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Plant Protectıon Products: Markets and The European Union

Dogan ISIK[1*] Husrev MENNAN[2]
[1]Black Sea Agricultural Research Institute Samsun, TURKEY
[2]Ondokuz Mayis University, Agriculture Faculty, Department of Plant Protection, Samsun, TURKEY

***Sorumlu Yazar**
e-posta: zorludogan@hotmail.com

INTRODUCTION

Plant protection products (ppps) are treatments used to keep crops healthy, as their name suggests. Cooperatively, they are also identified as pesticides. These types of chemicals either occur naturally or are synthetic. They help to control diseases, insects and weeds that harm or destroy our food crops. Cooperatively, they are also identified as pesticides. A plant's natural response is to produce its own protection, when attacked by disease or pests, in much the same way as humans produce antibodies. Synthetic crop protection chemicals act as 'medicines for plants', only needed when the plant's own defence mechanisms do not work well enough. Crops need to be protected from a variety of different pests, organisms that present a hazard to the crop. While we often think of pests as insects, a pest can also be a weed, a disease or an animal (such as a rat) or even bacteria. Insecticides, fungicides and herbicides are all crop protection products. While these three are the most common crop protection products, other types are used against specific pests. For example, molluscicides against slugs, acaricides for mites and rodenticides to control rats. Insects, slugs and other pests, however, play an important role in the natural ecosystem. So it's important to strike a sensible balance between healthy, profitable crops and the wildlife that thrives in and around the area (1)

The crop protection industry is repeatedly developing new, innovative products and technologies that deliver a wide range of benefits in direct response to public demand. The official approval process for crop protection products in the EU is one of the most stringent and is primarily designed to safeguard human health and the environment. A fundamental principle lies behind the European legislation governing crop protection products: it is more important to protect human health, wildlife and the environment than to improve agricultural productivity. Today, before product approval is granted, more than 100 specific tests must be completed. Researching, developing and bringing to market a new substance can take up to 9 years and typically costs about € 200 million (1; 2). Crop protection products are more thoroughly tested for all impacts than any other products - including human medicines. The main legal instrument that governs crop protection products in Europe is Directive 91/414/EEC. The Directive regulates the placing of crop protection products on the market and harmonises national product approval requirements throughout Europe. The approval process consists of two main stages: in the first, the active substance must be approved at the EU level, and in the second, formulations (products) for national markets must be registered by the Member States (1).

THE EUROPEAN UNION (EU)

The European Union (EU) is a political and economic community of twenty seven member states with supranational and intergovernmental features, located primarily in Europe. Since the European Coal and Steel Community (ECSC) is established by the six founding members in 1951 the foundation of the European Communities was laid in 1951, the importance and impact of the European Communities within its borders and on the global economic system has increased. It started with six European countries in 1951; the Six then decided, in 1957 with the Treaty of Rome, to build a European Economic

Community (EEC) based on a wider common market covering a whole range of goods and services. European Union Countries now comprise 27 Member States, and enlargement negotiations with further applicant countries are in progress. The European Communities have developed further into the European Union (EU), an umbrella for the three extant European Communities ECSC, EURATOM, and European Community (EC, previously European Economic Community- EEC). The EU is a single international arrangement with the most important and influential institutions being the European Parliament, the Council of the European Union, the European Commission and the Court of Justice (3).

GLOBAL CROP PROTECTION PRODUCTS MARKET

It is predicted that the global pesticides market boom over the next several years to the tune of a multi-billion dollar crescendo despite global economic instability and pressure from the media and the eco-friendly Green Revolution. The worldwide market surged 29% from $41 billion in 2007 to $52 billion in 2008, a record increase. It is anticipated that the present global financial crisis have an adverse temporary impact on the pesticides, though the strength of the worldwide market will accelerate into the foreseeable future. It is forecasted that a seven percent decline in 2009 to $49 billion, followed by a 10% growth in 2010 with high single digit percentage increases thereafter. As late as 2013, it is expected growth to again accelerate into the double-digits at 16%. (4)

The overall global increase in sales of 4.6% after inflation masks major differences in trends although the main markets remain the US, Western Europe and Japan (see Figure1). In 2004 sales in the Latin American region rose by an impressive 25% in dollar terms building on increased sales in Brazil of 7% and Argentina of 11% in 2003. Latin America is now a company target. The region also has an active for generic pesticide industry. With relatively minor variations, the regional spread of product sales is similar for all companies except Monsanto, whose dependence on GM technology means its sales are strongly located in the North American market (59%) and Latin America (20%) (5).

