

Breaking Bad:

Big Ag Mega-Mergers in Play
Dow + DuPont in the Pocket?
Next: Demonsanto?



ETC Group examines corporate consolidation in four agricultural input sectors: seeds, pesticides, chemical fertilizers and farm equipment. With combined annual revenue of \$385 billion, these companies call the shots. Who will dominate the industrial food chain? And what does it mean for farmers, food sovereignty and climate justice?

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Breaking Bad: Big Ag Mega-Mergers in Play...

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Breaking Bad: Big Ag Mega-Mergers in Play. Dow-DuPont in the Pocket? Next: Demonsanto?

Issue

The Big Six agrochemical corporations (BASF, Bayer, Dow, DuPont, Monsanto, Syngenta) that dominate commercial seed and pesticide markets worldwide now insist they must get bigger, faster if the world wants food security in the midst of climate chaos. According to agribusiness, the extreme pressures of population, demand for meat, and climate crisis require Big Science and Big Money – and that means extreme Mergers all along the industrial food chain.

At Stake

The fate of the six dominant pesticide and seed companies (and their \$93 billion market) is in play. For all the talk of “Climate-Smart Agriculture,” their R&D strategies are collapsing and, among them, there are more sellers than buyers. Simultaneously, the much bigger (\$175 billion market) greenhouse gas-intensive fertilizer industry is caught in the headlights of climate change negotiators and is wrapping itself in the mantle of Climate-Smart Agriculture to protect its assets. The four companies that control 56% of the \$116 billion farm machinery industry already have the robotics hardware; are acquiring the software (Big Data, satellite surveillance) technologies; and are thinking about adding the bio-based software (seeds and pesticides) to their shopping cart. It’s too soon to tell which companies or sector will become the one-stop shop for farm inputs – but farm machinery, seeds, fertilizers and chemicals are now linked like never before. Monsanto collaborates with the world’s three biggest farm equipment companies (Deere & Co, CNH Industrial, AGCO). Deere has strategic alliances with five of the Big Six companies. Ultimately, the company that controls the data on soil, historical weather and crop yield, as well as the Big Box robot that deposits the seeds, pesticides and fertilizers will be the company that can gain most from crop insurance contracts that increasingly dictate inputs to the farmer. In the short term, the big shifts will likely be among the existing seed and pesticide enterprises, but even in the mid-term, watch out for the muck and machinery majors to rule the roost.

Policies

Ag mega-mergers threaten to undermine the basis of our food supply and jeopardize efforts to build climate resilience. Allowing more farm inputs to fall into fewer hands is a recipe for disaster. Nationally and internationally, governments must strengthen their anti-combines/cartel regulations to break up agricultural input sectors so that pesticide companies can’t also be seed companies and farm machinery companies can’t control chemicals, seeds, crop insurance, etc. Secondly, governments need to take a hard look at corporate “innovation,” recognizing that today’s intellectual property system smothers useful innovation and retards progress. To move us all toward food sovereignty, the world needs a new configuration of true innovators, including smallholder producers and public researchers – who are not undermined by spineless regulators.

Fora

The international battleground is wherever the Big Six – and their Bigger Brothers in farm equipment and fertilizers – push for even greater market power under the guise of “Climate-Smart Agriculture” while evading antitrust constraints and regulatory scrutiny for new, high-risk technologies (e.g., synthetic biology). Beyond the urgent need to suspend (better yet, end) exclusive intellectual property monopolies, the most important battleground is in the global South, the prime growth region for industrial agribusiness. There is no benefit for farmers or consumers if Argentina, Brazil, South Africa, China or Indonesia, for example, accept foreign corporate control over the first links in their food security chain. If two or three of these countries “just say no,” the mergers won’t happen and everybody’s game plan changes.

The Big Six to be Deep-Sixed?

GM seed sales are plateauing, the pesticide pipeline is clogged and farm commodity prices are plunging. Investors demand higher returns from Big Ag. The new feeding frenzy began with Monsanto's \$45 billion bid to buy Syngenta in April 2015. Though twice rejected by Syngenta, the proposed merger would have created a colossal agrochemical giant controlling 45% of the world's commercial seed market and a 30% share in pesticides (without divestment, based on 2014 revenues).¹ Merger talks are sector-wide. In the words of one industry CEO, "Everyone is talking to everyone."²

At the time of this writing, for example:

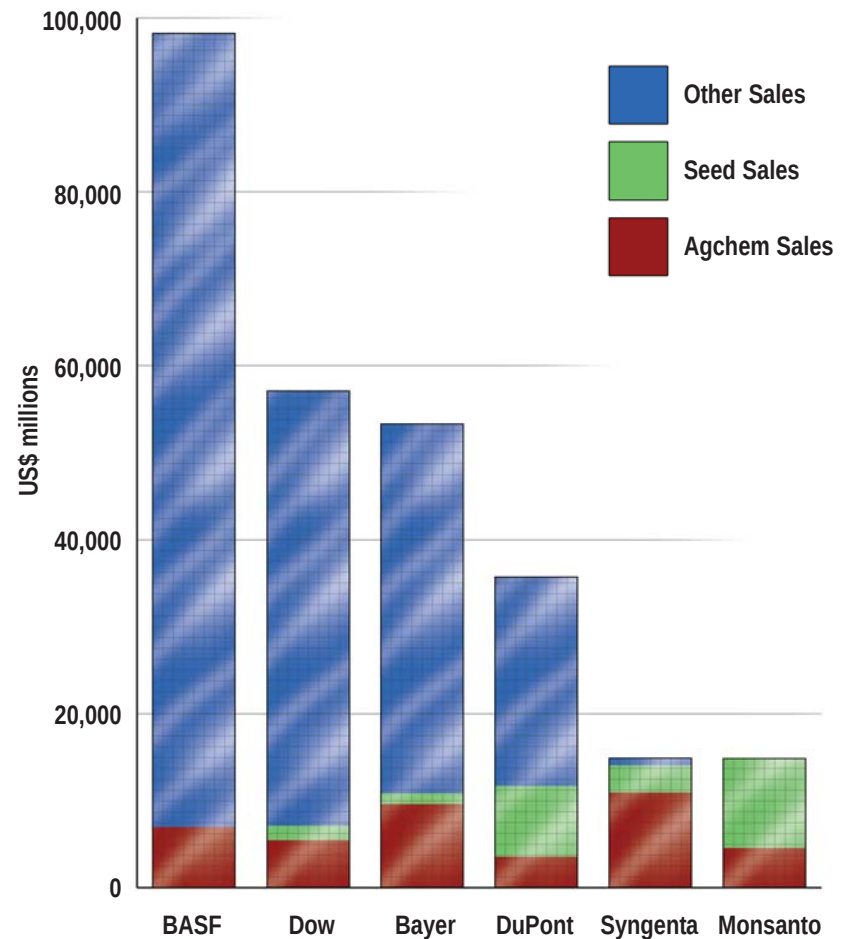
- Syngenta rejected a mid-November \$42 billion offer from ChemChina, the state-owned Chinese company that acquired the world's seventh largest agrochemical company in 2011;
- Dow is talking about spinning-off its agrochemical/seed unit;
- DuPont is under pressure to sell its agricultural interests, and is rumored to be in ag-unit merger talks with Dow.
- Monsanto continues to explore merger and acquisition (M&A) options, including mulling over a third Syngenta bid, while beefing up investments in "Big Data."
- Bayer will sell its plastics business to focus on pharma & pesticides/seeds.
- BASF secured financing earlier this year to buy Syngenta – to counter Monsanto's earlier bid.

The Big Six: BASF, Bayer, Dow, DuPont, Monsanto, Syngenta

With collective revenues of more than \$65 billion in agrochemicals/seeds and biotech traits (2013 figures), the Big Six control:

- 75% of the global agrochemical market;
- 63% of the commercial seed market
- More than 75% of all private sector research in seeds/pesticides.

