

**South American Crop Protection
and Seed Markets To 2010**

Opportunities, risks, and strategies in a continent
Undergoing dynamic farming change

Management Summary

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MANAGEMENT SUMMARY

A good market is hard to find! Yet for the world's marketers of agrochemicals and seeds, a good market is certainly close at hand - South America!

This report will take you inside the dynamics of this Latin market. How is it growing? What are the problems and the prospects? Which countries will provide the greatest crop protection opportunities? What role will biotechnology play in the future of the South American agriculture market? Although we do not claim to have a crystal ball, we believe that the conclusions and recommendations of this report will be helpful and stimulating to those in the ag input industry.

South America today – 1999

South America today is an exciting place for agriculture. The countries, especially the dominant duo of Brazil and Argentina, are expanding and leading the way into a decade of continued rapid expansion in pesticides, seeds and, most particularly, biotech.

Short-term economic volatility, long term growth

The major economies of Brazil, Argentina, and Chile were hurt by the extension of the far Eastern economic crisis; however even after a devaluation and major concern about a financial meltdown in late 1998 and early 1999, the continent's largest economy – Brazil, 50% of its total GDP – is recovering and appears to be moving toward renewed expansion in the year 2000.

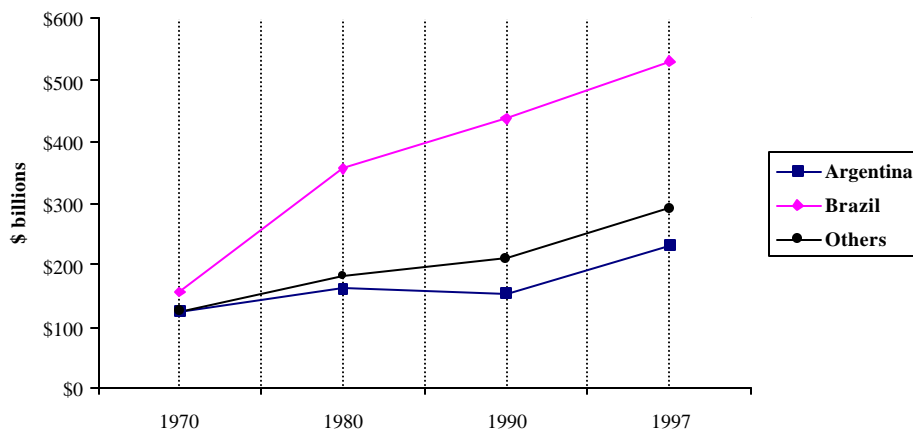
South America's GDP in 1997 stood at \$2.2 trillion, about a quarter of that of the US.

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In the 1990's GDP overall expanded at 4% per year. Brazil and Argentina lead the pack.

Growth in GDP for key South American economies, 1970-1997
(in constant 1990 \$billion)

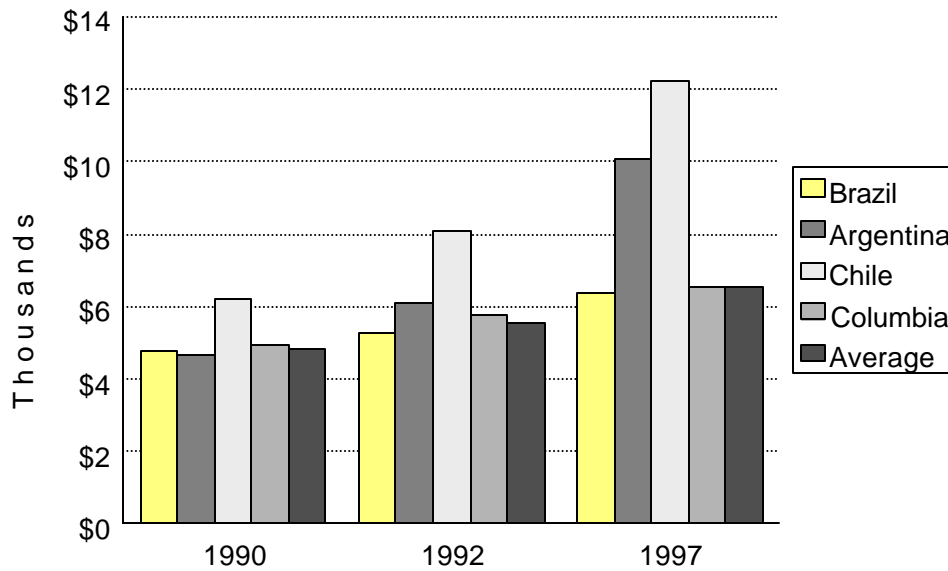


Source: IADB database

Growth has been driven by democratization, economic policy reforms, especially greater fiscal and economic responsibility, and the establishment of the two trading blocs – MERCOSUR and the Andean Pact. These two trading groups have stimulated more unfettered trading by their members – although several still are protective of agriculture – as well as trade expansion with outside countries, especially Europe and the US.

All of this activity has in turn stimulated household income growth and the resulted in positive feedback to the domestic economies.

Figure 1.4: Per capita income growth in South America, 1980-97



Source: IADB database

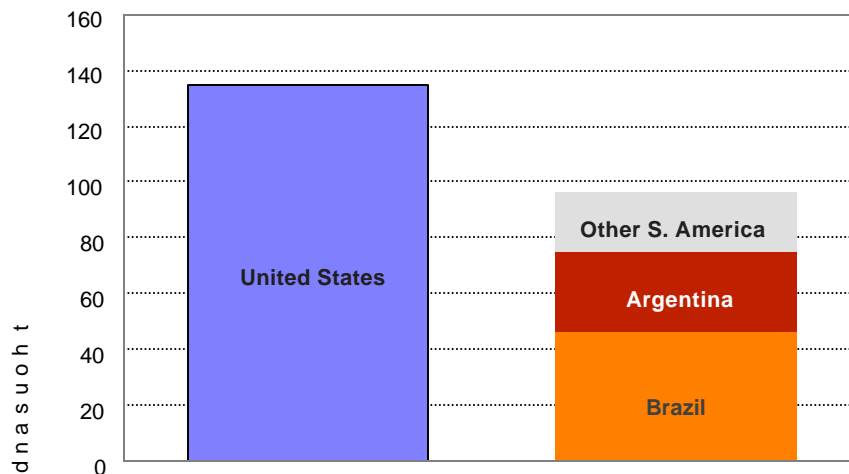
In sum, South America’s economy, though still a bit shaky from its stress of last year, appears to be reviving and moving forward.

Agriculture today, the dynamics for change

Despite an industrial boom in South America, agriculture is still a key all South American economies. Over 11% of the regions GDP is derived from, and 24% of the population work in, agriculture. Agricultural production rose 30% (volume basis) from 1990 to 1998.

South American agriculture comprises about 97 million harvested hectares and includes 4.6 million farms averaging 24 hectares each.

Comparison of harvested areas: Brazil, Argentina, other South America versus the US, 1998



Source: FAOSTAT, United Nations

Although subsistence farmers make up a large share of the universe, there are a growing number of highly skilled progressive farmers operating, especially, in the agricultural heartlands of Brazil (the *cerrados*) and Argentina (the *pampas*). It is here where Brazil's activity is changing most rapidly.

The expansion of farmland has been one of the driving factors of South America's agriculture. And it is still going on. Although growth slowed in the 90's we believe it will resume significantly in the next decade.

Yields are another opportunity for South American growth. Although there has been considerable progress, in general, they do not measure up to those of the US and Europe.

