

PLATE
TECH
TONICS

Mapping Corporate Power in Big Food

**Corporate concentration by sector and
industry rankings by 2018 revenue**

Introduction

For more than 40 years, ETC Group (formerly as RAFI) has monitored corporate power in food and farming. Our initial focus on the ownership and control of seeds expanded to include all major sectors of the industrial food chain as well as the impacts of agri-food consolidation and the ownership of new technologies on farming communities, food sovereignty and biodiversity.

Though the corporate landscape is ever shifting, *Plate Tech-tonics* offers a still frame of the biggest players in 10 food system sectors: seeds, agrochemicals, synthetic fertilizers, machinery for Big Ag, animal pharma, livestock genetics, commodity traders, food processors, big meat and grocery retail.

Different sectors of the global food system – with a cumulative monetary value hovering around US\$ 8 trillion, according to World Bank analysts² – have long been known as “links in the food chain.” Today the chain metaphor is less relevant. Driven by cross-sectoral strategies leveraging Big Data and genomics technologies, sector borders are blurring because corporate interests are overlapping. We are seeing fertilizer giants investing in seeds and agrochemicals, which, themselves, became ‘consciously coupled’ via genetic engineering technologies in the mid-1990s (e.g., Monsanto’s GM “Roundup Ready” seeds); we are seeing farm equipment companies forging alliances with seed/pesticide/fertilizer giants; and all of them manoeuvring to dominate Big Data’s digital farming platforms. Some of the world’s largest commodity traders are now top-ranking food processors as well as animal protein providers. Big Data behemoths are becoming Big Food retailers, and vice versa.

Plate Tech-tonics refers to an array of technological and financial disruptors that are driving consolidation and corporate power in Big Food. These cross-sector technological and economic disruptors include expansive Big Data platforms, genome editing (i.e., CRISPR Cas-9), blockchain and the oversize influence of asset management firms. The Plate Tech- tonic disruptions are not specific to a single sector, but rather, are fault lines that can be traced throughout the global agri-food system all the way to our dinner plates.

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This document provides corporate rankings and sector snapshots using the latest complete information available: company results from 2018 (and in some cases 2017) sales. Company descriptions are included with rankings for sectors with a low public profile and/or when figures for market values are unavailable or too speculative to be useful (i.e., livestock breeding, commodity trading, meat processing).

This report is meant to accompany recent ETC Group publications that provide in-depth analysis of impacts and implications of concentrated corporate power driven by new technologies:

Blocking the Chain: Industrial food chain concentration, Big Data platforms and food sovereignty solutions, October 2018.

Forcing the Farm: How Gene Drive Organisms Could Entrench Industrial Agriculture and Threaten Food Sovereignty, October 2018.

Too Big to Feed: The Short Report, with IPES FOOD, August 2018, summarizes the full report, ***Too Big to Feed: Exploring the impacts of mega-mergers, consolidation, concentration of power in the agri-food sector***, published by IPES FOOD in October 2017.¹

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Research by Hope Shand
and Kathy Jo Wetter
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Design by Stig

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Interlocking Oligopolies

Calculating a company's share of a global market is fraught because it depends on accurate and coordinated accounting of the value of a market across continents and currencies, and it depends on accurate and transparent revenue accounting by companies.³ However – even if we lived in a world of complete transparency and accuracy – companies' market shares would give an incomplete picture of corporate power. Giant firms consolidate power within and between sectors by employing a wide range of formal and informal inter-firm agreements (joint ventures, strategic alliances, intellectual property swaps, employee swaps, cartel arrangements and more). ETC Group's *Blocking the Chain* describes the increasingly common but largely invisible practice of "horizontal shareholding" by giant institutional investors (also known as "asset management firms") that have dramatically raised their levels of stock ownership in major corporations over the past two decades – including in companies involved in Big Food. The concern is that asset management firms aren't just investing in individual companies; they are buying stakes in multiple competing firms in the same market segment. The result is "interlocking oligopolies operating all along agri-food supply chains" with anti-competitive impacts in seeds, supermarkets and more.⁴ Policymakers and anti-trust regulators don't have the tools or the teeth to clamp down on 21st century oligopoly power.

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Multinational firms (both private-sector and state-owned) headquartered in the Global South are increasingly prominent in Big Food. Leading corporate players from emerging markets, particularly China, are highlighted throughout this report's league tables and are fast becoming driving forces in hyper-consolidation across the globe (e.g., ChemChina, SinoChem, JBS, WH Group, COFCO, Mahindra, Wilmar).

The Big Role of Big Data

This report highlights specific examples of Big Food and Ag's expansive use of digital information, but it is worth emphasising that, all along the food chain, companies are increasingly turning to Big Data, notably via Internet-based technologies ("Internet of Things"), to generate new revenue streams and to grow profits. "Big Data" is shorthand for the capacity to collect, store, organise, analyse, use and – crucially – to control vast quantities of digital information. To highlight the prerequisites for profiting from Big Data, commentators often refer to Three (or Four or Five) Vs, including: Volume, Velocity, Variety, Veracity (i.e., accuracy), and Value.⁶ For example, chemical giant BASF uses its supercomputer "Quriosity" to speed up product development and scale up production. The company says it would take 50,000 laptops to process the amount of scientific data that Quriosity can (i.e., 1.75 "petaflops").⁷

The (No) Sharing Economy

In order for ETC Group to calculate a company's market share in a given sector, we need access to accurate accounting of the company's revenue as well as reliable information about the value of the global market. As fewer and fewer firms control oversized market shares, information and unbiased analysis about Big Food is harder to secure, and it is more purposefully opaque.

Every time ETC Group updates its corporate rankings, we find that information is less available publicly and is more costly – because it is generated by for-profit analysts whose proprietary products are for CEO eyes and the benefit of institutional investors rather than for the purpose of facilitating public understanding or industry transparency and oversight.

The role of public sector researchers in monitoring agribusiness is fast becoming a thing of the past.⁵ As a result, we are all increasingly dependent on the limited statistics and interpretations offered by the agri-food industry and its closely connected and influential insider-analysts.

It's not surprising that BASF would need massive processing power to model agrochemical formulations⁸ with adequate toxicity to battle ever-evolving "superweeds;" or that Bayer/Monsanto scientists would rely on computing power to track which genes are active during a soybean seed's development in order to engineer new varieties.⁹ What may be more surprising is the extent these companies now aim to exploit the "consumer-facing" aspect of big data – think US-based behemoths Google (Alphabet), Apple, Amazon, Facebook, Microsoft and China-based Baidu, Alibaba, Tencent and Xiaomi. The incorporation, adaptation and subsequent dependence on Big data's social technologies are facilitating cross-sectoral convergences that were unfeasible and barely imaginable at the beginning of the 21st century.

A few examples include:

Food retailers, of course, want to know who's shopping, what they're buying and at what price – and what they may be persuaded to buy. Retailers are already adept at collecting consumer information via customer loyalty programs, but they also want to encourage, fill and deliver online orders (instantly). To do all that, brick and mortar stores have started doubling as "fulfillment centers" and retailers are increasingly reliant on robotics and artificial intelligence as well as digital payment services.

The top experts in "New Retail" – US-based Amazon and China-based Alibaba, with social media / gaming giant Tencent – are battling for dominance in the grocery market through increasingly convoluted and cross-sectoral relationships and through outright ownership.¹⁰ Examples include Amazon's acquisition of Whole Foods chain stores, which were then linked to its Amazon Prime online service; and French supermarket giant Carrefour's recent sale of 80% of its China-based business to Suning, an electronics retail chain with nearly 9,000 stores across China. Alibaba owns a 20% stake in Suning, which, in turn, has its own investments in Alibaba.¹¹

Big Ag is enlisting retail and social media technology experts to help them track livestock. In China, Alibaba and its biggest domestic rival JD.com (Tencent owns a 20% stake in JD.com) are using face recognition technologies to create a database of pig faces, hoping that the ability to identify an individual pig and to monitor its behaviour – including tracking coughs via voice recognition – could help farm managers address problems in the early stages.¹² Cargill has invested in a Dublin-based start-up specialising in dairy-cow face recognition to increase "their customers' ability to

make proactive and predictive decisions to improve their farm's efficiency."¹³ As the start-up's founder explains: "Cows don't hide behind hats, sunglasses, or clothes, and they don't object if you spy on them."¹⁴ (But, it turns out, they also don't know how to use selfie sticks and won't stand still for the camera.¹⁵)

The holy grail of Ag Machinery is a fully autonomous, AI-equipped farm vehicle (driverless tractor) that serves as a command center for real-time "precision"

agriculture – that is, on-board (and/or drone-based) imaging and sensing that can provide instantaneous soil and crop analyses, prescriptions for inputs (e.g., fertilizer, herbicide) exported to a mobile app, and automated/robotic input delivery.¹⁶ Driverless car technologies, face recognition technologies, drone technologies, imaging and sensing technologies, mobile apps and more will all come together on the world's biggest industrial farms. The global market for artificial intelligence exclusively for agriculture is expected to surpass \$2 billion within five years.¹⁷

The incorporation, adaptation and subsequent dependence on big data's social technologies is facilitating cross-sectoral convergences that were unfeasible and barely imaginable at the beginning of the 21st century.