The Big Six: Contribution of Seeds and Agchem Sales to Total Company Sales, US\$ millions, 2013



In recent decades the growth of private sector agricultural R&D spending has far outpaced public agricultural R&D.³ Corporate R&D has never been more influential or far-reaching: Big Six companies call the shots. For example, in 2013 the combined agricultural R&D budgets of the Big Six (agrochem & seeds, 2013) was:

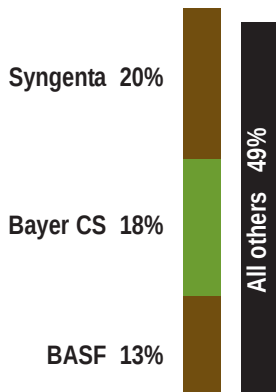
- 20 times bigger than the CGIAR's total expenditures on crop-oriented research/breeding in 2013 – including genebank conservation.⁴
- 15 times bigger than the USDA/ARS crop science research budget.⁵

Concentrated corporate power is a feature of every farm input sector. Economists warn that when four firms control more than 40% market share, there's a greater risk of anti-competitive (i.e., potentially collusive) behavior and a dampening effect on innovation. In the commercial seed, agrochemical and farm equipment sectors, three-firm concentration far exceeds that marker.

Three-Firm Market Concentration, 2013

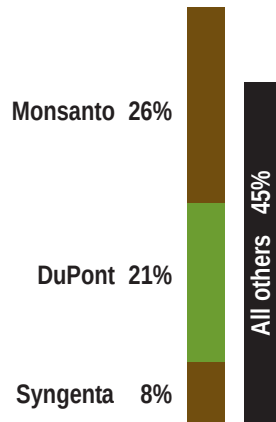
Agrochemicals

Three firms = 51% of Market share



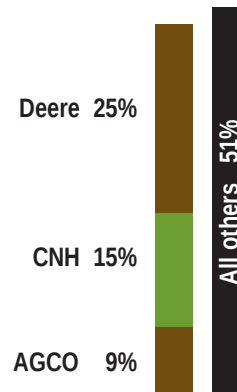
Seeds

Three firms = 55% of Market share



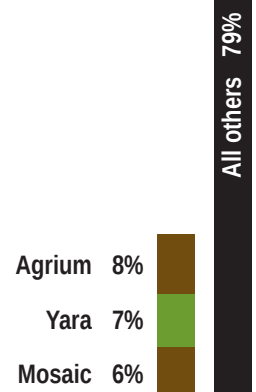
Farm Equipment

Three firms = 49% of Market share



Fertilizers

Three firms = 21% of Market share



Beyond the Big Six

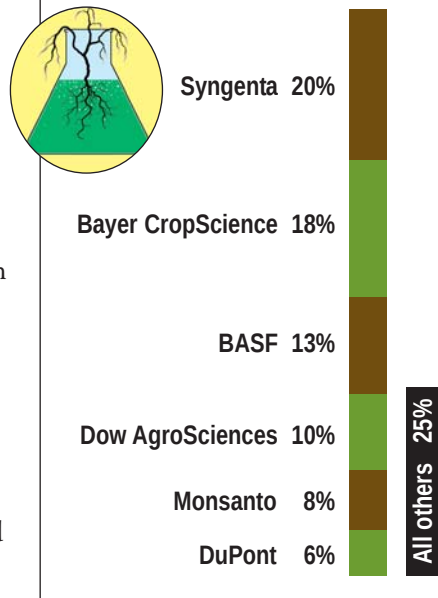
Potential mega-merger deals aren't limited to Big Six companies. Ag input giants beyond the Big Six could become major players in pesticides and commercial seeds. These include, for example, giant fertilizer companies, farm machinery companies and Chinese agribusiness firms.

Chinese Industry Wild Card?

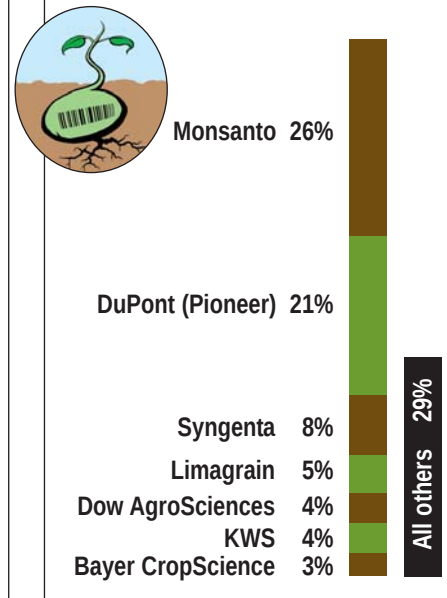
At the time of this writing, Syngenta is in merger talks with the state-owned China National Chemical Corporation (ChemChina). China is the third largest national market for agrochemicals (after Brazil and US). Valued at \$4.8 billion in 2013, the Chinese pesticide market is expected to surge to \$7.6 billion by 2019. ChemChina became a pesticide powerhouse in 2011 when its subsidiary, China National Agrochemical Corporation, acquired Makhteshim Agan Industries (Israel), the world's 7th largest pesticide manufacturer, and became ADAMA. With revenues over \$3 billion in 2013, ADAMA sells generic pesticide products in more than 120 countries. Although ADAMA's largest market is Europe (37%), followed by Latin America (25%), the company's strategic goal is to capture China's domestic agrochemical market, which is currently fragmented "and ripe for consolidation."⁶

In 2014, ADAMA scooped up four Chinese agrochem companies with 2013 total sales of approximately \$850 million. A merger with Syngenta would give ChemChina a 26% market share in the global agrochemical market (based on 2013 revenues),⁷ and propel the combined company to the #1 position in the giant China agchem market. Since ChemChina sells mostly generic pesticides, a merger with Syngenta's proprietary chemicals might not raise a single eyebrow among anti-trust regulators.

Big Six control 75% of the global pesticide market



Seven firms control 71% of the global seed market



In 2013 China's Shuanghui International (now WH Group) bought Smithfield Foods, the world's largest pork producer, for nearly \$5 billion. Over the past 15 years, China's grain imports have shot up 550%.⁸ Will a Chinese agro-industrial giant go after a Monsanto or DuPont Pioneer to secure the maize and soybean technology to feed its factory farms? Another heavy hitter is China's state-owned COFCO, a major grain trader that is "bulking up to become the Chinese answer to Cargill," according to the Wall Street Journal.⁹



©Suljo / iStockphoto

Where's the Beef?

In November 2015 a Chinese-Korean joint venture announced plans to build the world's largest animal cloning factory in Tianjin, China with the aim to eventually mass produce one million cloned calves a year.¹⁰ Growing demand for beef means even greater demand for grain.

Industrial Farm Inputs - Market Size by Sector, 2013, US\$ billions

Seeds \$39 billion

Pesticides \$54 billion

Ag Equipment \$116 billion

Fertilizer \$175 billion

*Who will
dominate
the chain?*

Ground is Shifting

The fertilizer industry is the largest ag input sector by far. Although the market power of leading firms appears less concentrated than other sectors, the fertilizer industry operates in cartels grouped by product and has been under scrutiny for decades.¹¹ In North America, for example, just three of the world's largest fertilizer companies (# 4 Potash Corp of Saskatchewan, # 3 Mosaic Company and #1 Agrium) control potash sales, operating as a "marketing venture" known as Canpotex (Canadian Potash Exporters). Canpotex controls over a third of the global potash production capacity, and a single company, Potash Corp., accounts for about half of that.¹²

According to a 2013 study: "Collusive agreements between fertilizer producers on prices and market shares pepper the history of the global commercial fertilizer industry dating back to the 1880s."¹³ More recently, there is growing recognition that synthetic fertilizers are a major contributor to climate-destroying greenhouse gases (GHG), and that overuse and leaching of nitrogen fertilizers has created massive "dead zones" in freshwater and marine environments. The estimated cost of environmental damage from reactive-nitrogen emissions is between €70 billion and €320 billion in the European Union alone.¹⁴

Fertilizing the Hungry – Yada Yada Yara

Despite the toxic role of chemical fertilizers in spewing GHGs and polluting the environment, the fertilizer industry is hoping to outsmart climate negotiators at the UN’s Climate Conference in Paris (UNFCCC COP21) by waving the flag for so-called “climate smart agriculture.”

Although the market power of leading fertilizer firms appears less concentrated than other sectors, the industry operates in cartels grouped by product and has been under scrutiny for decades.