When the effects of trade weighted inflation and currency exchange factors are excluded, the global crop protection market value in 2005 declined 2.5%. The decrease in value of the crop protection sector in real terms in 2005 was predominantly due to adverse weather resulting in a reduction in product usage. Similar factors depressed the market in 2003, whilst overall conditions in 2004 were more favourable (6). Although in 2006 the world plant protection market value declined by 2.5% in nominal US dollar worth to reach $30,425 million. As compared to 2006, the crop protection recorded increasing demand in 2007, on account of increasing demand for food, energy and feed plants coupled with declining inventories. Increased demand and calorie intake in emerging markets also helped accelerate the industry's growth. Geographically, in terms of sale Europe accounts for the largest share of the market, followed by Asia Pacific and the NAFTA region. Among the three types of agrochemicals, herbicide accounts for the largest market share globally, followed by insecticide and fungicides (7). In 2007 the global market value for crop protection products rose by 9.7% in nominal US dollar worth to reach $33,390 million (see Table 1a and 1b). Main reasons for the market extension in 2007 was the improvement in crop commodity prices that benefited farm incomes, allowing greater expenditure on crop protection products, particularly in Brazil and the USA. Brazil also benefited from more normal weather conditions, as did Northern Europe in the spring resulting in an improved fungicide market, although poor late season weather had an impact on crop production. In Asia, Australia suffered from continuing drought, whilst India benefited from a more normal monsoon season and a return in pest pressure, although the downturn in Japan continued. The weakening of the dollar had a significant impact on country market performances on currency translation. Demand for bio fuels resulted in alterations in crop demand and contributed to the improvement in commodity prices, although the further increase in biotech crop cultivation held back growth of the chemical crop protection sector (see Figures 2, 3 and 4) (8, 9).

One of the key factors that contributed to the evolution of the crop protection market in 2005 was a depression in crop commodity prices following excellent harvests in the US and Europe in 2004. This factor along with rising energy and fertiliser costs adversely affected

the planted area of most major crops. In 2005, fungicides again led market growth at the product sector level. Herbicides benefited from growth in developing markets, but were again affected by the uptake of herbicide tolerant crops and glyphosate price erosion in the USA. The weakest results were recorded by the insecticides sector with sales affected by low pest pressure following adverse weather in Asia, and further uptake of insect resistant crops, including those with new traits in existing markets and further geographical expansion(6) (see Figures 2, 3 and 4).