Seeds

The seed sector refers to crop seeds (primarily proprietary field crop and vegetable seeds) sold via the commercial market. It excludes farmer-saved seed and seed supplied by governments/institutions. Despite the astonishing level of corporate concentration in the global commercial seed sector, the vast majority of the world's farmers are self-provisioning in seeds, and farmer-controlled seed networks still account for an estimated 80%-90% of seeds and planting material globally.¹⁸

Over the past 40 years, the world's largest agrochemical firms have used patent laws, mergers & acquisitions (M&As), and new technologies to take control of the commercial seed sector. Although pesticides and commercial seeds are no longer distinct links of the industrial food chain, we provide corporate rankings and market share for the sectors separately.

Seed Sales of the Leading Companies, 2018 and 2017

Rank	Company (Headquarters)	2018 Seed Sales, US\$ million	% market share pro forma 2018	2017 Seed Sales, US\$ million	% market share pro forma 2017
1.	Bayer Crop Science (includes Monsanto) ¹⁹ (pro forma)	9,338	22.4	12,682	33.0
2.	Corteva Agriscience ²⁰ (pro forma)	8,008	19.2	8,200	21.3
3.	ChemChina /Syngenta (pro forma)	3,004	7.2	2,826	7.3
4.	Vilmorin & Cie /Limagrain ²¹ (France)	1,835	4.4	1,842	4.8
	Total Top 4	22,185	53.2	25,550	66.4
5.	KWSi ²² (Germany)	1,259	3.0	1,497	3.9
6.	DLF ²³ (Denmark)	684	1.6	614	1.6
	Total Top 6	24,128	57.8%	27,661	72
7.	BASF ²⁴ (ranking in 2018 only)	354	0.8		
	Total Worldwide Seed Sales	41,670		38,429	

Source: ETC Group, based on information from AGROW/INFORMA

The global commercially traded crop seed market increased by 1.3% in 2018 to reach \$41,670 million, according to Phillips McDougall.²⁵

In 2018:

- Top 3 companies account for 49% of the global market.
- Top 4 companies account for 53% of the global market.
- Top 6 companies control 58% of the global commercial seed market.

In 2017:

- The top 4 seed companies controlled two-thirds of the global commercial seed market.
- The top 6 seed companies controlled 72% of the global seed market..

Did the seed sector really become less concentrated between 2017 and 2018?

ETC Group believes that the sales reported by leading companies do not reflect the true level of global seed sales or market concentration because major seed company divestments and acquisitions were still being executed in calendar year 2018. Notably, BASF closed its acquisition of some of Bayer's assets in August 2018. The seeds & traits sales reported by BASF in its 2018 Annual Report provide only partial year reporting. By contrast, Bayer reported first quarter 2019 seeds & traits sales of approximately €1,022 million (~US\$1,205 million).²⁶ The figure suggests that ETC Group's chart, "Seed Sales of the Leading Companies, 2018," underestimates the degree of market concentration held by top 7 companies. We expect that BASF's 2019 reporting will provide full-year seeds & traits sales, revealing a more accurate level of seed industry market concentration.

Asset Management Firm (Headquarters)	Value of managed assets, US\$ trillion (2019)
BlackRock (USA)	6.0
Vanguard Group (USA)	5.3
State Street Corporation (USA)	2.5
Fidelity (formerly FMR) (USA)	2.4
Capital Group (USA)	1.9
Total Assets	18.1

Source: ETC Group

At the end of 2016 before the most recent round of mega-mergers, the world's five biggest institutional investors owned shares of all of the world's five largest seed companies – Syngenta, DuPont, Dow, Bayer and Monsanto. The level of collective ownership by the top five management firms ranged from 12.4% (Syngenta) to 32.7% (DuPont). These data and are from Mohammad Torshizi and Jennifer Clapp, "Price Effects of Common Ownership in the Seed Sector," 22 April 2019. Available at SSRN: <https://ssrn.com/abstract=3338485>.

What's Shaking Now

In 2016, the world's five biggest asset management companies collectively owned between 12.4% and 32.7% of the shares of the leading seed/agrochemical firms (Bayer, Monsanto, DuPont, Syngenta, and Dow – prior to recent mergers). Asset management firms aren't just investing in single companies; they are buying equity stakes in all of the biggest firms within a market sector, a practice known as "horizontal [or common] shareholding." Not surprisingly, in highly concentrated markets, competing firms held by the same institutional shareholders have little incentive to actually compete with each other. One anti-trust scholar refers to horizontal shareholding as "the greatest anticompetitive threat of our time."²⁷ Scholars have begun to document how horizontal shareholding by asset management companies is influencing corporate governance, driving M&As and leading to anti-competitive practices.²⁸

Horizontal shareholding in the seed sector: Canadian researchers recently asked

What effect does horizontal shareholding have on seed prices in a highly concentrated market? Quite a lot, in fact. A recent empirical study by Jennifer Clapp and Mohammad Torshizi reveals that market concentration and horizontal shareholding by asset management companies are responsible for approximately 28% of US seed price increases for soy, corn and cotton in the period between 1997 and 2017.²⁹ On average 14.6% of soy, corn and cottonseed prices over the 20-year period can be attributed to horizontal shareholding by five asset management firms that most of us have never heard of.³⁰

Market concentration and horizontal shareholding by asset management companies are responsible for approximately 28% of US seed price increases for soy, corn and cotton in the period between 1997 and 2017.

Agrochemicals

Companies in the agrochemical sector manufacture and sell pesticides (including herbicides, insecticides and fungicides) used in agriculture. In the wake of recent mergers, the top four companies are also major seed sellers.

In the wake of three colossal megamergers the industry's "Big Six" have become the "Fat Four." In 2017, the top four companies controlled 70% of agrochemical sales worldwide and more than two-thirds of commercial seed sales. (Note: Incomplete sales figures for 2018 do not allow an accurate comparison of market share in 2018).

Agrochemical Sales of the Leading Companies, 2018

Rank	Company (Headquarters)	2018 Agro-chemical Sales, US\$ million	% market share pro forma
1.	ChemChina – includes Syngenta ³¹ and Adama (China)	14,030	24.3
2.	Bayer Crop Science ³² (Germany)	10,617	18.4
3.	BASF (Germany)	6,916	12.0
4.	Corteva Agriscience (USA)	6,445	11.1
	Total Top 4	38,008	65.8
5.	FMC Corporation (USA)	4,285	7.4
6.	UPL (India)	2,741	4.8
	Total Top 6	45,034	78
	Total Worldwide Agrochemical Sales	57,561	

Source: ETC Group, based on info from AGROW/INFORMA

Agrochemical Sales of the Leading Companies, 2017

Rank	Company (Headquarters)	2017 Agro-chemical Sales, US\$ million	% market share pro forma
1.	Syngenta (Switzerland) + ChemChina (China) pro forma	12,767	23.5
2.	Bayer Crop Science (Germany) + Monsanto (USA) pro forma	12,440	23.0
3.	BASF (Germany)	6,704	12.3
4.	DowDuPont, now Corteva Agriscience (USA) pro forma	6,100	11.2
5.	Total Top 4	38,011	70.0
6.	FMC Corporation (USA)	2,500	4.6
	Sumitomo (Japan)	2,500	4.6
	Total Top 6	43,011	79.2
	Total Worldwide Agrochemical Sales	54,219	

Source: ETC Group, based on info from AGROW/INFORMA

The global market for conventional "crop protection products" – as the industry prefers to call herbicides / pesticides – grew by 6% to \$57,561 million in 2018, according to Phillips McDougall.