At least 60% of the private sector members of the Global Alliance for Climate-Smart Agriculture (GACSA) are representatives of the fertilizer industry.¹⁵ Stay tuned for the fertilizer industry’s latest techno-fix: feeding the hungry via “micronutrient fertilization” – i.e., applying “judicious fertilizer management” to soils leading to boosted levels of zinc (Zn), iodine (I) and selenium (Se) in the foods grown on them.¹⁶

World’s Top 10 Fertilizer Companies, 2013

Company (Headquarters)	Fertilizer Sales, 2013 in US \$ millions	Share of Global Market	Main Fertilizer Products
1 Agrium Inc. (Canada)	14,242 (retail & wholesale)	8.1%	Potash, nitrogen, phosphate, ammonium sulphate
2 Yara (Norway)	11,871*	6.8%	Ammonia, nitrates, NPK and specialty fertilizers
3 The Mosaic Company (USA)	9,974 (yr. ending May 31, 2013)	5.7%	Potash, phosphate
4 PotashCorp (Canada)	7,305	4.2%	Potash, nitrogen, phosphate
5 CF Industries (CFI) (USA)	5,475	3.1%	Nitrogen, phosphate
6 Sinofert Holdings Ltd. (China)	5,451**	3.1%	Potash, nitrogen, phosphate fertilizer & compound fertilizer (NPK)
7 Israel Chemicals Ltd. (Israel)	3,655	2.1%	Potash, phosphate rock, sulfuric acid, phosphoric acid, phosphate fertilizers, NPK
8 Uralkali (Russia)	3,323***	1.9%	Potash
9 PhosAgro (Russia)	3,167	1.8%	Phosphate, NPK, ammonia, ammonium nitrate and urea
10 K+S Group (Germany)	2,805****	1.6%	Potash
Total top 10	67,268	38.4%	
Global market	175,244		

Sources: ETC Group, from publicly available information. Global market figure is from MarketLine, *Fertilizer: Global Industry Guide*, 2014.

* Excludes revenues from Yara’s “industrial” segment: specialty chemicals, CO2, dry ice and civil explosives; Yara bought Bunge’s fertilizer operations in Brazil in 2013 for USD 750 million.

** Excludes sales of feed-grade phosphate.

*** Includes revenue from sales by BPC of Uralkali’s products between 1 January and 29 July 2013.

**** Includes some sales of potassium and magnesium products not used for fertilizers; excludes salt business segment.

“Digital Agriculture:” The Quest for Precision Profits

The world’s fertilizer giants (e.g., Yara, Agrium and Mosaic) and farm equipment manufacturers (e.g., Deere & Co., CNH, AGCO) are investing in Big Data and so-called precision agriculture (see table).

Hardware (that is, tractors, combines, planters, sprayers, etc.) is now outfitted with digital tools (e.g., remote sensing, aerial imaging, wireless data servers) to provide prescriptions regarding how, where and when farmers should plant seeds, irrigate, apply pesticides and fertilizers. Newer ag equipment such as drones and driverless tractors (satellite navigation) rely heavily on digital input. Drones have been used in Japan since the late 1980s to spray agrochemicals on crops – an estimated one in three bowls of rice consumed by Japanese households has been sprayed by one company’s (Yamaha) drones; Yamaha is hoping to expand its market and is now eyeing vineyards in the USA’s Napa Valley and France’s Champagne region.¹⁷ Deere & Co. has been selling self-guided tractors for more than a decade and sells its technology in more than 100 countries.¹⁸



Precision Ag Cab Photo (cc) United Soybean Board

Deere & Co. already has strategic alliances with five of the Big Six companies. Deere acquired Monosem, a European precision-planter manufacturer in early November 2015; one day later, Deere announced the acquisition of US-based and Monsanto-owned Precision Planting LLC as well as an agreement with Monsanto-owned Climate Corporation to allow some of Deere’s equipment to connect with the company’s Climate FieldView platform wirelessly, in-cab and in “near real time.”¹⁹ Three months earlier, AGCO announced it had inked a deal with Precision Planting to outfit a line of its planters with Precision Planting technology. AGCO also collaborates with Bayer, DuPont and BASF.²⁰

The goal is to sell a platform for mapping and monitoring weather, pests and soils throughout a farm’s entire growing area – Monsanto calls them “paid acres” and the company is targeting 300-400 million paid acres across the US, Canada, Brazil, Argentina, Western and Eastern Europe by 2025.²¹ Big Ag’s digital platform aims to be the corporate command and control center for every ag input decision – crop, seed variety, soil, seed, pesticide, fertilizer, irrigation, machinery, even crop insurance.

Top 10 Farm Equipment Companies, 2013

Company (Headquarters)	Farm Equip Sales, 2013 US\$ billions
1 Deere & Co. (US)	29.1
2 CNH (Netherlands)	16.7
3 AGCO (US)	10.8
4 Kubota (Japan)	8.3 ²²
5 CLAAS (Germany)	5.0
6 Mahindra & Mahindra (India)	Not available
7 Iseki (Japan)	1.6 ²³
8 YTO Group (China)	Not available
9 Same Deutz-Fahr (Italy)	1.6 ²⁴
10 Minsk Tractor Works (Belarus)	1.1 ²⁵

The farm equipment sector’s global sales = \$116 billion (2013)
Top 3 companies control 49% market share

Big Ag Investment in Digital Farm Data:

Hardware, Software, Analytics (Weather Diagnostics, Crop Insurance)

Company	Big AG Data Platform / Services	Partners / Alliances
AGROCHEMICAL / SEED INDUSTRY		
Monsanto	Precision Planting Inc. – acquired 2012 – sold to Deere Nov. 2015 Climate Corp. – acquired 2013; 640 Labs – acquired 2014 Climate Basic/Climate Pro/FieldScripts	Deere Agrium, Inc. Iteris' WeatherPlot
Syngenta	FarmAssist® AgriEdge Excelsior® Water+™ Intelligent Irrigation Platform	Ag Connections Lindsay Corporation (irrigation systems operating in more than 90 countries) Iteris' WeatherPlot
DuPont Pioneer	Encirca Services “whole-farm decision service” Encirca® Yield Stand Encirca® Yield Nitrogen Management	Deere AGCO DTN / The Progressive Farmer (weather; market information, grain trading) Raven Industries
Bayer	“integrate data access, wireless data transmission, and delivery of prescription recommendations”	Iteris' WeatherPlot Deere
BASF	“Clearpoint Advanced”	Deere Iteris' ClearAg – weather data
Dow	EXZACT Precision Technology platform	Deere; Arcadia Biosciences
Land O' Lakes (Winfield)	Acquired GEOSYS satellite imagery - 2014	Mosaic
FERTILIZER INDUSTRY		
Yara	N-Sensor (tractor-mounted tool) & N-Tester (hand-held device) nitrogen monitoring; Megalab (internet-based analytics); CropSpec (remote sensors to measure chlorophyll content of leaves); ZIM Plant Technology (water-sensing probe and internet-based data visualization)	CropSpec developed with Topcon Precision Agriculture (US-based subsidiary of Topcon Corp., Japan)
Agrium, Inc.	Echelon (formerly NutriScription HD); Precision Agri-Lab (analytical laboratory and tech center owned by Crop Production Services [CPS], retail business unit of Agrium)	CPS sold Monsanto's Climate Pro platform to retail customers in 2014-2015
Mosaic Company	Field InSite VRN (Variable Rate Nutrient), SaMZ (Satellite Derived Management Zones)	Cargill
FARM EQUIPMENT INDUSTRY		
Deere	“integrated precision system;” Greenstar; RTK satellite navigation; crop insurance; acquires Monsanto's Precision Planting LLC (Nov. 2015)	BASF, Bayer, DuPont, Dow, Climate Corp. (Monsanto)
CNH	Advanced Farming Systems	Climate Corp. (Monsanto)
AGCO	VarioDoc and AgCommand	Bayer, DuPont, BASF, Precision Planting (Deere, formerly Monsanto), Trimble
Kubota	Acquired Kverneland ASA in 2012 (new M7 series adopts precision ag features)	
CLAAS	Efficient Agriculture Systems	
GRAIN TRADER / FOOD PROCESSOR		
Cargill	NextField DataRx; data analysis software; crop insurance	
Archer Daniels Midland	ADM Crop Risk Services	

Following the Money

In 1981, ETC Group (then RAFI) warned that the spate of crop-chemical companies taking over seed companies could lead to the development of proprietary plant varieties dependent on proprietary pesticides. Both public- and private-sector scientists dismissed our warnings as alarmist, pointing out that no such technology existed. Yet by 1983, Ciba-Geigy (now Syngenta) was advertising its new seed-and-chemical packages in farm publications. But it was only with the introduction of GM seeds in 1995 that the world was introduced to herbicide-tolerant plant varieties – a proprietary chemical-and-seed package that couldn't be “uncoupled.” It wasn't that ETC was clairvoyant back in the '80s – we just followed the money.