***Comparison of crop yields in South America, the
US and Western Europe, 1998 (mt/ha)***

<i>Crop</i>	<i>S. America</i>	<i>USA</i>	<i>W. Europe</i>	<i>S. America % of highest</i>
Beans	0.9	1.8	0.6	50
Corn	3.3	8.3	8.4	39
Potatoes	21.2	37.9	32.5	56
Rice	3.1	6.3	5.8	49
Soybeans	2.4	2.6	3.6	67
Wheat	2.2	2.9	6.1	36

Source: FAOSTAT

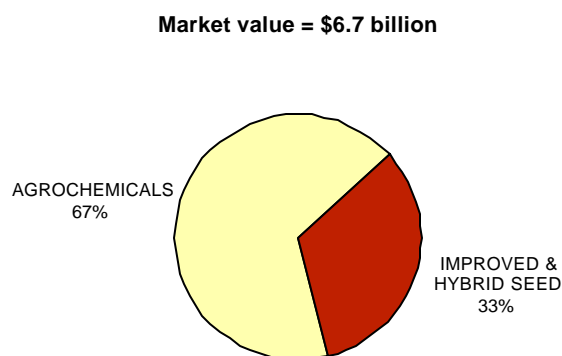
Many forces will come together over the next 10 years which should sharply boost these yields and crop production, including the use of advanced agricultural technologies such as precision farming and biotechnology.

South American crop protection and seed markets today

Present markets by country

The present total South American market for seeds (not including bin seed) and crop protection chemicals was \$6.7 billion in 1998, 67% of which were crop protection chemicals and 33% improved and hybrid seed, including genetically modified seeds.

***Figure 2.8: Seed and crop protection markets
in South America, 1998***

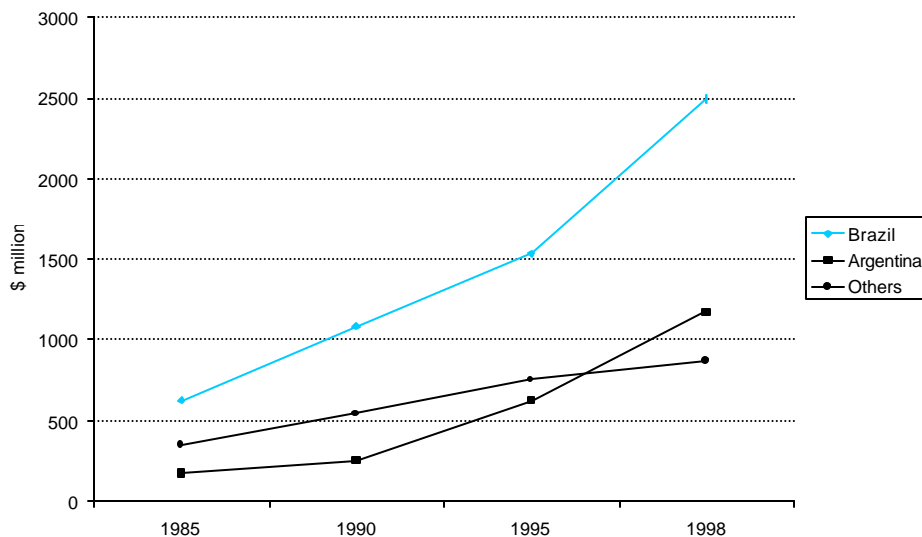


Source: PROMAR field interviews

Crop protection chemicals – a fast growing industry

The South American market for agrochemicals and seeds has been one of the most rapidly growing in the world. For example, pesticide shipments totaled \$4.4 billion in 1998 and have been growing at 11% per year since 1990. The US market is \$8.8 billion but has only been expanding at 6%. Plus, after the US, South America is moving the most rapidly of any region into biotechnology.

Growth of crop protection chemicals in South America
(\$ Millions)

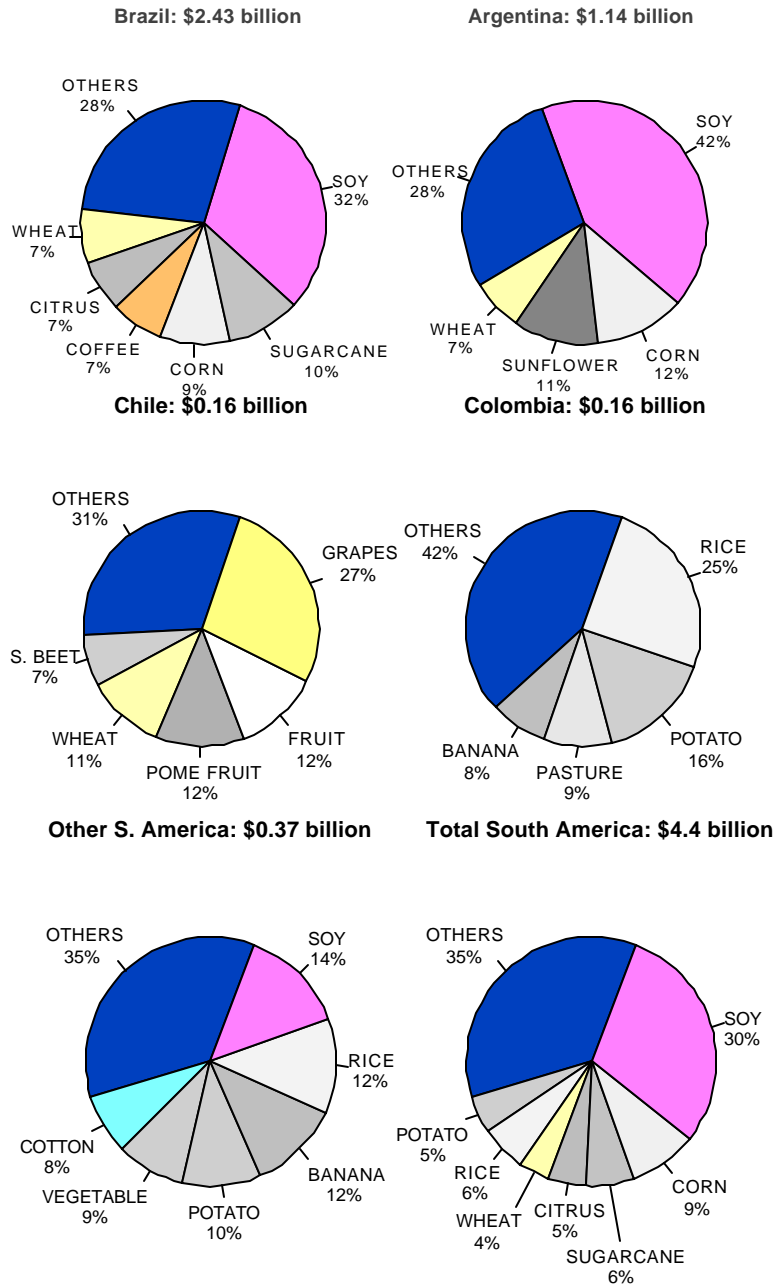


Source: Produce Studies and local crop protection industry bureaus

The agrochemical market in Brazil is the largest, totaling \$2.43 billion in 1998. Soybeans is overwhelmingly the most important crop to the pesticide industry – consuming \$1.3 billion alone in agrochemicals in 1998. Of the basic agrochemicals used in South America, herbicides is the most important followed by insecticides and fungicides.