Done Deals

- **ChemChina** clinched its \$43 billion deal to acquire Syngenta – China's biggest-ever foreign corporate acquisition – in June 2017;
- **Dow** and **DuPont**'s \$130 billion merger closed in September 2017. DowDuPont's agribusiness division became **Corteva Agriscience** in February 2018;
- **Bayer** absorbed **Monsanto** in a \$62.5 billion deal – the largest all-cash buy-out on record and the largest foreign acquisition ever by a German company – in June 2018.

Note: Due to recent mergers & acquisitions, the market share figures for 2017 and 2018 are pro forma. **The actual market share is not clear because some M&A and asset-swaps were not completed in the 2017 or 2018 fiscal year.**

What's Shaking Now

State-owned ChemChina, following its 2017 acquisition of Syngenta, plans to supersize its agrochemical empire by merging with rival SinoChem. In mid-2018, the chairman of SinoChem also took the helm at ChemChina, which is also state-owned, paving the way for the expected merger. In February 2019, ChemChina appointed a SinoChem executive to head Syngenta's operations in China. As of November 2019, the union of ChemChina and SinoChem is presumed but has not been consummated. The merger would create a colossal chemical giant with annual revenues over \$100 billion.³³

Colossal Chem

Driven by its creed, “In Science We Trust,” SinoChem Group operates more than 300 subsidiaries worldwide and now ranks 88th on *Fortune*’s list of the world’s top 500 corporations.³⁴ Beyond chemicals, pesticides and fertilizers, the company is a major player in energy, real estate, trade and finance.

Bayer Beware

Bayer is still reeling from an über-headache following its ill-timed takeover of Monsanto. In August 2018 a California jury ruled that Monsanto’s blockbuster herbicide Roundup (a.k.a. glyphosate) caused a terminally ill man’s cancer, awarding him \$289 million in damages. (A judge subsequently reduced the award to \$78 million.) The court ruled that Monsanto “acted with malice” and that it suppressed information about the human health danger of its product.³⁵ In March 2019, a US federal jury ordered Monsanto to pay more than \$80 million in damages to another California man. Bayer’s share price plunged in the months following the monumental verdicts. As of October 2019 some 42,700 additional plaintiffs are suing Monsanto.³⁶ The company continues to deny that its product causes cancer,³⁷ but Bayer’s CEO admits that the court rulings have “massively affected” the company.³⁸ Investors are getting jittery and rumours are stirring that Bayer will spin-off its tainted agro-chemicals division if a “financially reasonable” settlement cannot be reached.³⁹

New Gene-Editing Technologies

The world’s largest pesticide and plant breeding companies are enthusiastically promoting gene editing (especially CRISPR-Cas9) as the fastest, most precise and predictable method for adding, deleting or re-arranging a plant or animal’s existing genetic material – without the use of DNA from another species. Because gene editing can be achieved without inserting foreign DNA, some companies – and some countries – insist that gene editing does not meet the legal definition of Genetic Engineering / Genetic Modification and is therefore not subject to regulation; others argue that gene editing is governed by existing biosafety regulations at the international level (i.e., Cartagena Protocol, where organisms with novel combinations of genetic material are referred to as Living Modified Organisms), but this has not been established.⁴⁰ In March 2018 the US Department of Agriculture announced it will not regulate plants that have been modified through genome editing, declaring them “indistinguishable from those developed through traditional breeding methods”⁴¹ (though the US Food and Drug Administration maintains that gene-edited animals must be regulated as GMOs).

Gene editing in plants was denied a comparable free pass across the pond when, in July 2018, the European Court of Justice ruled that techniques like CRISPR are a form of genetic engineering and must be regulated accordingly; in an open letter from July 2019, scientists from 117 research facilities appealed to the Court to reconsider.⁴²

Corteva Agriscience (the agriculture division of DowDuPont) is reportedly the single biggest owner of CRISPR patents and applications worldwide.⁴³ Not surprisingly, Corteva is committed to “wide adoption of this technology in agriculture.”⁴⁴ ChemChina (via Syngenta), Bayer and BASF also hold significant intellectual property estates in agricultural applications for CRISPR genome editing – either via licenses or patents.

What is CRISPR-Cas9 technology?

CRISPR stands for Clustered Regularly Interspaced Short Palindromic Repeats that are specialized stretches of DNA. CRISPR is adapted from a bacterial cell’s natural defense mechanism that enables it to detect and destroy the viruses that attack it. With the help of various Cas proteins such as Cas9, CRISPR can be used to directly alter DNA sequences and modify gene function in plants, animals, humans and microorganisms. Researchers are encountering unexpected and unforeseen impacts of CRISPR genome editing – the technique was discovered less than a decade ago – including “off-target effects” that can lead to unintended mutations as well as editing “inefficiencies” (i.e., the edits don’t work in 100% of cells).⁴⁵

With the advent of CRISPR-Cas9 gene editing, it becomes technically possible to develop a far more dangerous and disruptive technology: gene drives.

Gene drives are a new genetic engineering technology that seeks to rapidly spread human-directed genetic changes through entire populations of animals, insects and plants. Unlike first generation GMOs targeting commercial crops, gene drive organisms (GDOs) can be designed to manipulate both domesticated and wild populations. Gene drives aim to be invasive – to persist and to spread and, in some cases, even to extinguish an entire population or species; early proponents suggest the use of gene drives to spread “auto-extinction” genes to wipe out agricultural “pests.” International civil society organizations and leading voices in the global food movement are calling on the UN Convention on Biological Diversity (CBD) or an equivalent UN-level body to place an immediate moratorium on applied research, development and release of GDOs, including field trials, and the CBD has already agreed a precautionary decision to restrict gene drive experimentation and deployment (CBD/COP/14/L.31). See ETC Group, *Forcing the Farm*.

Synthetic Fertilizers

The synthetic fertilizer industry manufactures and sells inorganic plant nutrients synthesized through chemical processes. The three main fertilizer compounds are nitrogen (N) – derived from petroleum/natural gas – and phosphorus (P) and potash (or potassium chloride, KCl), which are mined.

The level of concentration in the fertilizer sector is uniquely difficult to quantify, even while oligopolies and monopolies have been a defining feature for more than a century. The sector is fragmented and has historically operated in export cartels organized by fertilizer type.

Synthetic Fertilizer Sales of the Leading Companies, 2018

Rank	Company (Headquarters)	2018 Fertilizer Revenue, US\$ millions	2017 Fertilizer Revenue, US\$ millions	Main Fertilizer Products
1.	Nutrien Ltd. (Canada) PotashCorp and Agrium completed a merger of equals on 01 January 2018.	11,951 ⁴⁶	10,533 pro forma	Potash, nitrogen, phosphate, ammonium sulphate
2.	Yara (Norway)	9,624 ⁴⁷	8,861	Ammonia, nitrates, NPK and specialty fertilizers
3.	The Mosaic Company (USA) (includes Mosaic Fertilizantes sales, Brazil)	9,008 ⁴⁸	6,794 (estimate)	Potash, phosphate
4.	CF Industries Holdings, Inc. (USA)	4,429 ⁴⁹	4,048	Nitrogen fertilizer products, NPK
5.	Israel Chemicals Ltd. (Israel)	4,201 ⁵⁰	3,127	Potash, phosphate rock, sulfuric acid, phosphoric acid, specialty fertilizers, phosphate fertilizers, NPK
6.	EuroChem Group fertilizers division (Russia)	3,431 ⁵¹	2,947	Nitrogen, phosphate, potassium
7.	Sinofert Holdings Ltd. (53% owned by state-owned SinoChem Group, China; Nutrien owns 22%.)	3,343 ⁵² (estimate)	2,510	Potash, nitrogen, phosphate fertilizer and NPK compound fertilizer
8.	PhosAgro (Russia)	2,775 ⁵³	2,943	Phosphate, NPK, ammonia, ammonium nitrate and urea
9.	Uralkali (Russia)	2,668 ⁵⁴	2,761	Potash
10.	K+S Group (Germany)	1,704 ⁵⁵	2,019	Potash, magnesium (excludes salt and industrial products segments)
	Total top 10	53,134	46,543	
	Total Worldwide Synthetic Fertilizer Sales	104,900		

Source: ETC Group, from company reporting

Competitors face extremely high barriers to entry, including billions of dollars in investment capital to dig for mineral deposits. Regional assets are regularly shifted among the major players to capitalize on shifts in supply, demand and the status of trade agreements. The global market for synthetic fertilizers reached nearly \$105 billion in 2018.⁵⁶

The sector is still in recovery mode after four consecutive years of decline. While the Top 10 companies account for just over 50% of worldwide fertilizer sales, that figure underemphasizes the level of concentration in the fragmented sector: just two companies supply the entire North American potash market; just three producers account for one quarter of the world's phosphate fertilizer supply.⁵⁷

What's Shaking Now

Big players remain on the lookout for M&A possibilities, with specialty fertilizer companies being particularly attractive targets. (So-called specialty fertilizers differ from traditional [NPK] fertilizers by containing micro-nutrients, or by having specialized formulations – e.g., slow release – or by their intended use with specialty crops such as fruits, vegetables, flowers, etc.). Companies held steady during the downturn by emphasizing other industrial chemical products over fertilizers when they could and by relying on revenue from other agricultural inputs – including digital agriculture platforms such as Nutrien's "Echelon" and Yara's "Megalab" precision ag services.