Today, the shift of the Big Six toward Big Data – and similar moves by the farm machinery and fertilizer companies – shows that another step-change may soon be at hand as companies follow the money toward even greater input integration.

Who will win? We can't be certain. But the odds are on the big boys with the hardware. Seeds, pesticides and fertilizers all go into the “Big Box” that farm equipment companies sell. The machinery majors have decades of experience with robotic tractors now so automated (with satellite navigation) that farmers can focus attention on other things like in-cab data-displays or, literally, be asleep at the wheel; now drones are part of the arsenal (and have been used for spraying Japan's crops since the 1980s). At the end of the day, it's all about the data with the command center (a.k.a. tractor) crunching the numbers related to soil, market and weather conditions, then spitting out the recommended configuration of seed, pesticide and fertilizer.

Thinking Outside the Box

Back in the 1980s, the big competition for the merged seed/pesticide companies came from government and university breeding programs. It didn't take long to persuade governments to abandon public plant breeding and simply subsidize the R&D needs of the companies. Today, the Big Six have all but eliminated competition from public breeders and small companies, but they see another way governments can serve their needs: crop insurance.

While crop insurance is administered differently in different parts of the world, it almost always involves government (providing subsidies) as well as parastatal and private actors. No surprise, Big Ag has its hand in private crop insurance to make sure farmers buy their products. This is already standard practice in the U.S., the largest crop insurance market in the world. (China is second.) For growing season 2015-16, for example, John Deere Insurance Company collaborated with BASF to offer “Risk Advantage” – reduced crop insurance premiums and better coverage – if the farmer buys a minimum of three BASF products (one of which must be a fungicide) to cover at least 500 acres.²⁶ But this isn't limited to the U.S. The Syngenta Foundation offers “Climate-Smart Crop-Index” Insurance for maize and wheat farmers in Kenya and Rwanda, offering protection to those who agree to abandon seed saving in favour of buying “certified seed” and branded fertilizers. Swiss Re, one of the world's largest reinsurers, predicts that paid insurance premiums on crops in emerging markets could reach \$15-20 billion by 2025.²⁷

It makes perfect sense for Big Ag to demand that farmers who want crop insurance (or bank loans) sign the full service contract offered by the company dictating which of their proprietary inputs – including data – they must pay for and how their fields should be managed.

But climate change is putting a wrench in the works.

Big Ag is now gambling from both sides of the table: Do they reap more profit by locking in customers with product-dependent crop insurance, or will climate chaos result in irregular and potentially huge payouts to cover claims? In the U.S., droughts in 2011 and floods in 2012 gave crop insurers second thoughts, and merger mayhem is now hitting an already tightly consolidated industry. In 2015, John Deere Insurance Co. offloaded its business; underwriter OneBeacon and its partner

Monsanto sold their stakes in Climate Corporation's crop insurance business to AmTrust Financial Services; days later, Wells Fargo signaled it was looking to sell its crop insurance arm, Rural Community Insurance Services, which accounts for more than 20% of the US market.²⁸ Can Big Data – especially weather and climate data – bring profitability back to the crop insurance industry or is the climate just too chaotic to fit in a Box?

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Big Six Collaborators

Company market share doesn't give the full picture of corporate power. It's important to examine the combined power and influence of the Big Six because these corporations aren't just competitors – they are also cartel-like collaborators – in tightly concentrated markets. The Big Six companies use a variety of inter-firm agreements to create barriers to entry and reinforce their top-tier market power. These include, for example:

Intellectual property and trait licensing – The Big Six use exclusive monopoly patents to swap proprietary traits and technologies. The patent owner determines whether or not to license, or selectively license, and how much to charge. The graphic (right) by Phil Howard of Michigan State University illustrates cross-licensing agreements between the Big Six for GE seed traits in 2013.

R&D alliances – For example, since 2007 BASF and Monsanto have collaborated on R&D partnerships worth \$2.5 billion. The companies collaborate on six R&D projects: breeding, biotech, pesticides, ag microbials, ag biologicals, and precision agriculture.

Patent litigation truces – If patent litigation battles get too onerous, Big Six firms can dissolve differences and minimize damage. In 2013, for example, DuPont and Monsanto agreed to drop antitrust and patent claims against each other, forge a new licensing deal worth \$1.75 billion and toss out a \$1 billion jury verdict DuPont was ordered to pay Monsanto.²⁹ One DuPont executive called it “a more rational way to compete.”³⁰

Generic trait agreement – Five of the Big Six companies forged agreements to manage the so-called “post-patent” regulatory regime. The “accords” are binding contracts among signatories that lay out the rules for access to generic biotech traits at patent expiration. ETC Group calls it the “charity cartel.”³¹

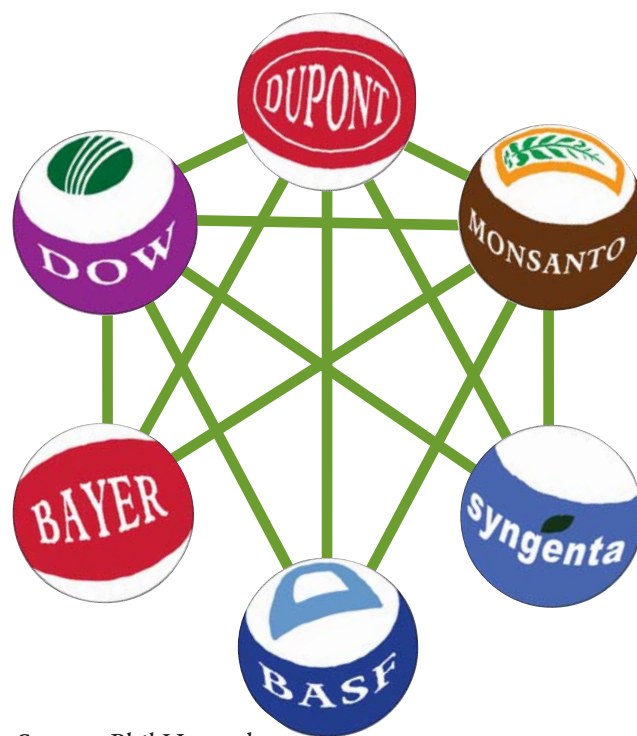
Big Six: Field Crop Seeds

3 firms – Monsanto, DuPont, Syngenta – control 60% market share in field crops.

5 of the Big Six companies (minus BASF) account for 68% market share in field crops.

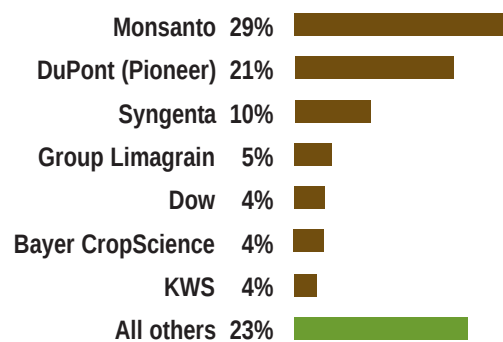
“Field crops” refer to major commercial grain, forage, sugar, oil and fiber crops (not vegetables/horticulture crops). The field crop seed market was valued at \$33.9 billion in 2013, or 86% of the total global market for seeds in 2013.

Cross-licensing Agreements for Genetically Modified Seed Traits



Source: Phil Howard,
Michigan State University, Sept. 2013

Three firms control 60% of the Field Crop Seed market, 2013



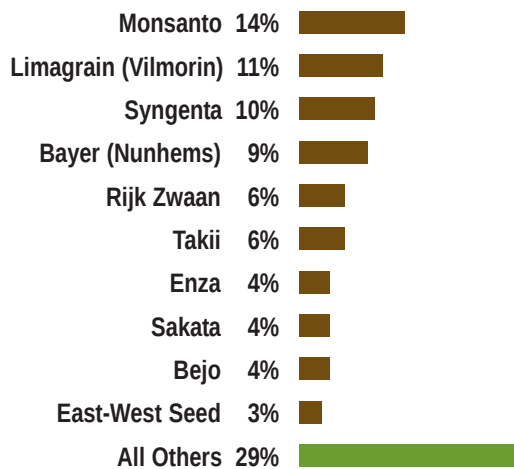


Sunflower and bee (cc) K G Nixer

Vegetable Seed Concentration

The Top 4 companies account for 43% of the worldwide vegetable seed market. In some geographic areas, vegetable seed industry concentration is much higher. Among the top 4 only Limagrain is not a Big Six agrochemical firm. Top 10 companies combined = 70% market share in vegetable seeds. The global commercial vegetable seed market was valued at \$5,634 million – or 14% of the total global market for seeds (\$39.4 billion) in 2013.