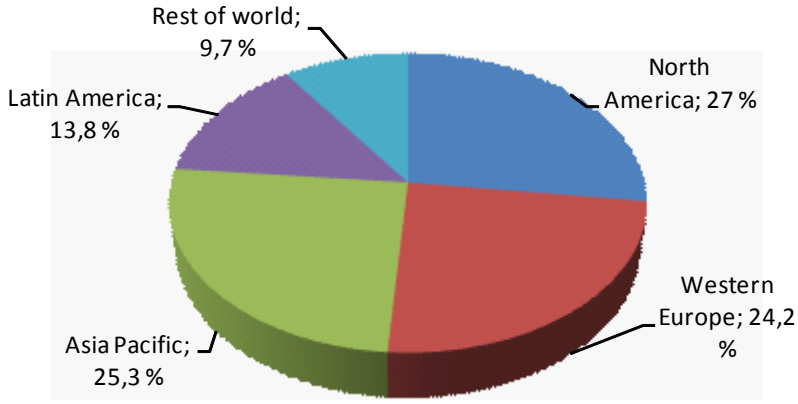


Figure 1. Global agrochemical sales by region in 2004
Source: D. Barbara, 2005

Table 1 a. Global Crop Protection Market Growth By Product Sector 2007

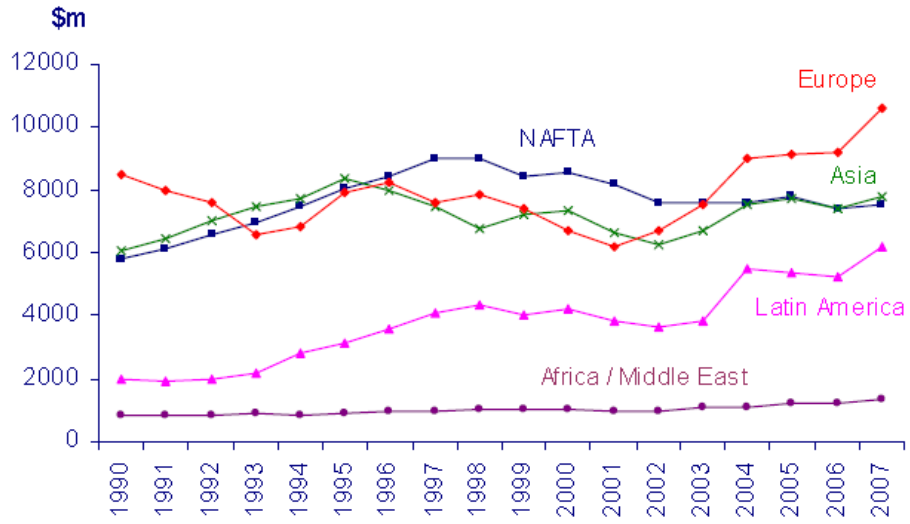
	2007($m)	2006 ($m)	Growth 2007/2006 %
Herbicides	16115	14805	8.8
Insecticides	8016	7380	8.6
Fungicides	8105	7180	12.9
Others	1154	1060	8.9
TOTAL	33390	30425	9.7

Table 1 b. Global Crop Protection Market Growth By Region 2007

	2007($m)	2006 ($m)	Growth 2007/2006 %
NAFTA	7507	7379	1.7
Latin America	6170	5203	18.6
Asia	7815	7405	5.5
Europe	10568	9217	14.7
Middle East/Africa	1330	1221	8.9
TOTAL	33390	30425	9.7