By the close of 2018, Nutrien had sold its 24% stake in Chile's SQM (Sociedad Química y Minera) to China's Tianqi Lithium Corp and its 28% stake in Jordan's Arab Potash Company to China's state-owned SDIC Mining Investment Company.

Nutrien is applying the revenue from the two sales to an expansion of its network of US farm retail outlets, which sell seeds and pesticides in addition to fertilizer. The company aims to establish a similar network in Brazil when the local "business environment" stabilizes;⁵⁸ Nutrien envisions a "North American-South American integrated company" that is a global powerhouse.⁵⁹

In the meantime, Nutrien pivoted away from Brazil and in August 2019, the company (via its Australia-based subsidiary Landmark) received regulatory approval to acquire its Aussie rival RuralCo for \$332 million; that acquisition will reduce the major farm services players in Australia to two. In February 2019, Nutrien announced it would buy California-based Actagro, a specialty fertilizer company, for \$340 million.

Yara aimed to "streamline" its phosphate production in Brazil, announcing in October 2018 that it would own 100% of the shares of Galvani Indústria, Comércio e Serviços S.A.;⁶⁰ Yara had held a majority stake in Galvani since late 2014.

Machinery for Big Ag

The farm machinery sector manufactures equipment used in the context of agriculture. This includes, for example, tractors, haying and harvesting machinery and equipment used for planting, fertilizing, ploughing, cultivating, irrigating and spraying. Hardware and software technologies related to so-called precision agriculture currently account for a small percentage of the global market (<5%), but that figure is expected to rise rapidly.

- Top 6 companies account for 52% of global market.

The North American farm equipment market is far more consolidated:

- Just 3 companies (Deere, CNH and AGCO) control 95% of the tractor market, and 100% of the combine market in North America.⁶¹
- The global market for agricultural equipment was \$126 billion in 2018.⁶²

Rankings in the global farm equipment market have changed very little since 2014, largely due to the dismal farm economy. Agricultural machinery sales sputtered from 2014 through most of 2017, a casualty of crop surpluses, depressed commodity prices and rising fuel costs worldwide. (When farmers aren't making money, they can't buy new equipment.) In the United States, net farm income tumbled a staggering 49% between 2013 and 2018.⁶³ In late 2017 and 2018, farm equipment sales began to recover, but the U.S.-China trade war has thrown a wrench in the farm equipment outlook.

What's Shaking Now

The farm equipment industry is pinning its recovery hopes on digital farming (i.e., precision agriculture), which, the techno-optimists insist, will feed the world by improving farm yields and reducing input (seed, pesticide) wastage, thereby optimizing sustainable practices.⁶⁴

Farm Equipment Sales of the Leading Companies, 2018 and 2017

Rank	Company (Headquarters)	Farm Equipment Sales, 2018 US\$ million	% market share in 2018	Farm Equipment Sales, 2017 US\$ million	% market share in 2017
1.	Deere & Co. (USA)	23,191	18.4	20,167	17.8
2.	Kubota (Japan)	13,837	11.0	12,320	10.9
3.	CNH Industrial (UK/Netherlands)	11,786	9.4	11,130	9.8
4.	AGCO (USA)	9,352	7.4	8,300	7.3
5.	CLAAS (Germany)	4,586	3.6	4,075	3.6
6.	Mahindra & Mahindra Ltd. (India)	2,466	2.0	2,050	1.8
	Total Top 6	65,218	51.8	58,042	51.4
	Worldwide Farm Machinery Sales (est.)	126,000		113,000	

Source: ETC Group

The world's largest farm equipment manufacturers have invested heavily in digital technology platforms and most have forged alliances with seed/pesticide and fertilizer companies to profit from data-driven farming. (For detailed discussion, see ETC Group, *Blocking the Chain*.) Precision agriculture – the application of computer-generated data and satellite- and Internet-based communications to industrial farm production – is also called “smart farming” or “farming 4.0.” It can refer to a wide array of proprietary hardware and software products using artificial intelligence and Big Data, such as remote imaging and sensing (via drones, for example), robotics and automation, and it can encompass financial services, commodity trading, weather forecasting, etc.

An estimated 70 to 80% of new farm equipment sold in the EU includes some form of precision agriculture technology.⁶⁵ Even so, adoption of digital farming has been slower than forecasters predicted, in part because many farmers still lack the required connectivity.⁶⁶ By one estimate, the global market for precision agriculture technologies is projected to grow to a relatively modest \$5.5 billion in 2021, up from \$3.4 billion in 2017, which represented only a small share of the global farm machinery market (just 3.5% of the total market, which is still dominated by heavy machinery used for ploughing, harvesting, spraying and irrigating).⁶⁷

While equipment manufacturers have embraced precision agriculture technologies – AGCO claims its combine features far more computer coding than a space shuttle⁶⁸ – farmers, especially in isolated areas, don't get the ‘tech support’ they need when something goes wrong with their AI-enabled equipment. Companies like Deere have claimed that tractor owners have “an implied license for the life of the vehicle to operate the vehicle,” but they do not have the right to fix it. Deere claims it retains ownership of all the tractor's software. A “right to repair” movement has gained ground across Europe, Australia and the United States where at least 18 states have introduced right to repair legislation; even some candidates campaigning for the 2020 presidential election are addressing the issue (at least in farming states).⁶⁹

In addition to fighting farmers, companies are fighting each other. In mid-2018, Deere sued Precision Planting LLC and AGCO, its parent company, accusing them of infringing a dozen of its patents. (AGCO bought Precision Planting from Monsanto in 2017 when the US Department of Justice blocked Monsanto's sale of the subsidiary to Deere on antitrust grounds.) In the face of controversy, some industry analysts optimistically suggest that farm machinery companies will ultimately need to collaborate by integrating equipment across various brands and adopting a universal operating platform.⁷⁰

Munich-based consultancy firm Roland Berger predicts: “We will see a trend towards open systems that allow for interoperability.”⁷¹ With the current level of market power in the hands of a half-dozen global firms, however, it's more likely that Big Data will drive greater concentration in the farm equipment sector. Since no company wants to risk allowing competitors to gain control of more information, the tendency for vertical integration along the industrial food chain increases (See ETC Group, *Blocking the Chain*). Mahindra & Mahindra (#6), India's largest farm equipment business and the world's largest selling tractor brand by volume (with more than \$16 billion in total sales across 20 industries) could provide a model: the company, integrated both vertically and horizontally, has 155 centres across the country to sell the company's farm equipment, seeds, pesticides, fertilizers, irrigation tools, soil testing and “agri counselling.” Mahindra's products are being sold on FlipKart, India's biggest e-commerce retailer (acquired by Walmart in 2018).

Big Ag's Quest for Data Driven Profits

Leading corporate players in seeds, pesticides, fertilizer, farm equipment, commodity trading and more are grabbing digital farming turf as fast as they can. Some firms are developing competing data platforms, either in-house or via acquisitions. Others focus on “interoperability” to maximize “paid acres” under subscription services. Worldwide, hundreds of technology start-ups now specialize in some aspect of the broad field of digital farming. Big Ag is acquiring these companies, or partnering with them, to build an arsenal of digital tools and services that can be integrated into their core products. Most notable of all, the largest firms in industrial agriculture continue to forge strategic digital partnerships across industry sectors.

Two recent examples:

Yara + Deere: In 2017, Yara (the world's second largest fertilizer company) acquired Adapt-N, precision ag software that provides “detailed fertilizer prescriptions.” Adapt-N is fully integrated with John Deere equipment (Deere is the world's top-ranking agricultural machinery firm).⁷² Adapt-N software was integrated with Nutrien's (world's largest fertilizer firm) digital ag platform prior to its acquisition by Yara.