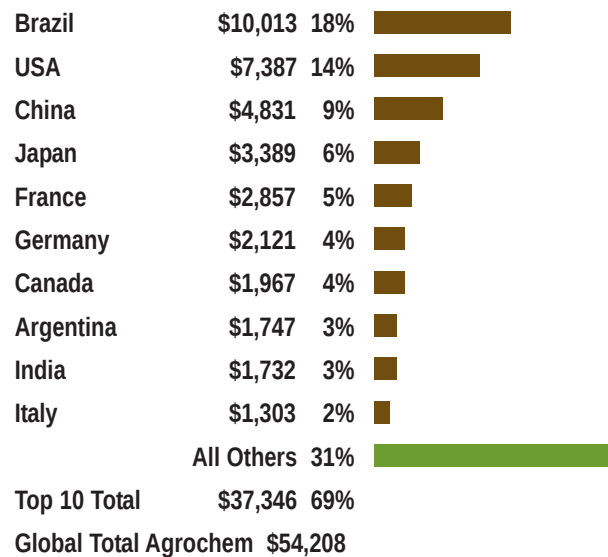
Four firms control 44% of the Vegetable Seed market, 2013



Top 10 Agrochemical Country Markets

Ten countries account for 69% of total agrochemical sales. Brazil overtook the US in 2014, and is the second biggest market for both Monsanto and Syngenta. The importance of emerging markets becomes a key issue when it comes to potential anti-trust regulation. Global South countries – especially Brazil, India, Argentina and China – could play a decisive role in any merger moves among the Big Six.

Top 10 Agrochemical Markets by Country, 2013, US\$ Millions



Source: Phillips McDougall,
Industry Overview – 2013, May 2014

Monsanto in Deere's Headlights? – The Urge to Purge

Counter to the corporate narrative, current M&A activity is not about technological innovation or efficiency – it's more about failure to diversify and innovate. While this applies to all of the Big Six, Monsanto is increasingly vulnerable on multiple fronts:

Monsanto needs to acquire new chemistry and diversify its revenue stream. For two decades, “Roundup Ready” has propelled Monsanto's profits – that is, seeds and traits sold (or licensed) in tandem with the company's blockbuster weedkiller Roundup [generic name: glyphosate]. Roundup is the best-selling agrochemical brand in history; today, glyphosate is the key ingredient in some 700 agchem products worldwide.³² In the U.S. alone, glyphosate-use on corn and soybeans shot up 20-fold from 1995-2013 (from 10 million to 205 million lbs/year); global use increased by a factor of more than 10.³³ But after two decades of relentless Roundup-based warfare,

glyphosate-resistant “superweeds” are proliferating and Roundup Ready crops are choking in weed-infested fields. In the U.S., farmers now face nearly 100 million acres of herbicide-resistant weeds in 36 states.³⁴ Worldwide, at least 24 species of weeds are now glyphosate-resistant.³⁵ In March 2015 the World Health Organization's International Agency for Research on Cancer struck another blow to Monsanto's flagship chemical, concluding that glyphosate “probably” causes cancer in humans.³⁶

About 85% of Monsanto's annual sales come from flagship products that are ageing out or defective: In 2013, GM corn seed alone accounted for 44% of Monsanto's total sales; GM soybean seeds/traits accounted for 11% of the company's sales.³⁷ Roundup-based weedkillers accounted for about one-third of Monsanto's earnings last year.³⁸ But Monsanto's pesticide pipeline is drying up. Syngenta is seen as a primary takeover target because of its ag chemical arsenal, and because at least half of the company's revenues come from emerging markets.³⁹

Quest for Precision Profits: In 2012, one Monsanto executive speculated that his company would soon become known as an information technology company.⁴⁰ Monsanto has since spent over \$1 billion buying three high-tech weather data/digital farming companies.



In June 2015 Monsanto's Climate Corporation announced that US farmers have mapped more than 75 million acres in the company's digital ag platform, up from 50 million acres in 2014 – an area equivalent to 45% of all corn and soybean acres planted in the U.S.⁴¹ It sounds impressive, but most enlisted farmers have sampled the free digital platform – not the “premium” fee-based services (now called Fieldview Plus & Fieldview Pro). With sluggish sales, Monsanto reportedly slashed this year's enrollment fee from \$15/acre to just \$3/per acre.⁴² In June 2015 Monsanto claimed that enrollment in its fee-based (“paid acre”) platform covered 5 million acres of farmland, up from 1 million acres last year.⁴³ The “paid acre” services include, for example, a

“Nitrogen Advisor” that prescribes the “optimum amount of nitrogen to maximize yield potential” or a “Field Health Advisor” that uses satellite imaging to evaluate pest infestation and prescribe insecticide or fungicide treatment.⁴⁴ Big Ag's push to control digital farming is controversial – especially farmers' concerns about ownership and control of farm-level information, security and privacy.⁴⁵

Flagging Farm Economy: Last year the U.S. accounted for over half (54%) of Monsanto's total sales. US farm incomes are projected to drop by nearly one-third in 2015 – the lowest level since 2009 – and farmers are desperate to cut costs. Meanwhile, a strong US dollar is also hurting Monsanto's foreign sales – especially in South economies like Brazil and Argentina, where Monsanto has huge market share in GM corn and soybeans.⁴⁶

Dodging Taxes: Monsanto is one of many US-based corporations eager to switch its incorporation to a country with a lower corporate tax rate, a strategy known as “tax inversion.”⁴⁷ According to one analyst, a potential merger with Syngenta would allow Monsanto to cut taxes by more than \$500 million and nearly halve Monsanto's effective tax rate.⁴⁸

Corporate Makeover: Monsanto's acquisition strategy positions the company to shed its tainted name.⁴⁹ In the minds of consumers everywhere, Monsanto personifies the evils of industrial agriculture. And after almost two decades of controversy, consumers still can't stomach GMO foods (if fully informed and given a choice). No matter which mergers/acquisitions ultimately materialize, there's little doubt that the infamous Monsanto name will soon be history.

Innovation and Corporate Concentration

The industrial seed/agrochemical industry argues that exclusive monopoly patents benefit society by spurring technological innovation. But even the traditionally staid *Economist* recently opined on the blatant failure of the patent system to spur innovation:

*“...stronger patent systems seem not to lead to more innovation. That alone would be disappointing, but the evidence suggests something far worse. Patents are supposed to spread knowledge, by obliging holders to lay out their innovation for all to see; they often fail, because patent-lawyers are masters of obfuscation. Instead, the system has created a parasitic ecology of trolls and defensive patent-holders, who aim to block innovation, or at least to stand in its way unless they can grab a share of the spoils...Patents should spur bursts of innovation; instead, they are used to lock in incumbents’ advantages.”*⁵⁰

Agrochemical Innovation Stagnates

With consolidation of agrochemical companies in the hands of fewer, bigger corporations, innovation in agrochemicals has withered. According to industry analysts:⁵¹

- The number of pesticide R&D companies dropped by half between 1995 and 2012: from 35 companies to 18.
- The number of new active ingredients in the R&D pipeline decreased by 60% between 2000 and 2012.
- Between 1995 and 2005, pesticide development costs rose by 118% – but the greatest share of R&D expenditures were spent on preserving sales of old chemical products facing patent expiration.

“On a global basis, the number of agrochemicals in development is falling, primarily due to fewer companies being involved, a greater focus by these companies on the seeds and traits area and a greater share of R&D investment being spent on defending products as they come off patent, including seed treatment and formulation technologies – rather than new active ingredient research.”
– Phillips McDougall, industry analysts⁵²

For Big Six companies, it is far more lucrative to breed GM seeds that boost sales of proprietary chemicals rather than develop agronomic solutions to pests, diseases and changing climate. (Worldwide, an estimated 85% of the total area devoted to GM crops in 2014 contained at least one trait for herbicide tolerance.⁵³)

According to industry estimates, it costs an average \$136 million to develop a new GM crop, and an average \$256 million – almost twice as much – to bring a new active ingredient to market.⁵⁴

To be clear, once a company has gone through the costs and regulatory maneuvers to bring a new pesticide to market it makes sense to focus on developing much cheaper plant varieties that either tolerate or need their proprietary toxin. But, it also means that a company has no incentive whatsoever to develop pest- or disease-tolerant plant varieties needing fewer toxins.