South American agrochemical market by country and crop

1998

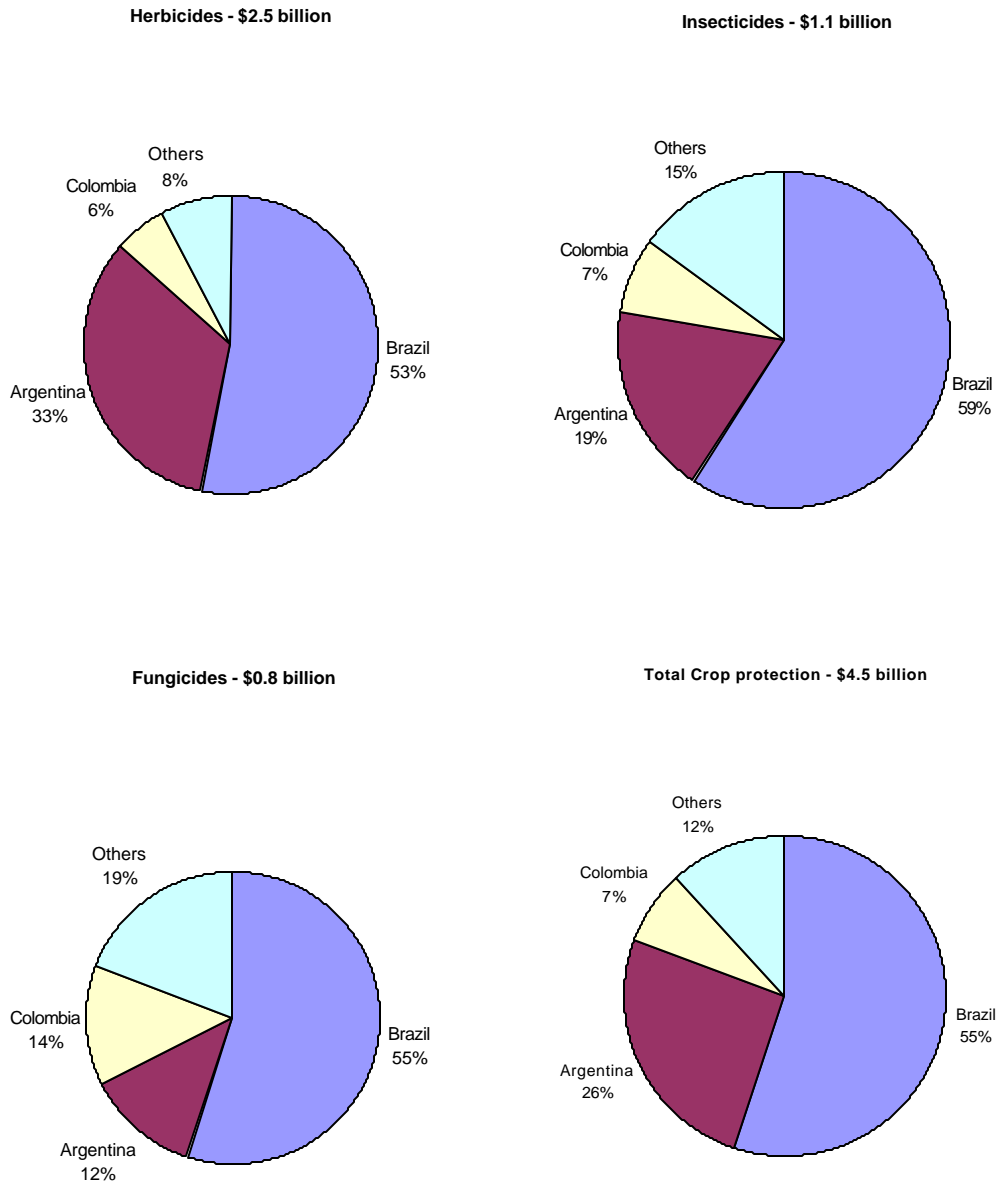


Source: PROMAR field interviews and country crop protection associations

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South American agrochemical market by product group and country, 1998

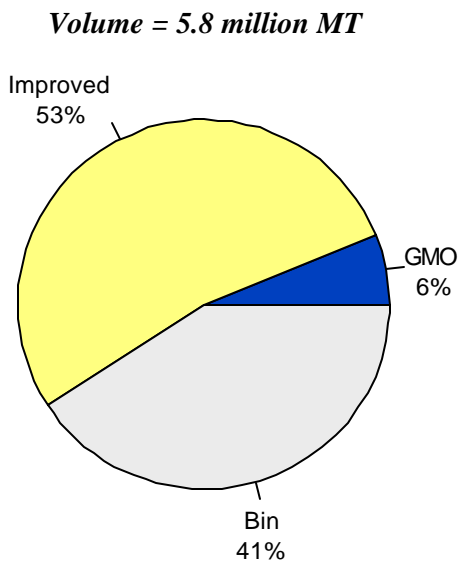


Source: Field interviews and country crop protection associations

Seeds - rebirth and realignment

In 1998, we estimate the South American seed market at approximately 5.8 million tons. Over 40 percent of this volume is common or bin seed. Improved (or certified, or hybrid) seed is the more rapidly growing and accounts for 53 percent of the volume and is approximately a \$2.2 billion business. For improved (including GMO) seeds, Brazil and Argentina are the major users, and soybeans and corn are the biggest markets.

South American seed market volume by type, 1998

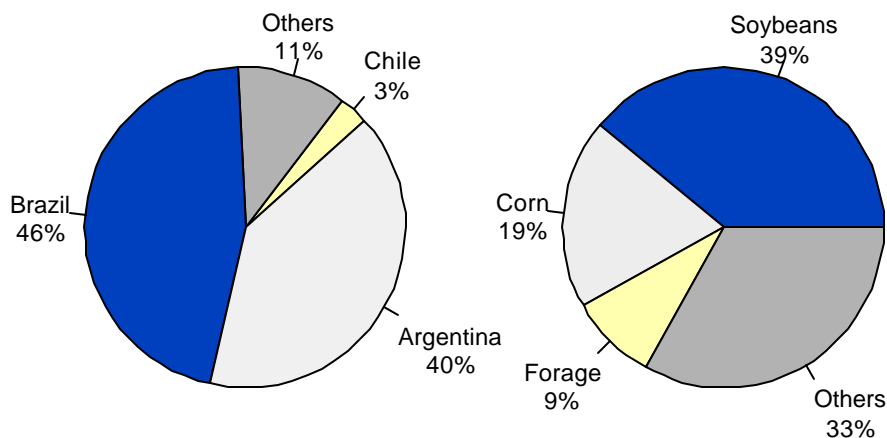


Source: PROMAR field interviews and country seed associations

While overall seed use has seen little growth in the last two decades, improved seeds have experienced a growth market. We expect this trend to continue as the land in agriculture grows and farmers realize the benefits of improved and genetically modified seeds.

Improved seed shares by country and crop, 1998

(\$2.4 billion)



Source: PROMAR field interviews and country seed associations

Beginning biotech dynamics

Generally, the definition of “biotechnology,” in the context of agriculture, is used to describe the genetic alteration of plants (or animals). The major advantage of modern biotechnology over traditional plant breeding is the speed with which characteristics can be isolated and expressed in a species. Genetic engineering of plants provides a short cut, reducing the time it takes to produce a variety with desirable traits (excluding field testing) from ten years or so with traditional breeding, to six months to a year with genetic engineering.