Bayer + CNH: In 2018, Bayer's subsidiary Climate Corporation joined forces with CNH (the world's #3 ranking farm equipment firm) to establish two-way data sharing between their respective platforms.⁷³

Outside Big Ag, even bigger players are looking at data driven profits in food & agriculture. In 2018, Alphabet X, the research lab of Google's parent company, announced it is exploring how to apply artificial intelligence technologies to farming and food production.⁷⁴

Animal Pharma

The animal pharmaceutical industry (also known as the animal health industry) sells commercial products for livestock productivity/health and companion animal (pet) health, including medicines and vaccines, diagnostics, medical devices, nutritional supplements, veterinary and other related services. This sector does not include livestock feed and pet food products.

- The top 3 firms control 46% of the global animal pharma market.
- The top 4 firms control 58% of the global animal pharma market.

According to Vetnosis, total worldwide animal pharma sales reached \$33.5 billion in 2018.⁸¹ That figure includes pharmaceuticals (58%), biologicals (30%), and medicinal feed additives (12%).

Animal Pharmaceutical Sales of the Leading Companies, 2018

Rank	Company (Headquarters)	2018 Animal Pharma Sales, US\$ million	% market share in 2018
1.	Zoetis ⁷⁵ (USA)	5,825	17.4
2.	Elanco ⁷⁶ (USA) + Bayer Animal Health ⁷⁷ (pro forma) [merger not finalized]	4,837	14.4
3.	Boehringer Ingelheim Animal Health ⁷⁸ (Germany)	4,670	13.9
4.	Merck & Co. ⁷⁹ (USA)	4,212	12.6
Total Top 4		19,544	58.3
5.	IDEXX Laboratories (USA) ⁸⁰	2,088	6.2
Total Worldwide Animal Pharma Sales, 2018		33,500	

Source: ETC Group

Animal Pharmaceutical Sales of the Leading Companies, 2017

Rank	Company (Headquarters)	2017 Animal Pharma Sales, US\$ million	% market share in 2017
1.	Zoetis (USA)	5,300	16.5
2.	Boehringer Ingelheim Animal Health (Germany)	4,750	15.0
3.	Merck/MSD (USA)	3,900	12.0
4.	Elanco (USA), former parent Eli Lilly	3,086	10.0
Total Top 4		17,036	53.2
5.	IDEXX Laboratories (USA)	1,969	6.0
6.	Bayer Animal Health (Germany)	1,702	5.0
Total Worldwide Animal Pharma Sales, 2017		32,000	71.0

Source: ETC Group

All of the top tier animal veterinary companies are subsidiaries, or spin-offs, of Big Pharma. The animal health market is tiny compared to Big Pharma's human health sales. The top five animal drug manufacturers, Zoetis, Boehringer Ingelheim, Merck, Elanco, and Bayer account for almost two-thirds of the global market.⁸²

Ongoing Consolidation

Reeling from buyer's remorse after its costly acquisition of Monsanto, in August 2019 Bayer agreed to sell its animal health division to Elanco in a deal valued at \$7.6 billion. ETC Group's ranking of the leading animal pharma firms gives the pro forma sales of Bayer Animal Health and Elanco, which will become the second-largest animal health business when the deal is finalized in 2020. Fourth place Eli Lilly spun off its animal health unit, Elanco, as an independent entity in September 2018.

What's Shaking Now

Despite the decrease in antimicrobial sales (due to tighter restrictions on non-medical use of antibiotics to promote growth in livestock), industry analysts predict that the animal health market will double in size by 2030.⁸³ Among the factors propelling growth are global health threats due to spread of infectious diseases from animals; rapid growth of the market related to the "pet humanization trend"; and increasing global demand for animal protein (eggs, milk, meat). Zoetis saw its pet revenues in China soar 47% from 2017 to 2018.⁸⁴

Animal pharma companies are drooling over a Big Data market for animal health (genetics, biodevices, diagnostics and data analytics) that is valued at \$150 billion according to animal pharma powerhouse, Zoetis.⁸⁵ For example, in May 2018 Zoetis announced a \$2 billion deal to acquire high-tech veterinary diagnostic firm, Abaxis, and in December 2018 Merck acquired digital livestock and animal health tech company Antelliq Group for \$2.37 billion.

Livestock Breeding / Genetics

The industrial livestock-breeding sector focuses on animal genetics and reproductive technologies for livestock, including aquaculture and seafood. The industry favors genetic traits that speed growth, eliminate disease, facilitate containment and processing, and/or meet consumer preference.

- Three companies control virtually all of the world's poultry breeding stock.
- Three companies control almost half (47%) of the commercial swine genetics market.

Sales of the Leading Livestock Breeding Companies, 2018

Company (Headquarters)	2018 Revenue, US\$ millions	2017 Revenue, US\$ millions	Species
Tyson Foods / Cobb-Vantress (USA)	40,052	38,260	Chicken, cows, pigs
<p>A multinational, protein-focused food company, Tyson's products account for 1 in 5 pounds of all chicken, beef, and pork consumed in the U.S. Tyson operates a vertically-integrated chicken production process: breeding stock, contract growers, feed production, processing, further-processing, marketing and transportation of chicken and related products, including animal and pet food ingredients. Tyson's subsidiary, Cobb-Vantress, Inc. is a global leader in broiler breeding industry.</p>			
WH Group (Hong Kong)	22,610	22,379	Primarily pigs
<p>With its 2013 takeover of Smithfield Foods, WH Group is the world's largest hog producer and pork processor and China's largest meat processing business. In 2017, WH produced over 20 million hogs, slaughtered 54 million hogs and sold 3.2 million metric tons of processed meat.</p>			
Charoen Pokphand CP Group (Thailand)	17,000 (CP Foods Plc) ⁸⁶	14,200	Pigs, broiler chickens, layers, duck, shrimp/fish
<p>Thailand's largest private company, CP's subsidiaries constitute Asia-Pacific's leading agri-industrial food conglomerate; operations include breeding, farming, feed production, food processing, retail and food outlets across Asia, Europe, and U.S.</p>			
EW Group GmbH / Aviagen (Germany)	Not publicly available	Aviagen revenues (est. ~900-1,000 (2016)) ⁸⁷	Broiler chickens, turkeys, eggs, salmon, tilapia
<p>EW is a private holding group and owns Aviagen, the world's leading poultry breeder for broiler chickens and turkeys. EW acquired Hubbard, the broiler genetics division of Groupe Grimaud in 2017; owns AquaGen (Norway), leading supplier of genetic material to the global salmon farming industry; acquired GenoMar (tilapia) in 2017.</p>			
Genus plc ⁸⁸ (UK)	627	568 ⁸⁹	Pigs, beef cattle, dairy cattle
<p>Genus is a publicly-held, multispecies livestock breeder. Genus controls 23% global market share of porcine genetics; 8% market share in dairy and bovine (beef) genetics. Its subsidiary PIC (porcine genetics), sells breeding stock and semen in 35+ countries. Another subsidiary, ABS (bovine genetics), sells cattle semen and embryos in 70+ countries.</p>			
Groupe Grimaud (France)	Not publicly available	346 ⁹⁰	Pigs, layer chickens, ducks, Guinea fowl, shrimp, rabbit, Pacific white shrimp.
<p>Groupe Grimaud is a private, mainly family-owned company and claims #2 ranking worldwide for multi-species animal genetic selection; it owns Blue Genetics, a breeding program for Pacific white shrimp and has 2,000 employees, 35 subsidiaries in 13 countries.</p>			
Hendrix Genetics (Netherlands)	Not publicly available	Not publicly available	Layer turkey, pig, aquaculture (salmon, trout) and traditional poultry breeding.
<p>Hendrix is a privately-held multispecies breeder; a leader in turkey, layer, and trout breeding, with a growing share in swine, salmon and guinea fowl breeding.</p>			

Source: ETC Group

The Other Seed Stock - Global Livestock Genetics Industry

Despite the growing prominence of animal protein consumption and the massive contribution of industrial livestock to climate change, virtually no one is monitoring the degree to which a handful of transnational firms supply the breeding stock for an ever-increasing share of the world's industrial meat, milk, eggs and farmed fish/seafood.