Industry insists that innovation is being strangled by the burden of harsh regulatory environments and the red tape of onerous field trial data. But it’s important to remember that the more costly and complex the regulatory requirements, the greater the barrier to entry, especially for smaller players. Together, exclusive monopoly patents and regulatory rules allow Big Six companies to gain and maintain market dominance:

“The more costly and complex the regulatory process is, the greater the barrier to entry it poses to competing products. Moreover, the obstacle posed by regulatory requirements can consolidate the exclusivity created by patents and other forms of IP. Together they form an IP–regulatory rules complex that companies use to gain and maintain competitive advantage.”
– David Jefferson et al., *Nature Biotechnology*, August 2015⁵⁵

Increased Choice?

In July, Monsanto’s president insisted that the company’s proposed mega-merger with Syngenta was all about creating more choice for farmers. But many studies indicate that market concentration means precisely the opposite.

Two recent European studies show that corporate breeders offer fewer varieties and a shift to crops that are more profitable for companies – not farmers. A 2015 study of five Nordic countries indicates that consolidation (from 1950 to the present) has resulted in a decrease in the number of available cultivars, a shift in focus to crops and hybrids more profitable to companies, and termination of breeding programs for regionally relevant crops.⁵⁷ A 2013 study on corn variety availability in Spain, Germany, Austria, Switzerland found that local seed companies and breeding organizations increase farmers’ choices, whereas multinational breeders offered fewer choices.⁵⁸

“...what we’re trying to do is create more choice.” – Monsanto President Brett D. Begemann on proposed Syngenta merger, July 2015⁵⁶

Consolidation & Seed Prices

Seed industry consolidation also means disproportionately higher seed prices.

For example: from 1990-2010, the prices of farm inputs in the U.S. rose faster than the prices farmers received for their commodities. Seed prices spiked highest of all inputs, more than doubling relative to the price farmers received for their crops.⁵⁹ In the EU, between 2000 and 2008 the prices of seeds and planting stock jumped by an average 30%.⁶⁰

Anti-trust regulation

– Under Cubicle Arrest? ⁶¹

After decades of toothless response to corporate mega-mergers in virtually all sectors, it's difficult to predict to what degree new combined entities will be forced to divest some portion of their holdings. There is likely to be a delay of many months before any announced deal receives final authorization in all jurisdictions. And any announced merger is likely to result in a cascade of other deals.

The 2015 value of global mergers & acquisitions is on track to shatter the record-setting \$4.3 trillion recorded in 2007 (just prior to the collapse of global financial markets). A sample of recent and pending industrial food chain mergers:

Kraft Foods merges with **H.J. Heinz** in 2015, creating the fifth-largest food & beverage company in the world.

Anheuser-Busch In Bev's \$107 billion takeover (pending) of **SABMiller Plc**, creating mega-brewer with almost 30% of global beer sales.

CF Industries Holdings' \$8 billion bid (pending) to acquire the European and North American nitrogen-fertilizer assets of **OCI** – will rival industry leader Yara.

Anti-trust regulators in the U.S. have a dismal record when it comes to busting up Big Ag mergers. Monsanto brazenly pointed out that its proposed merger with Syngenta was not a concern in the U.S. because there's "no history of conglomerate merger enforcement in the U.S. in the last 40 years."⁶² The company was so confident that anti-trust regulators would approve the proposed merger (with proposed divestment of seeds and some agrochemicals) that Monsanto pledged to give Syngenta a \$3 billion break-up fee if the merger was ultimately blocked.

Historical Note:

Near the end of Bill Clinton's second term as US President, just after the world's largest grain trader, Cargill, acquired the second largest grain exporter, Continental Grain Company, draft legislation was introduced in both houses of Congress – with a dozen sponsors from farming states – that would "impose a moratorium on large agribusiness mergers and to establish a commission to review large agriculture mergers, concentration, and market power" (H.R. 3159 and S. 1739, The Agribusiness Merger Moratorium and Antitrust Review Act of 1999). The Commission would make recommendations on how to change underlying antitrust laws "to keep a fair and competitive agriculture marketplace for family farmers, other small and medium sized agriculture producers, generally, and the communities of which they are a part." The bill provided context and rationale:

"Growing concentration of the agricultural sector has restricted choices for farmers trying to sell their products. As the bargaining power of agribusiness firms over farmers increases, agricultural commodity markets are becoming stacked against the farmer...Concentration, low prices, anticompetitive practices, and other manipulations and abuses of the agricultural economy are driving family-based farmers out of business...The decline of family-based agriculture undermines the economies of rural communities across America...Increased concentration in the agribusiness sector has a harmful effect on the environment...To restore competition in the agricultural economy, and to increase the bargaining power and enhance economic prospects for family-based farmers, the trend toward concentration must be reversed."

A little more than a year later, George W. Bush was inaugurated. The bill was never enacted, though it sputtered along in weakened versions for another session of Congress until finally being taken off the table. How did it happen that the 1999 text describing the need for an agribusiness merger moratorium sounds both obvious and downright radical just a decade and a half later? For one thing, Big Ag took hold of the "feeding the world" narrative and ran with it. Now they're trying to convince us that industrial ag is "smart" for the climate. On the cusp of a new wave of ag mega-mergers, an agribusiness merger moratorium and meaningful review of concentration in the sector are more urgent than ever.

Could the South Deep-Six Big Six Mergers?

But the discussion will no longer be limited to anti-trust regulators in the US and EU. China, Brazil, India and Argentina rank among the top 10 pesticide markets and can't be ignored. Brazil, in particular, takes a hard line on cartels and could possibly single-handedly scupper any merger.⁶³ Competing companies, farmers and consumers in the global South would be hurt by ag mega-mergers, and anti-trust regulators in those markets should put their foot down.

Rightly or wrongly, some countries in the global South subsidize farm fertilizer and chemical costs and would not be happy to see these costs increase with corporate concentration. South governments may also want to safeguard the future market prospects of a national business champion that could someday (perhaps soon) acquire one of the Big Six without raising eyebrows in anti-trust offices in the EU and/or U.S.

Conclusion

Big Ag mega-mergers will increase costs, reduce innovation, cut choices and diminish diversity. National level anti-trust authorities – especially in the global South – must review, enforce, and strengthen antitrust laws.

Big Ag's cross-sector alliances involving digital farming data and analytics (farm machinery, seeds, fertilizers, pesticides, crop insurance and more) pave the way for unprecedented corporate collusion and control over the first links in the industrial food chain. Action is urgently needed to monitor, regulate and curb corporate power before food sovereignty and climate justice are further compromised.

As a first step, companies with both seed and pesticide divisions should be broken up. Competition policy regulators should make it unlawful for any company to market seeds whose viability and/or productivity depends on the application of a companion chemical.

At the international level, it is imperative that governments connect the dots between Big Ag mega-mergers, corporate consolidation and the devastating impacts on smallholder livelihoods, global food security, extreme climate and biodiversity.

These include, for example:

Governments meeting in Paris at the UN Climate Conference (UNFCCC COP 21) must reject industry's version of "Climate-Smart Agriculture" and instead promote Climate-Resilient strategies based on agroecology. Farmer-led strategies for climate change survival and adaptation must be recognized, strengthened and supported, with the direct involvement of farming communities.

At its 2016 meeting, the UN Committee on World Food Security (CFS) must take up Big Ag mega-mergers as a new and emerging issue. As the premiere body to address crises related to food security, it is urgent that CFS take the lead in addressing the impacts of corporate concentration and cartels. Recommendations for national, regional and global regulatory action are imperative.

Parties to the Convention on Biological Diversity meeting in Cancún, Mexico, in December 2016 (COP13) must examine corporate concentration in food & agriculture and the impacts on fair and equitable sharing of agricultural biodiversity, especially for smallholder producers in the global South.

Big Ag's cross-sector alliances involving digital farming data and analytics (farm machinery, seeds, fertilizers, pesticides, crop insurance) pave the way for unprecedented corporate collusion and control over the first links in the industrial food chain.