Recently transgenic seeds with built-in herbicide tolerance and insect resistance, or so called input traits, have been introduced in South America. Research and field trials in Argentina and Brazil are developing other valuable agronomic output traits in major field crops. Products are marketed by several companies, the most important of which are Monsanto (YieldGard corn and Bollgard cotton) and Novartis. However, Mycogen, Dow AgroSciences, Pioneer Hi-Bred and others also own or lay claim to the technology.

Genetically modified seed has not been introduced to other South American countries because they have been slow to enact legislation that protects the intellectual property rights of companies and is acceptable to government organizations, farmers and the public at large. The issue has only recently

been decided in Brazil, where a number of transgenic projects were on hold until issues such as intellectual property rights, access of genetically modified commodities to foreign markets and a host of ecological and ethical issue were resolved. Although the last two points are still not fully resolved, the Brazilian government approved the use of genetically modified seed in May 1999. However, implementation in that country is being held up by court orders in several states.

Moreover, there are other issues that still need to be addressed:

- C Intellectual property rights (IPR) legislation must be enacted and enforceable and issues of ownership resolved in order for the full benefits of the new technology to occur.
- C The definition of “farm-saved seed” must be agreed upon.
- C Farmer acceptance of genetically modified seeds will be essential for success.
- C Legal hurdles must be overcome, the most basic of which is the patentability of genetically modified plants.
- C Distribution issues relate to dealers who need to plan for and profit from leading edge services other than traditional farm chemical packages.
- C Resistance problems, particularly relating to Bt crops, preoccupy growers.
- C Consumer issues and concerns regarding genetically modified foods will be a major factor in determining the future success of biotechnology in South America.

The resolution or lack of resolution of these issues will go a long way to determine how rapidly the biotech revolution takes over South America.

Traditionally, South American governments have played an important role in agricultural promotion through subsidizing loans, setting commodity support prices, purchasing and auctioning commodities and, until the last decade, establishing protective trade policies. In short, governments have used their legislative might to intervene on behalf of growers and consumers at many levels.

Consistent with the regional shift to free market policies, direct government support programs in South America have been vastly reduced. However, in the spheres of agrochemical and seed variety regulation, genetically modified organisms and plant biotechnology, the governments of South America play a prominent role and will continue to do so.

The South American players

The continental player base

Until recently the seed and crop protection industries were two distinct businesses; however, the lines of demarcation have blurred, especially in Brazil and Argentina.

The key players are:

The life science majors

Monsanto	US
Novartis	Switzerland
DuPont	US
Dow Agrosiences	US
Aventis (AgrEvo & Rhone-Poulenc)	Germany, France
Zeneca	UK

The other major agrochemical companies

Bayer	Germany
BASF	Germany
Cyanamid	US
Makhteshim	Israel

The secondary international participants

Abbot	US
FMC	US
Rohm & Haas	US
Sumitomo/Valent	Japan
Uniroyal	US

In addition, there are an estimated 20-80 local crop protection companies and nearly 700 local seed producers. In each of these categories only a few are significant.

Monsanto, Novartis, the new Aventis (AgrEvo and Rhone-Poulenc) are the industry leaders in South America.

Market shares of major producers in South American crop protection and improved seed market, 1998

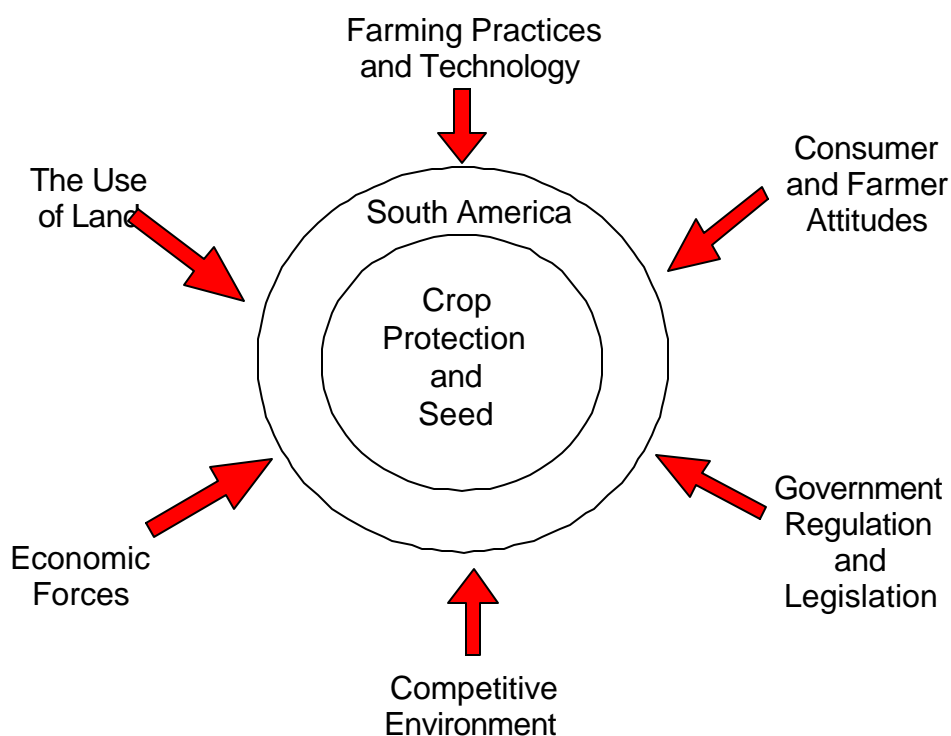
	<i>Crop protection</i>	<i>Seed</i>	<i>Total</i>	<i>Market share (%)</i>
Monsanto	385	289	674	10
Novartis	569	80	649	10
Aventis	549	13	562	8
DuPont	320	175	498	7
Zeneca	458	27	485	7
Cyanamid	341	–	341	5
Dow	282	44	326	5
Bayer	307	–	307	5
Makhteshim	232	–	232	4
BASF	286	–	286	4
Others	721	1,637	2,361	34
TOTAL	4,430	2,265	6,695	100

Profiles of each of the transgenic majors and other majors are presented in the body of the report. For each we provide:

- C Background
- C New developments
- C South American position
- C A SWOT analysis
- C Competitive position by crop and country

Forces for change – A continent in transition

In this section we look closely at the forces that are changing the South American market and industry over the next decade, including specifically those shown below.



Economic forces

We expect the South American economy to continue to grow during the next decade by at least 3-4% per year, stimulated by its democratization, free market doctrines and increasingly liberalized trade. Changes in the economic and demographic landscape will translate into changes in domestic food demand. For example, as population on the continent grows, farmers will need to find a way to feed more mouths through increased yields or more land.

As the region grows economically, people will have more money to spend on food. Consumers will demand higher value foods such as meat and value-added foods. Greater urbanization will mean more working women, less discretionary time, and a greater demand for processed or convenience foods.

The worldwide demand for South American commodities also is expected to increase in the coming decade. Trade liberalization and worldwide growth in incomes will be the driving forces for this increased export demand.

The use of land

The increased demand for food both domestically and internationally is likely to drive more land into agricultural use. We expect that every South American country will experience a growth in the land used for agriculture with the major increases in hectares planted in soybeans, sunflowers, rice, corn and beans. The table below depicts the growth that we estimate by country.