There is very little information available about the market size of the animal genetics market. Privately-held companies are not obliged to publish figures on revenue and R&D. A 2013 study of chicken broiler companies by the European Commission notes that trade flows or values of genetic stock “do not exist” and information about breeding stock/lines is not publicly available.⁹¹ Compared to other input sectors, the livestock genetics market is puny. A 2016 report predicted that the global animal genetics market would be worth \$5.5 billion by 2021.⁹²

Market concentration in the animal genetics industry is highest for poultry, followed by swine and then cattle. The concern is not just the tightly held ownership and control of breeding stock, but the degree to which animal genetic companies are privately-held, secretive, and rely on proprietary genetics that are based on a very narrow range of uniform breeds. The widespread adoption of industrial livestock genetics is driving animal breed extinction.⁹³

Poultry Genetics

Poultry is the world's primary source of animal protein, and its share of the industrial meat complex is expected to climb to 45% over the next decade.⁹⁴ **Three companies control virtually all of the world's poultry breeding stock:**

- Two companies (EW Group and Tyson Foods) supply over 91% of the commercial breeding stock for broilers (i.e., chickens raised for meat).
- Two companies (EW Group and Hendrix) control layer chicken (i.e., chickens raised for eggs) genetics worldwide.
- Two companies (EW Group and Hendrix) supply virtually all of the commercial turkey genetics worldwide.

Big Piggies / The Swine Genetics Industry

Three companies control almost half (47%) of the commercial swine genetics market.⁹⁵ Genus plc, Topigs Norsvin and Hendrix Genetics. PIC (Pig Improvement Company, owned by Genus) claims that more than 120 million slaughter pigs produced each year contain its genetics.⁹⁶ The company also claims to serve 70% of the 200 largest pork producers⁹⁷ and sells boars, sows and semen. PIC touts its global focus and claims deals with eight of China's largest producers.⁹⁸ Genus reported an 80% increase in profits from sales in China in 2017 as the country moves away from backyard farms toward hi-tech megafarms.⁹⁹

In 2018-2019 the U.S.-China trade war and a virulent epidemic of African Swine Fever in Asia have trampled China's national herd and disrupted pork shipments internationally. The epidemic is expected to wipe out 50% of China's sow herd in 2019 (roughly a quarter of the world's pork supply). Industrial breeders forecast that pork prices and the demand for elite breeding stock will surge.¹⁰⁰

The level of concentration in swine genetics is likely higher than estimates that are based on market share as a percentage of global revenue; that's because the biggest players strategically partner with each other in joint ventures, research and other collaborations. For example:

- In February 2017, Genus announced a strategic partnership with European pig breeder Hermitage in which Genus will acquire the genetic rights and intellectual property of Hermitage.
- In July 2018, Genus announced a strategic partnership with Danish pig breeder Møllevang in which Møllevang will become “an elite genetics production partner of PIC in Denmark.” The terms of the agreement were kept confidential.

What's Shaking Now

Livestock breeders are chomping at the bit to apply new gene-editing tools like CRISPR-Cas9 to farm animals claiming they can improve animal welfare, create disease resistant livestock and heat-tolerant animals that can withstand planetary warming. Gene-editing proponents insist that tools like CRISPR-Cas9 are cheap, precise and predictable methods for adding, deleting or re-arranging an animal's existing DNA – without the use of foreign DNA, and therefore government regulation is not needed (see above, Agrochemicals section). British scientists, for example, aim to engineer chickens to be resistant to flu, which would create a bird “buffer” that could prevent a flu pandemic in humans.¹⁰¹ Using CRISPR, the birds' DNA is altered by removing parts of a protein that the virus would normally depend on to infect a host.

CRISPR Bacon?

Genus plc already devotes 13% of its R&D budget to gene-editing technologies,¹⁰² and the company holds a worldwide license to use Caribou Biosciences' CRISPR-Cas9 gene-editing technology platform.¹⁰³ In May 2019, Genus licensed its virus resistant CRISPR pigs to Beijing Capital Agribusiness Co Ltd, which is seeking approval to sell its gene-edited pigs in China – the world's largest pork market.¹⁰⁴ Genus is separately seeking approval from the US Food and Drug Administration to commercialize CRISPR pigs in the U.S. Using gene editing US-based Recombinetics, DNA Genetics, and Hendrix are working to eliminate the need for mechanical castration of swine (a routine practice in pig production); the companies seek to develop male piglets that are born “naturally castrated.”¹⁰⁵

Whither the Proofreaders?

Despite Big Ag's full-frontal embrace of gene-editing tools, the accuracy and safety of CRISPR-Cas9 and other new genome-editing techniques has not been demonstrated. And although CRISPR-edited animals are being steered to commercial markets, a menagerie of gene-edited animals is popping up in the lab and in the barnyard¹⁰⁶ with outcomes that are far from precise or predictable. Experiments in China involving gene-edited rabbits, designed for leaner meat, were unexpectedly born with enlarged tongues.¹⁰⁷

In a separate experiment, gene-edited pigs developed additional vertebrae, and gene-edited cattle in New Zealand (engineered for heat tolerance) died prematurely.¹⁰⁸ In July 2019 FDA scientists reported that foreign, non-bovine DNA unexpectedly showed up in the DNA of gene-edited dairy cattle being developed by Recombinetics (USA).¹⁰⁹ The company is editing the cows to be "naturally" hornless (to eliminate the need to mechanically dehorn calves). The unintentional contamination of DNA from a different species in the genome of gene-edited cows raises more red flags and makes a mockery of the oft-used term "precision breeding" to describe gene editing.

Agricultural Commodity Traders

Agricultural commodity trading companies are diversified firms that produce, procure, process, transport, finance and trade grains, food, fibre, meat, livestock, sugar, etc. on a global scale. They are involved in all phases of production and trade, from origination¹¹⁰ to processing, marketing, financial instruments, risk management and distribution.

The titanic firms that control global commodity trading are among the most powerful companies in the industrial food chain, but it's difficult to estimate the value of global commodity markets because much of the information is proprietary. Only three of the world's top-ranking agricultural commodity trading giants are publicly traded; three are privately held, and one is state-owned.

- The combined 2018 revenues of the leading six agricultural commodity traders was \$377 billion – far exceeding the combined global markets for seeds, pesticides, farm equipment and fertilizer (\$295 billion in 2018).
- Revenues of the world's largest agricultural commodity firm, privately-owned Cargill, were \$115 billion in 2018, surpassing the global sales of the entire farm machinery sector (\$90.7 billion).

What's Shaking Now

The commodity trading giants not only control infrastructure – silos, ports, barges, railroad cars and crushing/processing facilities – they are masters of Big Data. Acquiring and controlling digital data platforms is the key to finance and risk management in notoriously volatile commodity markets. As the *Economist* puts it: "Trading is an information war."¹¹²

Locking and Blocking the Chain?

In 2019, the world's largest agriculture commodity traders announced plans to collaborate on the development of emerging digital technologies (especially blockchain and artificial intelligence) to automate grain and oilseed trading.¹¹³ With the exception of Wilmar, all of the giant commodity traders listed in our table below have joined the digital technology alliance, claiming that the partnership will increase transparency and efficiency for customers while increasing security and reducing supplier costs. Publicly available information on the digital trading alliance is scarce, but a digital tech partnership among top-tier "competitors" should trigger alarm bells for regulators, farmers and consumers. How will regulators oversee a digital technology initiative that spans the globe, especially if it is based on proprietary platforms that could exclude or marginalize smaller firms? Will anti-trust regulators have the tools to determine if the initiative is spurring anti-competitive practices? What are the risks for global food security if the world's largest handlers of agricultural goods and financial services establish a digital lock on the global food chain? The commodity trading partnership expects to launch its new platform in the second half of 2020 "subject to regulatory approval."¹¹⁴

On the Cusp of Colossal M&A?

2017 and 2018 saw constant chatter about possible mega-mergers amongst the titanic commodity trading firms, but uncertainties surrounding the U.S.-China trade wars have dampened deal-making in 2019.¹¹⁵ Publicly-traded Bunge, the world's largest soybean processor, has been the most likely takeover target, with ADM, COFCO and Glencore viewed as possible buyers. The head of privately-owned Louis Dreyfus, Russian billionaire Margarita Louis-Dreyfus, who now controls 96% of the company, has reportedly been searching for co-investors, or may sell off chunks of the business.¹¹⁶

The rising star in the tiny but powerful constellation of global commodity traders is China's state-owned COFCO International, founded in 2014 as a subsidiary of COFCO Group. China's food imports have soared 12-fold since 2000, to \$117 billion in 2017.¹¹⁷ COFCO is China's largest food processing company, but already earns more than 50% of its operating income overseas. By 2020, the company aims to increase its share of China's massive state-owned food and grain industry to 80%.