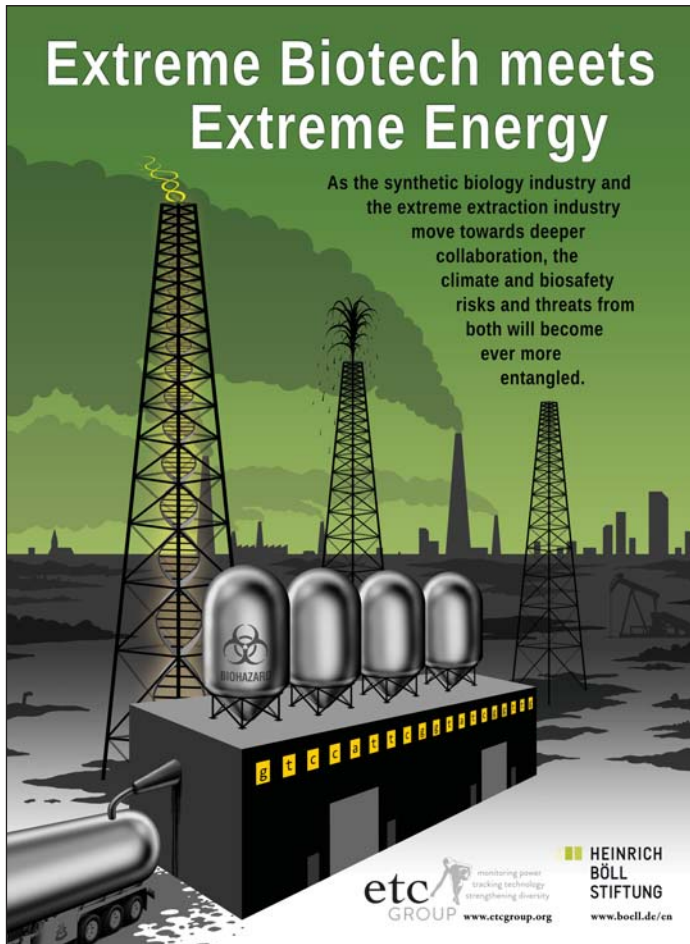
Endnotes

- 1 Jacob Bunge and Andrew Morse, "Monsanto Makes Bid to Go Big in Pesticides," *Wall Street Journal*, 8 May 2015.
- 2 Swetha Gopinath and Sneha Banerjee, "Dow Chemical reviews options for agri unit, restructures JVs," *Reuters*, 22 October 2015.
- 3 Carl Pray and Keith Fuglie, "Agricultural Research by the Private Sector," *Annual Review of Resource Economics*, Vol. 7, October 2015, pp. 399-424.
- 4 *CGIAR Financial Report 2013*. The CGIAR 2013 expenditure on crops-oriented research and conservation was \$332.2 million (that is, combined 2013 spending in seven crop-oriented CRP categories: 1) wheat, 2) maize, 3) rice, 4) roots, tubers, bananas, 5) grain legumes, 6) dryland cereals, 7) forage/feed crops, 8) genebanks. In 2013, the combined Big Six R&D budget (seeds/agrochem) = \$6,590 million.
- 5 U.S. Department of Agriculture CRIS, Table D: National Summary USDA, SAES and other institutions, FY 2013. USDA total crop-related spending: \$431 million (2013). In 2013, the combined Big Six R&D budget (seeds/agrochem) = \$6,590 million.
- 6 ADAMA, Introduction to ADAMA, May, 2015, p. 25.
- 7 *Ibid.*
- 8 Chuin-Wei Yap, Jesse Newman and Jacob Bunge, "Chinese Food Giant Explores Deals in U.S.," *Wall Street Journal*, 2 April 2015.
- 9 *Ibid.*
- 10 Charles Clover and Clive Cookson, "Chinese-Korean joint venture to mass-produce cloned beef cattle," *Financial Times*, 23 November 2015.
- 11 C. Robert Taylor and Diana L. Moss, "The Fertilizer Oligopoly: The Case for Global Antitrust Enforcement," American Antitrust Institute, 2013. According to the authors, "the global industry is dominated by two government-sanctioned export associations in the U.S. (*PhosChem*) and Canada (Canpotex); a privately traded monopoly sanctioned and likely controlled by the Moroccan government (Office Chérifien des Phosphates (OCP); and a cabal of three potash companies in the former Soviet Union (Belaruskali, Silvinit, and Uralkali, operating through their marketing cartel, Belarusian Potash Company BPC)," p. 7. N.B. BPC has since broken up.
- 12 Andreas Kröner, Ludwig Burger, "K+S investors see Potash Corp deal within reach despite rebuff," *Reuters*, 9 July 2015.
- 13 C. Robert Taylor and Diana L. Moss, "The Fertilizer Oligopoly: The Case for Global Antitrust Enforcement," *American Antitrust Institute*, 2013.
- 14 Mark Sutton, "Too much of a good thing," *Nature*, Vol. 472, 14 April 2011, p.159.
- 15 See: GRAIN, "The Exxons of Agriculture," September 2015: www.grain.org/article/entries/5270-theexxons-of-agriculture. See also: CIDSE, "Climate-smart revolution ... or greenwashing 2.0?" May 2015: www.cidse.org/publications/justfood/food-andclimate/climate-smart-revolution-or-a-new-craof-greenwashing-2.html.
- 16 Tom W. Bruulsema, Patrick Heffer, Ross M. Welch, Ismail Cakmak and Kevin Moran, "Fertilizing Crops to Improve Human Health: A Scientific Review," Executive Summary, pp. 3-4.
- 17 Kana Inagaki, "Yamaha aims to unlock US and EU markets with agricultural drone," *Financial Times*, 5 July 2015: <http://www.ft.com/intl/cms/s/0/626684e2-2181-11e5-aa5a-398b2169cf79.html#axzz3sLSJ0goC>.
- 18 Andrea Peterson, "Google didn't lead the self-driving vehicle revolution. John Deere did." *Washington Post*, 22 July 2015: <https://www.washingtonpost.com/news/the-switch/wp/2015/06/22/google-didnt-lead-these-self-driving-vehicle-revolution-john-deere-did/>.
- 19 Deere & Company news release, "John Deere and The Climate Corporation Expand Options for Farmers," 3 November 2015: https://www.deere.com/en_US/corporate/our_company/news_and_media/press_releases/2015/corporate/2015nov03-corporaterelease.page. Monsanto acquired Precision Planting LLC in 2012; acquired The Climate Corporation in 2013; and, in 2014, rolled both companies into Monsanto's Integrated Farming Systems and Precision Planting group as "Climate Corporation."
- 20 See Matthew J. Grassi, "AGCO Announces Precision Planting Integration," AGCO news release, 6 August 2015: <http://www.precisionag.com/equipment/agco-announces-precision-planting-integration/>.
- 21 Mike Stern presentation, Climate Corporation, 11 November 2015, p. 13.
- 22 Personal communication from Dave Kanicki, Executive Editor, Farm-equipment.com, 24 Sept. 2015.
- 23 See: http://www.iseki.co.jp/english/news/up_img/1419587650-511457.pdf. Conversion from JPY to USD based on year average (for year ended March 31, 2014).
- 24 Same Deutz-Fahr, SDF Annual Report 2014 (2013 revenues = €1,212 million). Average calendar year 2013 conversion rate from EUR to USD.
- 25 Personal communication with Arie Prilik, MTZ Equipment USA (via email). 5 Oct 2015.
- 26 See BASF web site for full conditions: http://agproducts.basf.us/campaigns/growersadvantage/index.html?utm_source=headlineadvantage.com&utm_medium=offline&utm_campaign=headlineadvantage.
- 27 Swiss Re news release, 16 January 2015: http://www.swissre.com/media/news_releases/nr_20130116_improving_food_security.html.