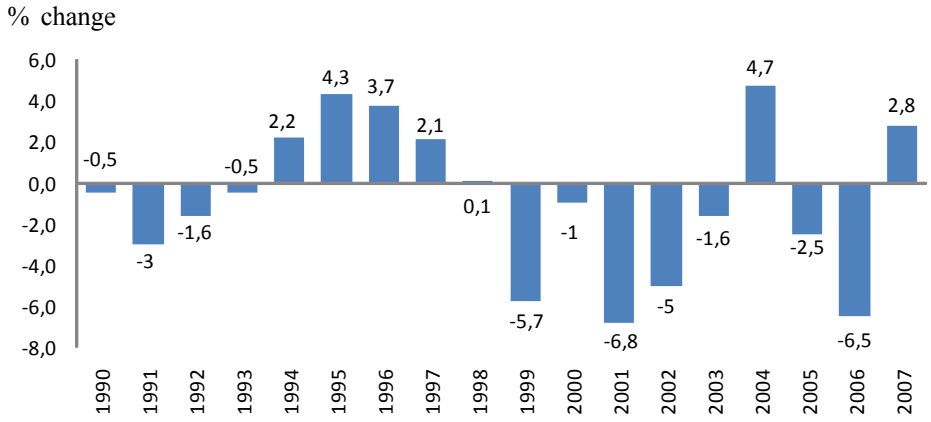
Source: Phillips McDougall 2008

Figure 2. Global Crop Protection market Development in millions of US$



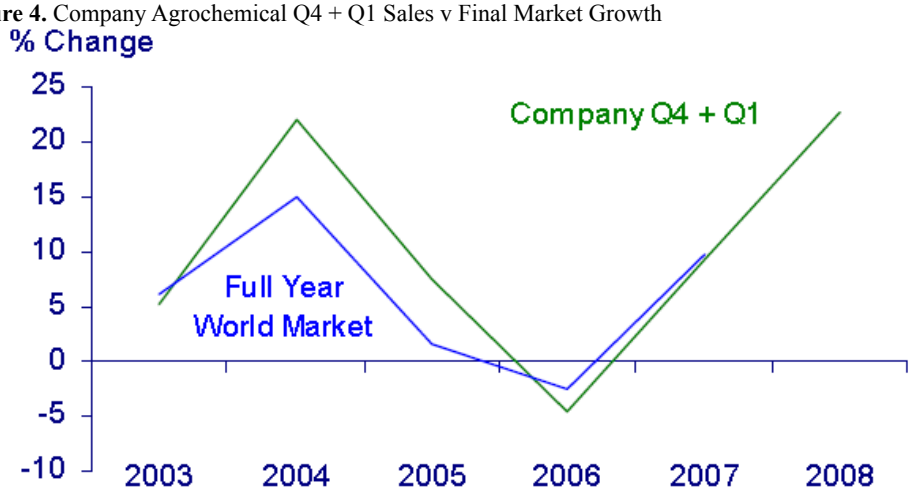
Source: Phillips McDougal 2008

Figure 3. Crop Protection Market Real Growth 1990-2005



Source: Phillips McDougall 2008

Figure 4. Company Agrochemical Q4 + Q1 Sales v Final Market Growth



Source: Phillips McDougal 2008

IV. EUROPEAN UNION (EU) CROP PROTECTION PRODUCTS MARKET

The European plant protection industry is a significant economic player on the world market. In addition, there are many other companies involved in the use of plant protection products (PPPs) in one way or another (e.g. manufacturers of spraying equipment, service companies for aerial spraying and others) Three of the five largest global companies are based in Europe (10). Agriculture is by far the biggest PPP-using sector. With approximately 320000 tonnes of active substances sold per year, the European Union currently accounts for one quarter of the world market of PPPs. The major types of product are fungicides (ca 43% of the market), followed by herbicides (36%), insecticides (12%) and other pesticides (9%). The European PPP producing industry is a major employer in Europe (around 35 000 workers) (11).

In 2007, the market for crop protection products in Europe (EU-27 and EFTA nations) increased by 5.2% to reach 17,080 million at the ex manufacturer level. This figure relates to the value of product actually used on farm during the agricultural year. After the elimination of currency and inflationary factors this was equivalent to a real increase of 2.8%. After two consecutive years of prolonged winters, 2006/7 was far more benign benefitting both the autumn and early spring spray seasons. In Northwest Europe this was followed by a wet summer, however the Southeast was hot and dry, neither conducive to crop production. The crop protection market in Northwest Europe was not overly affected by the weather; however the market in South Eastern countries, particularly the Ukraine and parts of Russia was negatively affected by the lack of rainfall. In 2007, the total European market increased by 14.7% in US dollar terms to account for 31.7% of the global crop protection market, ahead of both the Asian and NAFTA regions that each accounted for 23.4% and 22.5% respectively. Over the last five years, the European crop protection market is second only to Latin America in terms of average dollar growth, recording 9.5% per annum, although some of this has been because of currency translation. A major influence in this performance has been growth of Central and Eastern European countries, not only the new Member States of the European Union thanks to increased investment in agriculture, as well as recovery in Russia and the Ukraine, although this was held back by weather conditions in 2007 (see Table 2) Looking at the data for the EU-15 and Switzerland, staff numbers stand at a total of nearly 23,800 employees – having reduced by over 1000 compared to 2006. Of the people employed in the crop protection sector, 11,000 are involved in

production and logistics, nearly 5,300 in sales & marketing and nearly 4,700 in technical support, including the research and development of the crop protection products in use (12).

Overall the general expectation for crop protection market performance in Europe in 2008 remains very positive, because of higher commodity prices and farm incomes. In the intermediate term some softening of grain prices, higher energy and fertiliser costs and some restriction of access to credit may limit further development, however more consistent expansion is anticipated in Central and Eastern European markets. For the longer term, continuing expansion of the European crop protection market is anticipated, although market conditions by 2012 may not be as positive in the EU-15 countries as in 2007 and 2008. However, much will depend on global grain supplies and the effect that they have on farm incomes (12).