Sales of the Leading Agricultural Commodity Traders, 2018 and 2017

Rank	Company (Headquarters)	2018 Sales, US\$ million	2017 Sales, US\$ million	Company Profile
1.	Cargill (USA)	114,700	110,000	Privately-held Cargill is the world's largest buyer, processor and distributor of grain, oilseeds and other agricultural commodities. With 155,000 employees in 70 countries, Cargill handles ~250,000 cross-border shipments of goods annually.
2.	COFCO Group China National Cereals, Oils and Foodstuffs (China)	71,200	69,700	State-owned COFCO handles 150 million tons of commodities annually in over 140 countries. COFCO is China's largest food processing company, but earns more than 50% of its operating income overseas. The company operates 2.3 million terminal sale points throughout China.
3.	ADM / Archer Daniels Midland (USA)	64,300	60,800	Publicly-traded ADM is a vertically integrated firm in more than 170 countries, with more than 270 ingredient manufacturing facilities. According to the company, ADM owns ~1,800 barges, 12,300 rail cars, 290 trucks, 1,300 trailers, 100 boats, and 10 ships; it leases an additional ~510 barges, 16,000 rail cars, 270 trucks, 130 trailers, 10 boats and 15 ships. ADM holds a 25% equity investment in Asian agribusiness giant, Singapore-based Wilmar (see #5 below).
4.	Bunge (USA)	45,700	45,800	Publicly-traded Bunge is a likely takeover target. Bunge has five business segments: Agribusiness, Edible Oil Products, Milling Products, Sugar and Bioenergy and Fertilizer. The agribusiness segment buys, stores, transports, processes and sells ag commodities and products. Roughly 33% of Bunge's processing capacity is based in South America, 27% in North America, 25% in Europe and 15% in Asia-Pacific.
5.	Wilmar International (Singapore)	44,500	43,800	Publicly-traded Wilmar focuses on oil palm cultivation, oilseed crushing, edible oils refining, sugar, flour and rice milling and refining, consumer product manufacture, specialty fats, oleochemicals, biodiesel and fertilizers. Wilmar operates over 500 manufacturing plants; its distribution network covers China, India, Indonesia and ~50 other countries.
6.	Louis Dreyfus Company (Netherlands)	36,500	43,000	Privately-held Louis Dreyfus produces, procures, processes and transports ~81 million tons of agricultural goods annually, employs ~19,000 people worldwide in more than 100 countries. Major platforms include coffee, cotton, sugar, dairy, oilseeds, fruit juices, freight (more than 200 vessels), global markets (foreign exchange management, and other financial instruments).
	Total Top 6	376,900	373,100	
7.	Glencore Agriculture (Netherlands)	N/A ¹¹¹	12,600	Privately-held Glencore sold a 40% stake in its agricultural business to Canada's largest pension fund for \$2.5 billion in 2016. Glencore Agriculture is owned by three shareholders: Glencore (49.9%); the Canada Pension Plan Investment Board (CPPIB) and the British Columbia Investment Management Corp (Canada). Glencore Agriculture operates in more than 35 countries and employs more than 14,000 people. The company manages 246 storage facilities, 35 crushing and processing facilities and owns 23 port terminals around the world. Glencore specializes in grain, oilseeds, pulses, cotton and sugar.

Source: ETC Group

Food & Beverage Processing

Sales of Leading Food & Beverage Processors, 2018

Rank	Company (Headquarters)	2018 Food & Bev Revenue, US\$ million	% share of top 10 food & bev revenues
1.	Nestlé (Switzerland)	80,195	17.8
2.	PepsiCo (USA)	64,661	14.3
3.	Anheuser-Busch InBev (Belg.)	54,619	12.1
4.	JBS (Brazil)	46,790	10.3
5.	Tyson Foods (USA)	40,052	8.8
6.	ADM (USA)	38,900	8.6
7.	Mars (USA)	35,000	7.8
8.	Cargill (USA)	32,500	7.2
9.	Coca-Cola (USA)	31,856	7.0
10.	Kraft Heinz Company (USA)	26,259	5.8
	Total Top 10	450,832	100

Source: *Food Engineering*, September 2019¹¹⁸

Sales of Leading Food & Beverage Proc., 2017

Rank	Company (Headquarters)	2017 Food & Bev Revenue, US\$ million
1.	Nestlé (Switzerland)	78,908
2.	PepsiCo (USA)	63,525
3.	Anheuser-Busch InBev (Belgium)	56,444
4.	JBS (Brazil)	46,188
5.	Tyson Foods (USA)	38,260
6.	Coca-Cola (USA)	35,410
7.	Mars (USA)	35,000
8.	ADM (USA)	34,195
9.	Cargill (USA)	30,500
10.	Danone (France)	27,885
	Total Top 10	446,315

Source: *Food Engineering*, September 2018

The food & beverage industry focuses on the post-harvest processing of raw agricultural commodities into consumer products – both foodstuffs and feedstuffs for human and animal consumption.

Big Food & Beverage Companies Play 'Ketchup'

The Top 10's combined sales topped \$450 billion in 2018, a slight increase from 2017 sales and bucking the trajectory of decline of the previous four years.¹¹⁹ The top five players held their places with some shuffling in the ranks of the lower five; Kraft Heinz clawed its way back into the Top 10 by ousting Danone, the French yogurt mogul.

The world's biggest food & beverage manufacturers have been getting squeezed on all sides – by consumers who are trying to shun highly-processed foods in favour of apparently healthier foods and cheaper alternatives and by giant grocery retailers that are stocking shelves with private label products and gobbling up online food sales. (Supermarkets reap an estimated 8-10% premium for their own private label products over branded ones.)

Big Food's perennial struggles also stem from a lack of innovation as well as overambitious mergers & acquisitions driven by profit-hungry institutional investors. The infamous Kraft-Heinz merger in 2015 is now a textbook case: the value of its flagship brands has plummeted more than \$15 billion and sales are down 13% from pre-merger levels.¹²⁰

What's Shaking Now

In 2018, the global food and beverage industry saw 527 M&A deals – down more than 10% from 2017's record year worth a total of \$142 billion.¹²¹ Big Food is still thirsty for M&As, but recent acquisitions are more focused on organic (so-called "clean labels"), convenience and trendy snack foods and beverages. In 2018, Conagra spent \$11 billion to buy frozen food business, Pinnacle Foods. The other big deals of the year involved beverages: coffee brewer Keurig Green Mountain acquired soft drink firm Dr. Pepper Snapple Group for \$18.7 billion to create North America's third largest beverage company; Nestlé paid \$7 billion to market Starbucks' coffee beans and drinks in grocery stores and other outlets.

Other noteworthy deals in 2018 and 2019 include:

- **Tyson's** acquisition of Keystone Foods business from Marfrig Global Foods (Brazil) for \$2 billion.
- **Campbell Soup's** biggest-ever deal to acquire Snyder Lance (snack foods) for nearly \$5 billion.
- **Hershey's** acquisition of Amplify Snack Brands for \$1.6 billion.
- Luxembourg-based **Ferrero's** acquisition of Nestle USA's candy business for \$2.8 billion (2018). In 2019, Ferrero bought businesses from Kellogg Co. – including Keebler – for \$1.3 bn.
- **General Mills's** acquisition of natural pet food maker Blue Buffalo Pet Products for \$8 billion.
- **Coca-Cola's** biggest acquisition ever to buy Costa Coffee (UK) for \$5.1 billion.
- **PepsiCo's** acquisition of Israel-based SodaStream for \$3.2 billion at the end of 2018, and its purchase of CytoSport (Muscle Milk brand) from Hormel Foods for \$465 million.

Big Meat / Protein

The corporate meat processing (or meatpacking) industry involves the slaughtering, processing, packaging and distribution of meat from cattle, pigs, sheep, poultry and other livestock.