- 28 Chris Clayton, "Crop Insurance Consolidation," *DTN*, 17 August 2015.
- 29 Carey Gillam, "Monsanto, DuPont strike \$1.75 billion licensing deal, end lawsuits," *Reuters*, 26 March 2013.
- 30 Ian Berry, "DuPont, Monsanto Resolve Patent Dispute," *Wall Street Journal*, 26 March 2013.
- 31 ETC Group, Gene Giants Seek "Philanthropopoly," 7 March 2013: <http://www.etcgroup.org/content/Ecomm-gene-giants-seek-philanthropopoly>.
- 32 Carey Gillam, "Herbicide scrutiny mounts as resistant weeds spread in U.S.," *Reuters*, 22 September 2015. Note: This number includes generic glyphosate products that are not Monsanto's proprietary products.
- 33 Philip Landrigan and Charles Benbrook, "GMOs, Herbicides and Public Health," *New England Journal of Medicine*, 373, 20 August 2015, pp. 693-695.
- 34 *Ibid.*
- 35 Union of Concerned Scientists – USA, "The Rise of Superweeds—and What to Do About It," December 2013: http://www.ucsusa.org/sites/default/files/legacy/assets/documents/food_and_agriculture/rise-of-superweeds.pdf.
- 36 Andrew Pollack, "Weed Killer, Long Cleared, Is Doubtful," *New York Times*, 27 March 2015: http://www.nytimes.com/2015/03/28/business/energy-environment/decades-after-monsantos-roundup-gets-an-all-clear-a-cancer-agency-raises-concerns.html?_r=0.
- 37 In 2013, maize seeds & traits (\$6,596) accounted for 44% of the company's total sales. In 2013, soybean seeds & traits (\$1,653) accounted for 11% of the company's total sales.
- 38 Emiko Terazono, "Herbicide diversity drives Monsanto's bid for Syngenta," *Financial Times*, 2 June 2015.
- 39 *Ibid.*
- 40 Tim McDonnell, "Farming in the face of climate change? Monsanto has an app for that," *Grist*, 20 November 2014.
- 41 Climate Corporation news release, "The Climate Corporation Announces Record Adoption of Digital Agronomic Services Platform," 24 June 2015: <https://www.climate.com/company/press-releases/digitalagronomic-services-platform/>.
- 42 Rich Duprey, "Did Monsanto Inc. Waste \$1 Billion on This Acquisition?" *Motley Fool*, 1 April 2015. <http://www.fool.com>.
- 43 Climate Corporation, "The Climate Corporation Announces Record Adoption of Digital Agronomic Services Platform," 24 June 2015: <https://www.climate.com/company/press-releases/digital-agronomicservices-platform/>.
- 44 Climate Corporation web site. See, for example: http://www.climateinsights.com/?randomId=10t5v11FoSy5K&_ga=1.104621448.960901067.1448901944.
- 45 See, for example: <http://www.wired.com/2015/04/dmca-ownership-john-deere/>.
- 46 Laura Lorenzetti, "Forget the Roundup cancer report, Monsanto's worried about a stronger U.S. dollar," *Fortune*, 1 April 2015: http://fortune.com/2015/04/01/roundup-cancer-monsanto/?xid=yahoo_fortune.
- 47 Jason Bramwell, "Monsanto pursues \$500 million US tax cut with Syngenta deal," 9 June 2015: <http://www.accountingweb.com/aa/auditing/bramwells-lunch-beat-its-back-monsanto-seeks-tax-inversion-with-syngenta>.
- 48 Felipe Cortes, Armando Gomes and Radhakrishnan Gopalan, Corporate Inversions and Americanizations: A Case of Having the Cake and Eating it Too? *Social Science Research Network*, 15 August 2014: <http://ssrn.com/abstract=2481345> or <http://dx.doi.org/10.2139/ssrn.2481345>.
- 49 Emiko Terazono, Arash Massoudi and James Fontanella-Khan, "Monsanto targets tax inversion strategy with Syngenta offer," *Financial Times*, 8 June 2015.
- 50 Anonymous, "Time to fix patents," *The Economist*, 8 Aug 2015: <http://www.economist.com>.
- 51 The information used in the following three bullet points comes from Phillips McDougall, R&D trends for chemical crop protection products and the position of the European Market, A consultancy study undertaken for ECPA, September 2013: http://www.ecpa.eu/files/attachments/R_and_D_study_2013_v1.8_webVersion_Final.pdf.
- 52 *Ibid.*
- 53 Canadian Biotechnology Action Network (CBAN), Where in the World are GM crops and foods? March 2015: www.gmo inquiry.ca/where.
- 54 Phillips McDougall, R&D trends for chemical crop protection products and the position of the European Market, A consultancy study undertaken for ECPA, September 2013.
- 55 David J Jefferson, Gregory D Graff, Cecilia L Chi-Ham & Alan B Bennett, "The emergence of agbiogenetics," *Nature Biotechnology*, Vol. 33 No. 8, August 2015, p. 819.
- 56 Alison Rice, "Monsanto's Begemann Tackles Farmgate Concerns about Proposed Syngenta Merger," July 8, 2015: <http://www.agweb.com/article/monsanto-begemann-tackles-farmgate-concerns-about-proposed-syngenta-merger-naa-alison-rice/>.
- 57 S. Ø. Solberg & L. Breian, "Commercial cultivars and farmers' access to crop diversity: A case study from the Nordic region," *Agricultural and Food Science* (2015), Vol. 24, pp. 150–163.
- 58 Angelika Hilbeck, Tamara Lebrecht, Raphaela Vogel, Jack A Heinemann and Rosa Binimelis, "Farmer's choice of seeds in four EU countries under different levels of GM crop adoption," *Environmental Sciences Europe*, 2013, 25:12: <http://www.enveurope.com/content/25/1/12>.

- 59 Keith Fuglie, Paul Heisey, John King, Carl Pray, Kelly Day-Rubenstein, David Schimmelpfennig, Sun Ling Wang, and Rupa Karmarkar-Deshmukh, *Research Investments and Market Structure in the Food Processing, Agricultural Input, and Biofuel Industries Worldwide*, USDA, Economic Research Service, December 2011.
- 60 Greens / European Free Alliance in the European Parliament, Concentration of Market Power in The EU Seed Market, 2014. <http://www.greens-efa.eu/seed-market-regulation-11542.html>.
- 61 The term “cubicle arrest” comes from C. Robert Taylor, Ph.D., Professor emeritus of Economics at Auburn University. The term was used by Washington, D.C. antitrust regulators to describe how they were being restrained from pursuing some investigations or their reports were buried.
- 62 Monsanto web site, *Monsanto White Paper on Proposed Acquisition of Syngenta*, June 2015.
- 63 Caroline Stauffer, “Brazil presents another hurdle in Monsanto's bid for Syngenta,” *Reuters*, 4 August 2015.

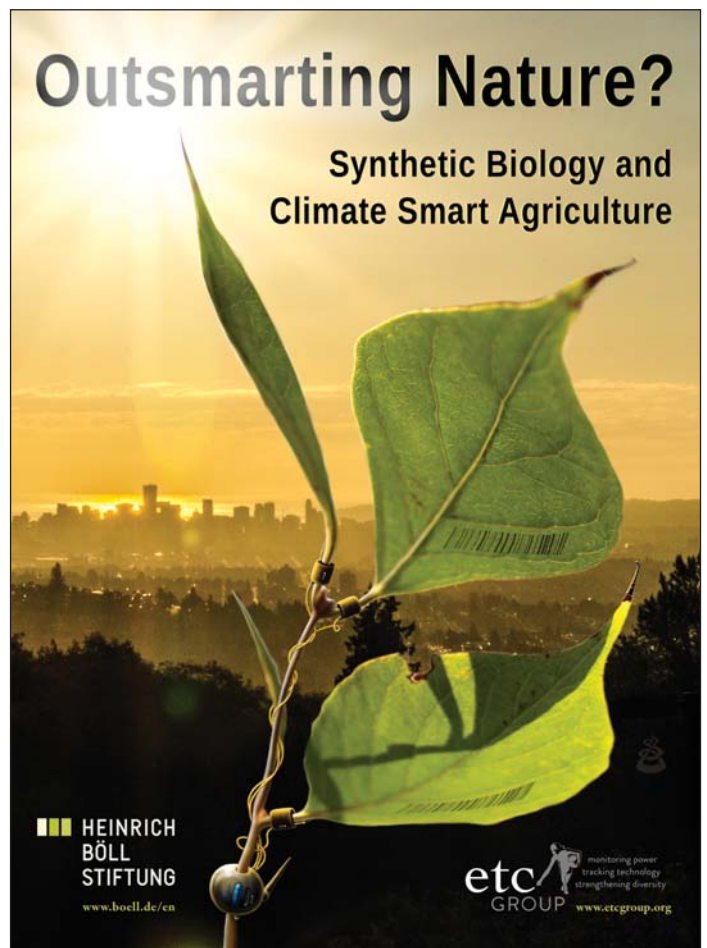
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