of Agriculture and Food Industry. Vietnam.
"PECC overview speech".
Mr. COYLE William. Leader Asia Iniciative Commercial Agriculture Division. Economic Research Service. United States.

Nº 8

Informe sobre la participación argentina en el Foro de Agricultura y Alimentos del Pacific Economic Cooperation Council.

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