Crop area growth in South America by country, 1998-2010

<i>Country</i>	<i>1998 (1000 ha.)</i>	<i>2010 (1000 ha)</i>	<i>CAGR* (%)</i>
Brazil	48,060	58,150	1.6
Argentina	30,886	34,200	0.9
Chile	1,723	1,825	0.6
Colombia	4,260	4,500	0.4
Venezuela	1,840	2,520	1.5
Bolivia	2,324	4,000	4.6
Others	8,394	9,425	0.5
Total	97,487	114,620	1.3

Source: PROMAR estimates

* CAGR – Compound annual growth rate

By crop, we expect the following:

- C soybeans will increase by more than 30 percent
- C sunflower seed will increase by more than 20 percent
- C rice will increase by almost 20 percent

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- C corn will increase by between 10 and 20 percent
- C beans will increase by more than 10 percent.

A large portion of this growth will come in the cerrados and llanos regions of Brazil. However, growth in harvested area will encounter several major challenges, including:

- C questions of land title
- C absentee landlords and negligent land management
- C progressive urban sprawl
- C rural violence and farmer safety
- C investments in infrastructure.

Farming practices and technology

Farming in South America in the next decade can be characterized by two trends: larger farms and more technologically savvy farmers. We expect that farms will grow from an average size of about 24 hectare today to about 35 hectares by 2010. This will be a factor of both increases in agricultural land use as well as farm consolidation due to economic pressure.

While most South American farms today are unsophisticated by developed country standards, we expect the region to experience phenomenal technological growth in the future. Areas where we expect South American farmers to make significant inroads include irrigation, conservation tillage, precision farming, integrated pest management and the use of farm machinery.

The use of these new technologies, combined with an increase in hectares planted, will help meet the growing domestic and export demand for South American commodities. Without these technologies it is unlikely that South America will be able to meet the growing needs of its own people and growing worldwide demand.

It is noteworthy that the new technologies discussed in this section will also require a set of services, information and new equipment for farmers. Many of the new technologies, such as precision farming, are not strategies that farmers can implement alone. Consulting to determine the worth of the new technologies in particular situations will help South American farmers maximize their potential.

As new technologies break into the South American scene, farmers in the region are going to look to retailers, and possibly ag input manufacturers, for similar services.

While all of the previously discussed advances will be important for South American agriculture, it is biotechnology that will have the greatest impact on farming in the region. It is difficult to definitively predict the future size of such infant markets in South America. Nonetheless, based on our assessment of changes in crop areas and input trait penetration, we forecast the following levels of penetration of the total harvested area of different crops by 2010.

Possible input trait penetration in percent of harvested area in 2010

	<i>Herbicide Tolerance</i>	<i>Insect Resistance</i>	<i>Disease Resistance</i>
Soybeans	60 - 70	20 - 30	0
Corn	40 - 50	30 - 50	0
Rice	35 - 45	0	0
Sunflower	70 - 80	35 - 40	10 - 20
Cotton	50 - 60	55 - 65	0
Wheat	25	0	20
Potatoes	20	15 -20	15 - 25

Source: PROMAR estimates

In the more distant future, we also expect to see output traits and specialty crops to impact the South American market. For example, high oleic soybeans, mid-oleic sunflower seeds, and low-phytate corn may all have a place in agriculture in the region by 2010.

Consumer and farmer attitudes

Consumer attitudes about agriculture and agricultural practice have long had an impact on the industry. However, biotechnology has proven to be one of the most pivotal, controversial agriculture topics this century.

Essentially we believe South American consumers will be with even less concerned about the safety of genetically modified foods than their US counterparts. This apathy towards biotechnology will be grounded in culture, tradition, and South American belief systems. In general, South American

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consumers are less prone to adopt confrontational postures and, on balance, are more “laid back” than their more pro-active counterparts in the United States and Europe.

South American consumers today are still relatively powerless, in the sense that they still fail to recognize their capacity to shape the world around them through their day-to-day activities. This is a reflection of decades of commercial authoritarianism whereby the government made virtually all of the decisions relating to product availability and pricing, leaving precious little room for the consumer to impact the market. These conditions are changing, and consumers are now beginning to take stock of their commercial power. While South American consumers of the future will certainly exert more discretionary control over the market and the products which they buy, we do not believe that they are particularly predisposed to take issue with biotechnology.

Certainly environmental awareness and concern will increase in the region. However, barring some ecological disaster or staggering public relations *faux pas* on the part of the purveyors of this technology, these concerns should be maintained at manageable levels.

Present consumer attitudes regarding GMOs

<i>Attitudes influencing</i>	<i>Americans</i>	<i>Europeans</i>	<i>South Americans</i>
<i>Negative GMO influences</i>			
Concern about food safety	M	H	M
Concern about the environment	M	H	L
Concern about imports of competitive products (e.g., soybeans, corn)	L	H	L
Active in pursuit of such issues	M	H	L
Key:	H - High		
	M - Medium		
	L - Low		

Source: PROMAR estimate

Farmers in South America have also been very accepting of this new technology. Resistance, not to the technology, but to the policies regarding the technology, is also coming from some Argentine farmers who believe that they would be able to save transgenic farm seed. Real resistance from the farmers, however, has been minimally forthcoming, and we conclude that there is no fundamental constraint on the development of the technology from within the farming community.

At present, the primary resistance to biotechnology has come from states in countries concerned about losing export markets such as Brazil.

Government regulation and legislation

South America can provide a labyrinth of regulations for agrochemical and seed companies. Some countries are better than others, and we expect to see significant improvement in this area in the next decade. There appears to be clear recognition by South American nations that legislative transparency and ease of registration are issues that must be dealt with in the near future.

The larger economies of South America all provide reasonable patent protection, generally in line with that of the developed countries. Moreover there is a movement to rectify the absence of patent protection in the smaller countries, as they recognize that it is a turnoff to major investors. For this reason, the next decade should witness considerable change in patent protection.

Interpretation of patents on genetically modified organisms may well hinge upon developments in the World Trade Organization (WTO) over the next several years. At present such interpretation varies between countries and the patent rules established by the International Convention for the Protection of New Varieties of Plants (ICPNVP) need clarification.

Most South American countries are signatories to the International Union for the Protection of New Plant Varieties (UPOV) and have introduced legislation to meet its obligation. As discussed, Brazil has adopted biotechnology patent regulations similar to those in the US. Brazil essentially protects the developers of a genetically modified seed from the creation and sale of such seeds by the farmers using them. In Argentina, despite UPOV obligations, the reverse is now true, and major seed developers are losing profits to farm saved seed. As for the rest of South America, rules are either at the formative stage (Bolivia and Paraguay) or extremely lax (Columbia).

We anticipate that slowly the conflict between national laws and international obligations will be resolved and the force of UPOV undertakings will become evident.

Industry consolidation

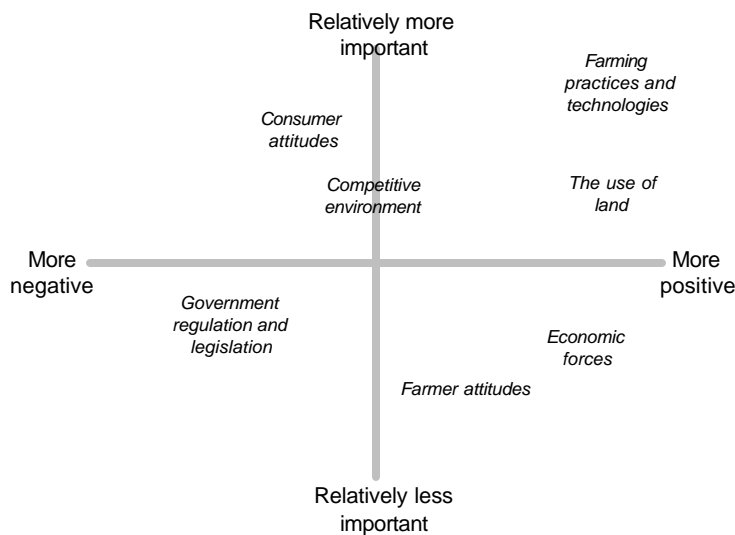
The competitive environment in the ag input industry has been constantly changing. Industry consolidation has been a factor for much of the 1980's. It resulted from a range of factors of which worldwide pressures on agriculture as a result of farm policy liberalization were particularly important. Companies saw opportunities to combine resources and several joined forces to meet the economic pressures of the day. The opportunity of novel genetic procedures was also a major stimulus. The industry recognized its future lay within the seed and that the integration of crop protection and seed characteristics opened many opportunities. These forces resulted in an ongoing joint venture and acquisition marathon of multinational agrochemical, seed and biotechnology companies.