Number employed in the plant protection products sector in EU slightly decreased from 2004 to 2006 although still exceeding the numbers in 2003 (see Table 3). Looking at the data for the EU-15 and Switzerland, staff numbers stand at a total of nearly 24,800 employees – having reduced by over 900 compared to 2005. Of the people employed in the crop protection sector, over 10,300 are involved in production and logistics, 4,900 in sales & marketing and 3,900 in technical support, including the research and development of the crop protection products in use (1).

EU launched re-registration to refreshes product range. Annex I in the Council Directive 91/414 /EEC concerning the placing of Plant protection products on the market is related to active substances. Active substances (a.s.) should be inclusion in Annex I otherwise active substances, non-inclusion in Annex I and withdrawal from the market. In July 2003, the first major tranche of products which were either refused Annex 1 re-registration or not supported through the re-registration procedure began to cease to be available in the EU market. 2004 was the first full year when some value enhancement to the agrochemical market was expected as a result of replacement of the products, whose approval has been or will be revoked, with higher priced alternatives. This factor will also have an impact in the new EU member states, and also in any country wishing to export agricultural

Table 2. European market (EU-27 + EFTA) by product sector 2007

	2006 €m	2007 €m	Growth 2007/06%
Herbicides	2958	3037	2.7
Fungicides	2516	2738	8.8
Insecticides	958	982	2.5
Others	297	323	8.8
Total	6729	7080	5.2

Source: The European Crop Protection Association (ECPA)

Table 3. Number of Employees in Agrochemical sector in the EU (15 member states), and Switzerland as at 31 December in years 2003-2006.

	2006	2005	2004	2003
R&D / Technical Services	5 214	5 326	5 602	5457
Production 1 Logistics	12 303	12 658	12 973	12 747
Sales / Marketing	6 618	6 713	6 751	5 948
Administration	3 343	3 570	3 490	3 235
Total	27 478	28 267	28 816	27 387

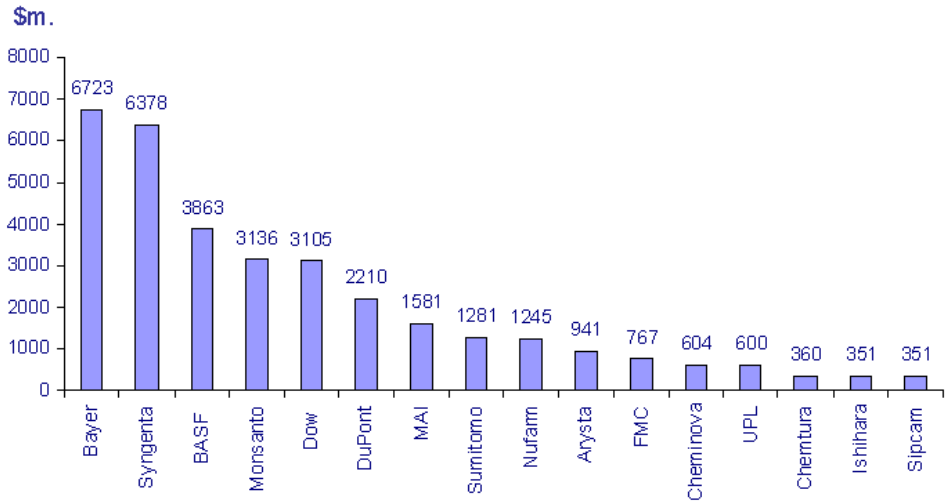
Source: The European Crop Protection Association (ECPA) (http://www.ecpa.eu)

produce to the EU when the maximum residue limits for these unapproved products have been revoked (13).