Consolidation activity has occurred with the greatest frequency in the United States, then Europe, then South America. That activity will continue over the next few years, especially in Brazil and Argentina. However, the major Latin deals have already been struck, and only a few really desirable acquisition prospects remain.

Pulling it all together

There are many forces that will change South America's crop protection and seed over the next decade. The impact of some of them will be significantly more important, others less. Moreover, some could potentially have a very positive effect on the market and others could have a negative impact.

Importance of forces for change



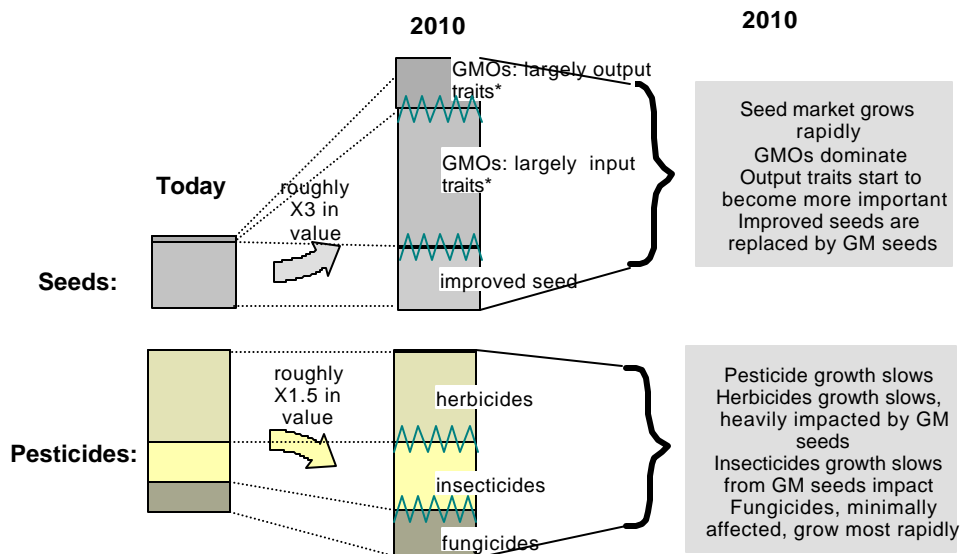
What will the South American crop protection and seed markets look like in 2010? How will the biotechnology revolution affect these markets? What will be its impact on crop protection in the future?

Although a tight specific forecast is not feasible, we have drawn our conclusions regarding what we believe will happen by combining the results of our discussions with the industry and independent observers of the South American market with our own detailed assessment. Our forecasts also depend heavily on the broad assumptions which we itemize in the Appendix. From all of these we conclude the following.

The total South American crop protection and seed market over the next ten years will roughly double in size. This growth will be stimulated primarily by:

- C the significant increase in crop area;
- C increased emphasis on major row crops, especially soybeans and corn, by farmers;
- C sharply increased use of genetically modified seeds incorporating specific input traits;
- C continuing increases in pesticide use for crops and applications unaffected by genetically modified seed usage;
- C the initial use of genetically modified seeds incorporating predominantly output traits; and
- C increased yields and farmer incomes from the foregoing, thus supporting the expanded use of pesticides and high value seeds such as improved and genetically modified seeds.

The crop protection and seed markets in 2010



* We have classified GMOs into two broad categories; those modified to enhance or introduce an output trait and those modified to enhance or introduce an input trait. We recognize that in many cases, GMOs will have both critical input and output traits. Our purpose is to give the broad direction of emphasis in the GMO seed market.

The following are our broad conclusions. We expect, as indicated, that land usage will expand significantly. We have estimated 17 percent or 17 million hectares between 1998 and 2010.

Further, most of this land expansion, an estimated 84 percent, will be seen in high volume row crops, especially soybeans and corn, but also rice and wheat. Those crops will be planted by South America's largest and most technologically oriented farmers who will be seeking the most effective yield and income expanding methods. We expect most of this growth (about 70 percent) will take place in Brazil, in Argentina (17 percent) and Bolivia (10 percent).

Pesticide usage will continue to grow, albeit at a slower pace. Agrochemical uses will increase in those crops not expected to be affected by biotech seed usage, where pesticides are still a growing market for row crop applications, where genetically modified seeds are not appropriate (such as insect resistant seeds for rice), and as influenced by the expansion in crop lands. We expect an approximately 20 to 50 percent increase in their overall usage by 2010.

The penetration of genetically modified seeds will offset some growth in pesticides. Herbicide tolerant traits and their corresponding herbicides will have a significant impact on conventional herbicides. Insect resistance GM traits will decrease the need for insecticides. And to a similar degree will disease resistance decrease the need for fungicides.

In summary, as they become more sophisticated and technologically aware, the South American farmers will be using somewhat more pesticides and a lot more genetically modified seeds over the next decade. And they will justify such usage and the corresponding increases in input costs by the increases in yields, reductions in labor costs, and higher product return, especially from genetically modified output traits.

South America is a rapidly changing market. And, as indicated, any forecast of this total market 10 years hence is in part guesswork. Thus, our best estimate of what will happen in the South American market by 2010 is shown in the figure on the prior page.

Strategic imperatives and implications

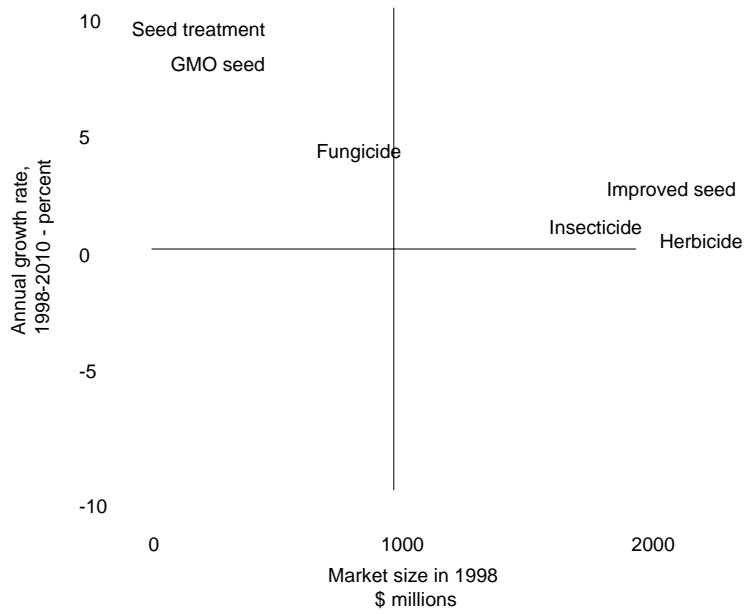
The forces for change draw a clear picture of where the crop protection future lies in South America. While different types of companies will have different strategies for the future, several general trends will affect all companies involved in crop protection in the region. In sum, the future of South America can be summed up in one word: GROWTH.

The foundations for competition in the future

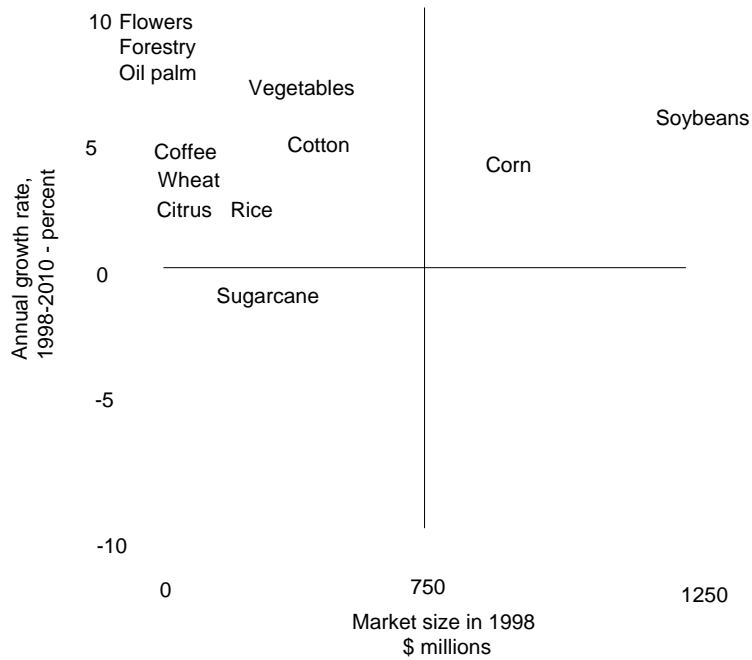
The purpose of this section is to synthesize and summarize the data and analysis in previous sections. It will review the potential for markets in the future by country, crop and market sector. Our aim is to provide a background from which companies can develop strategies to deal with the emerging competitive environment.

The first three of the following figures plot PROMAR predicted growth rates for specific crops, countries and market segments by the size of the market. The purpose of this exercise is to highlight which markets are big, which ones are growing, and which ones may offer niche opportunities. Each of these graphics plots the market size today versus the annual growth rates from 1998 to 2010.

Pesticide and seed markets

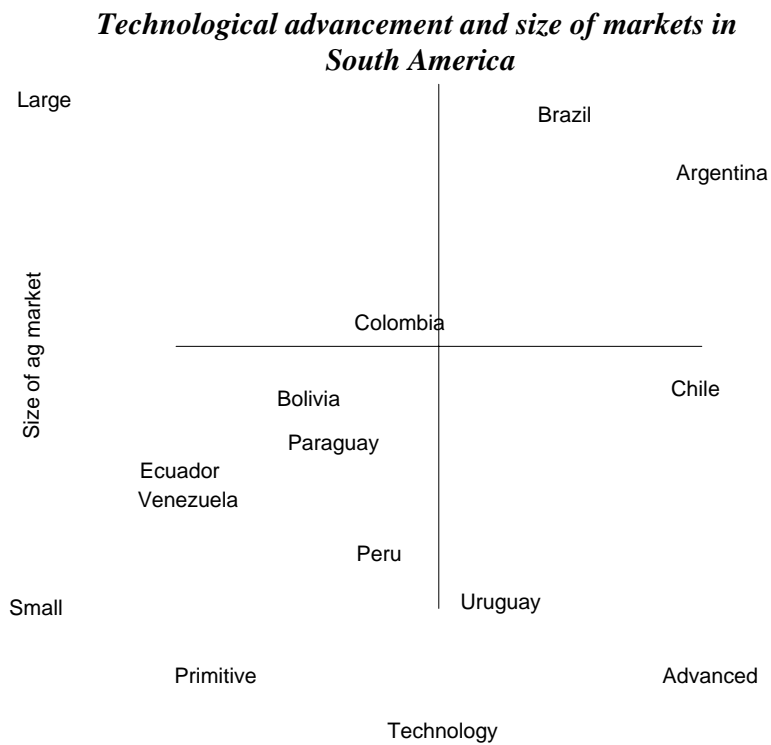
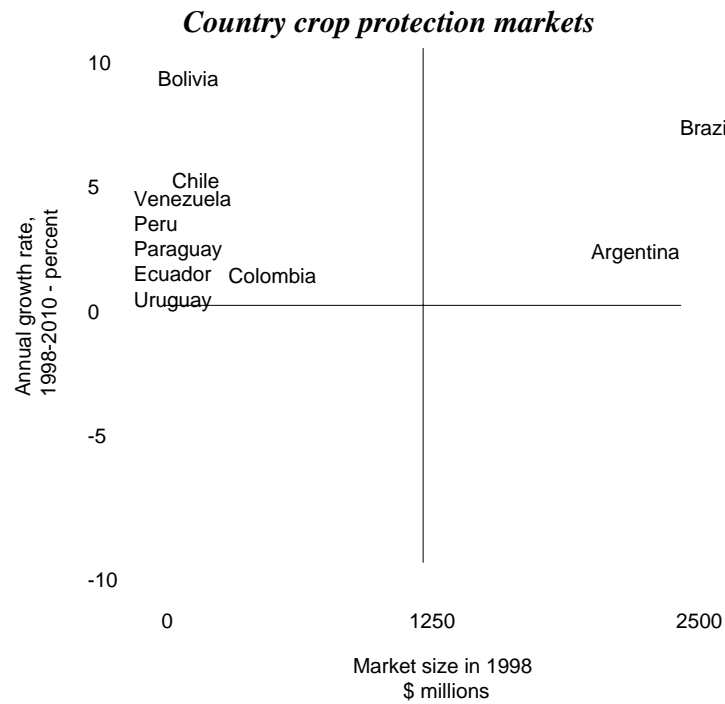