The agrochemical market is dominated by six companies, who between them accounted for 73% of the market in 2002, 81% in 2003, and 77% in 2004. The Swiss company, Syngenta, was overtaken in 2004 as the market leader by the German company Bayer, and between them these two now control 37% of all agrochemical sales (5). The sluggish overall market for pesticides in recent years was largely compensated for by sales of GM crops and seeds (see Table 4). In addition to this, from figure 5 and table 5 it is clear that there are 10 EU companies which play a big role in the world plant protection markets, including the three biggest companies, making Europe the most important player in the world plant protection market.

Over the five years 2000- 2004, Bayer grew by 172%, initially through the take over of Aventis in 2001, but subsequently by increased sales and expansion into GM technology. Over the same period, Syngenta sales grew by 2%, reflecting its earlier concentration strategies. BASF showed the next most dramatic increase in sales, 86%, with high sales of its fungicides and insecticides, and expansion in the Latin American market. BASF benefited financially from its purchase of fipronil products from Bayer in 2003 – a high income earner in spite of a recent restriction on its use in France as a result of adverse impacts on bees. The significant drop in pesticide sales in Monsanto reflects its decision to shift focus from agrochemicals to seeds and genomics, a transition made in 2003. The company profitability in the past was dominated by one product, glyphosate (marketed as Roundup), which accounted for 36% of its total sales and 60% of agrochemical sales. Among the strategies to defend its glyphosate market, Monsanto had succeeded in getting European Union duties of up to 48% (now 29.9%) levied against glyphosate imports from China. The transition to a largely GM seed company is reflected in its domination of traits it

Figure 5. Agrochemical Company Sales 2006



Source: Phillips McDougal 2007 (14)

Table 4. Agrochemical sales of leading companies, 2000-04, ranked by order of sales in 2004 (US$ million)

Company	**2000**	**2001**	**2002**	**2003**	**2004**	**2004 additional sales**
Bayer(1) (German)	2,252	2,418	3,775	5,394	6,120	+€989 environmental and bioscience sales
Syngenta(2) (Swiss)	5,888	5,385	5,260	5,421	6,030	+US$1,239 seed sales
BASF (German)	2,228	3,105	2,787	3,569	4,141	
Dow (US)	2,271	2,612	2,717	3,008	3,368	agrochemicals (approx. 90%), seeds, biotech
Monsanto(3) (US)	3,885	3,755	3,088	3,031	3,180	+$2,277 seed and GM sales
DuPont (US)	2,009	1,814	1,793	2,024	2,211	+$2,618 seed sales
Sales of top six	$22,234	$23,034	$19,420	$22,447	$25,050	
% of global sales	76	85	73	81	77	
Total market(4)	$29,200	$27,104	$26,561	$27,791	$32,665	

1. Bayer took over Aventis (see table 6) in 2001, and 2002 represents combined sales.
2. Figure for 2000 is estimated from combined sales of Novartis and AstraZeneca.
3. Decline in agrochemical sales reflects strategic shift to sales of GM crops.
4. Total market figure includes Japanese companies and generic producers, but omits Indian, Chinese and Latin American generic producers.

Source: D. Barbara, 2005

Table 5. Crop Protection Company Market Shares

Market Share	>15%	15% - 5 %	5% - 2 %	2 % - 0.8%	<0.8%
European	Bayer Syngenta	Basf		Sipcam Oxon Cerexagri Cheminova Isagrio	Phyteurop IPiCi Schirim
USA		Monsanto Dow DuPont	FMC	Chemtura	Amvac Govan Albaugh
Japan			Sumitomo Arysta	Kumiai Ishihara Hokko Nihon Nohyaku Nissan Nippon Soda Sankyo	Nippon Kayaku Mitsui Chemical Otsuika SDS Biotech Agro Kanesho
Other			Mai Nufarm		Atanor Gharda Rallis Utd Phosphorous Sinon Excel

Source: Phillips McDougall 2006 (15)