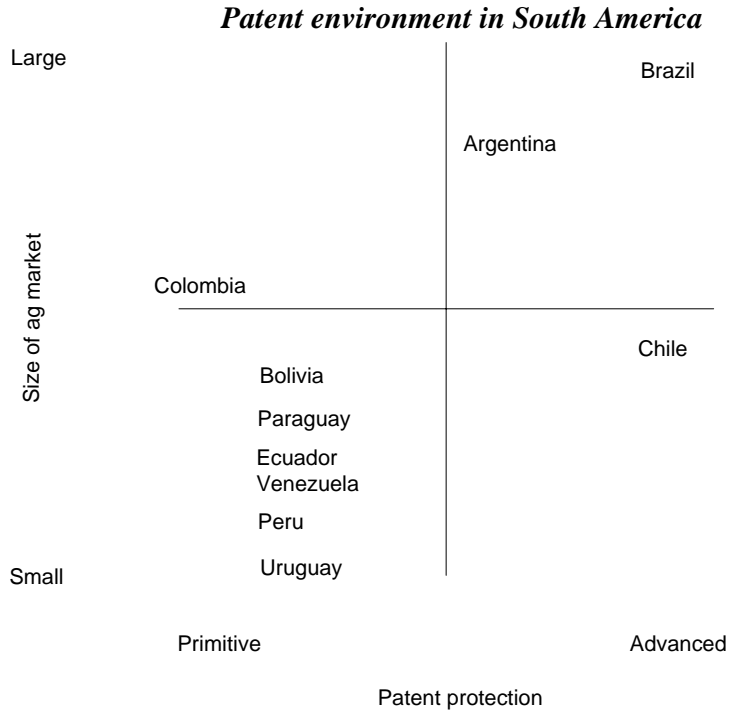
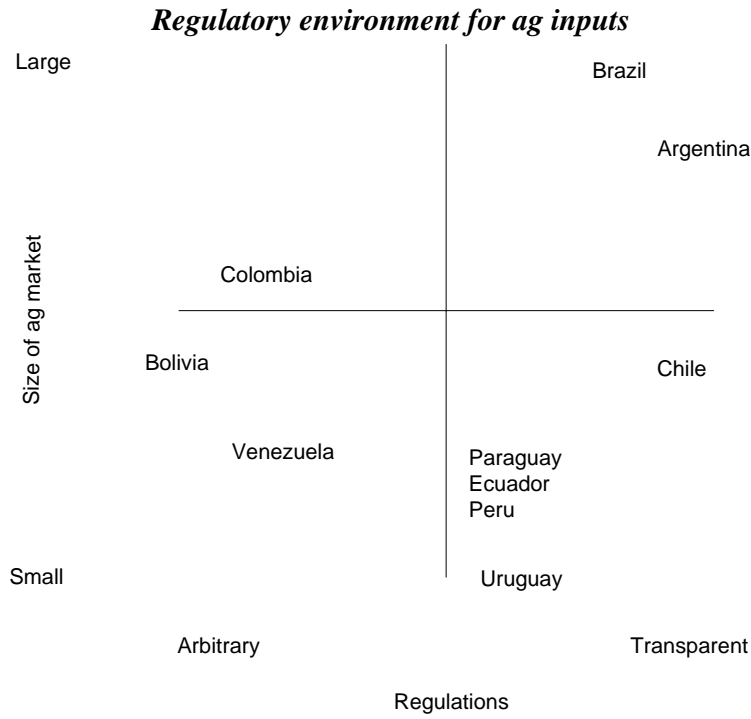
Crop markets



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Management summary





Competing for row space: Life science companies

It is clear from this study that the South American market has the potential to offer ag input companies substantial financial rewards into the next decade. However, merely having a presence in South America will not maximize profit potential. With a clear goal of profitably developing the crop protection and seed markets in South America, the graphic below defines the challenges that life science companies will face as well as strategies that can help them overcome these challenges.

Life science companies will have four main challenges to meet to most effectively compete in the South American crop protection and seed markets of the next decade. First, they must **maintain the technological advantage** that biotech capabilities give them over traditional crop protection companies. Also, they must be sure that they **have a strong product line** and that they are **targeting the appropriate markets** in the region. Finally, it will be essential for life science companies to **distribute their products effectively**.



Competing for row space: Multinational crop protection companies

For those major players in the crop protection market that do not have a seed presence, opportunities still exist in South America. The goal is still to develop the market to the greatest extent possible. Many of the challenges are the same as the challenges facing the life science companies. However, because of a lack of a biotechnology presence, multinational crop protection companies will have a unique set of strategies that will help them maximize their profits in South America.

Multinational agrochemical companies have essentially the same challenges to face in the South American market as the life science companies. However, because of their different orientation, the strategies that agrochemical companies need to implement in order to be successful in this market are likewise different.



As biotechnology infiltrates the South American market, the most important strategy for multinational agrochemical companies will be to minimize their technological disadvantage by avoiding products that will have biotechnology alternatives. The table below rates some of the markets that will be adversely affected by biotechnology. The darker the shading, the greater the market will be affected.

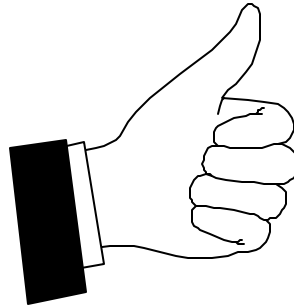
Pesticides that may be threatened by biotechnology advancements

	Herbicides	Insecticides	Fungicides
Soybeans			
Corn			
Sugarcane			
Cotton			
Rice			
Sunflower			
Coffee			
Fruits			
Vegetables			

The big winners and losers in 2010

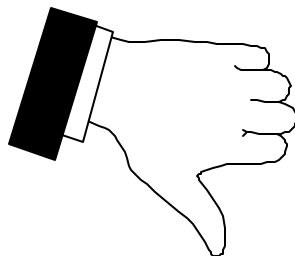
The following graphic offers a “checklist” of traits that will be seen in winners and losers in South America in the future. While few companies will meet all of the criteria of one category or another, the success of a company in the South American market in the future reasonably can be predicted by the number of winning and losing traits that it has.

WINNERS



- T A broad product base, or at least one that does not contain a high percentage of products that will be threatened by biotechnology advancements
- T Some form of commitment to the seed industry and biotechnology
- T A strong market position in Brazil and Argentina
- T A concentration on developments in row crops such as soybeans and corn
- T A large research and development budget that is replacing old products at a reasonable pace
- T Strong distribution network within South America, particularly in Brazil and Argentina
- T Bundling products and products and services such as precision farming
- T Has an ongoing dialogue with regulators, farmers and consumers in the areas of biotechnology and environmental issues

LOSERS



- T A product base that is too reliant on herbicides and other products that are susceptible to replacement because of biotechnology
- T Minimal or no ties to the seed and biotechnology sectors
- T South American emphasis on the tropical region
- T Little new research and an outdated or generic product line
- T A weak distribution system, particularly in the Southern Cone
- T No way to bundle products or incorporate new technologies such as precision farming into the overall business package
- T Minimal or no communication with regulators, farmers and customers

Again, the winners and losers criteria and the following table in which we rank the companies are not to say that a company that has any one particular traits is a winner or loser. The purpose of this exercise simply is to draw a picture of what successful practices will be into the future in South America. Essentially, it is those companies that are able to adjust to a changing competitive environment and a new set of technologies that will gain the most in the South American crop protection and seed markets. Those companies that stand still and do not move forward, will not benefit from the fast-moving South American opportunity.

In the next table we have ranked the major life science and agrochemical firms competing in the South American market on the bases of those characteristics which we believe will separate the winners from the losers. We have scored each based on a one to ten scale, with ten being the best ranking and one being the worst. The results were as follows:

Ratings of major life science and agrochemical companies in South America

<i>Rank</i>	<i>Company</i>	<i>Broad product line</i>	<i>Major biotech and seed position</i>	<i>Strong in Brazil and Argentina</i>	<i>Strong in corn and soybeans</i>	<i>Major R & D commitment</i>	<i>Strong distribution</i>	<i>Bundling products and services</i>	<i>Good dialogue with regulators, farmers and consumers</i>	<i>Total Rating</i>
1	Monsanto	7	10	10	10	6	10	10	1	64
2	DuPont	8	9	8	9	5	8	9	7	63
3	Novartis	10	8	9	6	9	6	5	5	58
4	Dow Agro	3	6	4	5	3	9	7	10	47
5	Aventis*	9	7	7	4	4	4	2	2	45
6	Zeneca	6	5	5	7	10	3	8	8	44
7	Bayer	6	4	3	1	8	7	4	9	42
8	Makhteshim	5	1	1	3	1	5	6	6	28
9	American Cyanamid	1	2	6	8	2	2	3	3	27
10	BASF	2	3	2	2	7	1	1	4	22

* Aventis includes AgrEvo and Rhone-Poulenc