Table 6. Agrochemical market concentration, 1994-2004

Beginning 1994	**By 1997**	**By 1999**	**2000-2004**
BASF (EU-G*)	BASF	BASF	**BASF** is the largest chemical company in the world, with 11% of its sales in agrochemicals in 2004.
Cyanamid (US) [took over Shell Agriculture (UK / Dutch) in 1993]	Cyanamid bought by AHP, 1994 (US)	Cyanamid (US), purchase completed in 2000.	
Bayer (EU-G) Hoechst (EU-G) Schering (EU-G)	Bayer AgrEvo	Bayer	**Bayer CropScience** (G) accounted for 20% of the proceeds of the Bayer group in 2003. Took over Aventis in 2002
Rhône-Poulenc (EU-Fr)	Rhône-Poulenc	Aventis	
DowElanco (US) – incorporating Eli Lilly	DowElanco – incorporating Eli Lilly	Dow AgroSciences	**Dow AgroSciences** accounts for 9.2% of Dow Chemical sales. In 2001, it purchased Rohm and Haas's Ag products and Union Carbide.
Rohm & Haas (US)	Rohm & Haas	Rohm & Haas	
DuPont (US)	DuPont	DuPont	**DuPont Crop Protection** has 15.5% of DuPont sales
Monsanto (US)	Monsanto	Monsanto	**Monsanto** Pharmacia bought 80% in 2000; became independent again in 2002
Ciba Geigy (Swiss) Sandoz (Swiss)	Novartis (Swiss, merger 1996) (acquired Merck)	Novartis	
Zeneca (ex-ICI)(EU-UK)	Zeneca	AstraZeneca (UK-Swedish) (1999)	**Syngenta AG** (Swiss) formed in 2000

*Source: Agrow's Top 20: 2003-2005. * G = Germany Cited* D. Barbara, 2005

has developed, which account for over 90% of GM crops grown worldwide (5).

The history of market concentration, which halved the number of major players between 1984 and 2003, is shown in table 5. For a brief number of years during the period of intense concentration, the industry presented itself as the 'life sciences', aiming to build on synergies between agrochemical and pharmaceutical interests. This strategy has been dropped. Most of the companies have either spun off their pesticide division as an independent company, or separated the links. The common approach is to promote a 'plant science' or 'crop science' industry. A strategy of all six companies is to reduce their product portfolio and retain only the most profitable. Some governments are requiring pesticides to undergo re-registration, a process requiring companies to submit up-to-date data. The cost of this process is a major factor persuading companies to slim down their portfolios. For example, the European Union re-registration programme (carried out under directive 91/414/EEC) accounts for an average of three euros of every ten spent on research and development. By May 2004, 471 of 907 active ingredients formerly on the EU market were due for withdrawal, mostly because they were dropped by companies. BASF, for example, reduced its product portfolio from 300 to 170 active ingredients, including selling off its phenoxy herbicide business and phasing out many uses of its older organophosphates ethion, dimethoate, phorate. Syngenta aims to have core range of just 17 active ingredients, each with annual sales of over $100 million by 2006, which will include its controversial paraquat and atrazine products (5).

CONCLUSION

The value of the world plant protection products market exceeds US$30 billion and the European plant protection industry is a significant economic player on the world market. Three of the five largest global companies are based in Europe (10). Agriculture is by far the biggest PPP-using sector. With approximately 320000 tonnes of active ingredients sold per year, the European Union currently accounts for one quarter of the world market of PPPs. The European PPPs producing industry is a major employer in Europe (11).

However the European Union thinks that a large amount of market growth in pesticides should be reduced with greater use of Integrated Pest Management (IPM) accompanied by better ways of informing and educating farmers. The official approval process for pesticides including PPPs in the EU is one of the most stringent in the world and is primarily designed to safeguard human health and the environment. A fundamental principle underlying the European legislation governing crop protection products is that it is more important to protect human health, wildlife and the environment than to improve agricultural productivity (1) There have been successful introductions of IPM strategies for many crops such as rice, vegetables and cotton that have reduced pesticide use suggesting that many farmers may be using needlessly great amounts of pesticides (16). The trouble lies in the lack of readily reachable alternative strategies and technologies for pest control. The research budgets of the six research- based agrochemical companies dwarf the finances for publicly funded research, especially in developing countries. Policy makers should reflect on whether more needs to be done to help farmers address pest management problems using a range of techniques, and not only by relying on the market to provide products, many of which may be adversely affecting human health and the environment (5).

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