Sales of the Leading Meat Processors, 2018

Rank	Company (Headquarters)	2018 Food Sales, US\$ million	2018 Rank Among Top 100 Food Cos.	2017 Rank Among Top 100 Food Cos.
1.	JBS S.A. (Brazil)	46,790	4	4
	JBS is the world's largest meatpacker; produces beef, chicken, pork (and leather); eyeing potential acquisitions but still in recovery mode after being fined \$3.2 billion in 2017 for bribing ~2,000 Brazilian politicians over 25 years and the arrests of former CEO and his brother (a JBS shareholder) for insider trading; only acquisition in 2018/2019 was Brazilian pork processor Adelle Indústria de Alimentos Ltda for \$60 million.			
2.	Tyson Foods (USA)	40,052	5	5
	Tyson processes ~1.8 billion animals annually (cows, chickens, pigs) and employs 121,000 people; Walmart is its biggest customer, accounting for ~17% of sales (Walmart announced in 2019 it would supply its own beef to 500 of its US stores). Along with other big poultry purveyors, Tyson is facing multiple lawsuits and a DOJ investigation alleging a price-fixing scheme from 2008 - 2016. In 2019, Tyson sold its stake in alt meat start-up Beyond Meat, but made nominal investment in lab-grown shrimp start-up New Wave Foods and launched Raised & Rooted, its in-house line of alt-meat and "blended" products. Tyson's acquisitions from troubled Brazilian protein giants included Keystone Foods from Marfrig for \$2.6 billion (2018) and the Thai and European operations of BRF for \$340 million (2019).			
3.	Cargill (USA)	32,500	8	9
	Privately-held Cargill produces poultry, beef and pork. In Sept. 2019, the company announced it would launch a new unit called Cargill Health Technologies to focus on "building a digestive and immune business for humans and animals" (i.e., feed/food additives). In 2018, Cargill Meat Solutions recalled 130,00+ pounds of ground beef (<i>E. coli</i> contamination). Cargill Protein Latin America expanded by buying Colombia's Pollos El Bucanero (2017) and Campollo, a poultry and protein producer (2019). Cargill has made nominal investments in lab-grown meat start-ups Memphis Meats (2017) and, in 2018 and 2019, PURIS (pea protein) and Aleph Farms (lab grown beef using 3D tissue engineering).			
4.	Smithfield Foods / WH Group (China)	21,283	12	15
	Owned by WH Group, Smithfield is the world's largest pork processor (~32,000 pigs/day) and hog producer; profits of ~\$1 billion in 2018, down 4% from 2017 due to US tariffs and an outbreak of African Swine Fever in China. A jury decided that WH Group should pay \$473.5 million to neighbours of Smithfield hog farms in North Carolina (USA) for hog waste, noise and pests (2018). More lawsuits have been filed.			
5.	NH Foods (Japan)	10,750	33	38
	NH is the largest fresh meat processor in Japan (beef, pork, chicken) and operates in 19 countries. NH bought Uruguayan beef processor/exporter BPU for ~\$130 million (2017). The company has joint venture with Lay Hong Foods (Malaysia) to produce halal chicken. In 2019, NH announced research partnership with IntegriCulture, Inc., a Japanese firm focused on cell-cultured meat production.			
6.	Danish Crown (Denmark)	9,650	39	42
	Danish Crown is the world's largest pork exporter and Europe's largest meat processor. The company established regional HQ in Vietnam and sales offices in Taiwan and Philippines in 2017 to focus on Asia; in 2018, Danish Crown signed a five-year supply deal with China's Win-Chain (Alibaba subsidiary) worth \$300+ million.			
7.	Hormel Foods Group (US)	9,546	41	44
	After three major meat acquisitions in 2017 – Columbus Manufacturing, Inc. (USA) for \$850 million; Fontanini Italian Meats and Sausages (USA) for \$425 million; and Cidade do Sol (Brazil) for \$104 million – Hormel's M&A activity has slowed. In 2018, 310,000+ pounds of the company's turkey and 228,000+ pounds of Spam recalled due to salmonella (turkey) and presence of metal (Spam).			

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Rank	Company (Headquarters)	2018 Food Sales, US\$ million	2018 Rank Among Top 100 Food Cos.	2017 Rank Among Top 100 Food Cos.
8.	BRF (formerly Brasil Foods) (Brazil)	8,270	50	37
	BRF is the world's second largest chicken producer; replaced its CEO and CFO in 2017 after allegations that company had bribed meat inspectors; VP of Global Operations arrested in 2018; Europe banned imports from the company's facilities. BRF acquired Banvit, Turkey's biggest poultry producer (2017) and sold its Thai and European operations to Tyson for \$340 million (2019). Merger with Marfrig (#9) called off mid-2019.			
9.	Marfrig (Brazil)	8,140	51	76
	Marfrig processes/produces beef and lamb. The company was implicated (along with JBS) in scandal involving bribing meat inspectors. Marfrig acquired equity stake in US-based National Beef Packing Co. in 2018 for ~\$1 billion, making Marfrig the world's 2nd largest beef processor; sold its US-based Keystone Foods to Tyson to help pay for acquisition. In December 2018, Marfrig acquired Argentina-based Quick Food S.A. from BRF for \$60 million. Merger with BRF (#8) called off mid-2019.			
10.	Vion (Netherlands)	3,948	98	74
	Vion processes/produces pork and beef. In 2017, Vion closed its pork slaughterhouse in Germany to focus on exports to Asia and in 2019 announced it would consolidate its European operations and convert a beef-processing facility in the Netherlands to produce plant-based meat alternatives.			
Total Top 10		190,929		

Sources: ETC Group and *Food Engineering*, September 2018 and *Food Engineering*, September 2019

What's Shaking Now

Meat's messy business was exposed more than a century ago, but all-too-frequent incidents of contamination, corruption, court settlement payouts, alleged collusion (price-fixing) and worker injuries – some of which are highlighted in the company profiles above – make clear that the industry has yet to clean up its act. Brazil-based JBS, the world's biggest meatpacker, is embroiled in scandal at home and abroad, but still manages to stay open for business and slaughter 77,000 cows, 116,000 pigs and 13.6 million chickens every single day.¹²²

Using new technologies, including synthetic biology-based fermentation, companies are beginning to produce animal-free meat in the lab – so-called clean meat¹²³ – and they are developing new plant-based meat substitutes. The big players won't walk away from their cows, pigs and chickens anytime soon, but they are understandably intrigued by the prospect of delivering protein without the environmental, health & safety and clean-up costs of animal meat processing. In 2017, Cargill (#3) began investing in Memphis Meats, a Silicon Valley start-up developing lab-grown meat, and, in 2019, the company added Israel-based Aleph Farms to its "clean meat" portfolio. (Aleph Farms starts with cells extracted from cows and uses tissue engineering to grow meat in the lab.) In 2018, Cargill also invested \$25 million in a joint venture with PURIS, a US-based yellow field pea protein producer and tacked on another \$75 million investment in PURIS in 2019 to beef up its plant-based protein profile.

In April 2019, Tyson (#2) announced it was selling its nominal stake in California-based Beyond Meat and would start selling its own plant-based meat by the end of the year. Tyson's head of venture investing explained the move: "If disruptions take place in the way that food is going to be developed or delivered in protein, in particular, Tyson Foods is going to be there."¹²⁴ Tyson's line of plant-based meat and "blended" meat products (animal meat combined with plant-based protein), called Raised & Rooted, hit the shelves in September.

Meatless protein's biggest boost came in April 2019 when Burger King, the global fast food hamburger chain operating in 100 countries, announced that it would put an animal-free, plant-based "Impossible Whopper" on its menu beginning with 59 restaurants in the USA; the meatless burger will be available nationwide by the end of 2019.¹²⁵ The Impossible Burger's key ingredient – "heme," an iron-rich protein derived from soy – is produced via synthetic biology-based fermentation in genetically modified yeast. (For more information about the Impossible Burger's controversial route to market, see ETC Group, "Bleeding' veggie burger has 'no basis for safety,' according to FDA."¹²⁶) The global market for plant-based meat substitutes is expected to reach \$7.5 billion by 2025.¹²⁷ In the United States, cattle ranchers are just beginning to feel the threat to their bottom line. They've stampeded nearly 30 state legislatures to lobby on behalf of bills that prohibit alt-meat companies from using words such as *meat*, *burger*, *sausage*, *jerky* or *hot dog*; seven US states have already enacted the prohibitions.¹²⁸

Grocery Retail

Grocery retailers sell perishable and non-perishable foods (“edible grocery”) to consumers via retail outlets (stores or online). The world’s largest grocery retailers sell both non-food products (“non-edible grocery”) and food.

According to retail industry analysts Ascential, worldwide consumer spending on retail food & beverage was \$7,932 billion (\$7.9 trillion) in 2018.¹²⁹

Sales of Leading Grocery Retailers, 2018

Rank	Company (Headquarters)	Edible Grocery Sales 2018, US\$ million	% market share of top 10 grocery retailers
1.	Walmart (USA)	234,031	27.3
2.	Schwarz Group (Germany)	96,147	11.1
3.	Kroger (USA)	91,808	10.6
4.	Aldi (Germany)	88,957	10.2
5.	Carrefour (France)	70,656	8.1
6.	Costco (USA)	62,336	7.2
7.	Ahold Delhaize (Netherlands)	59,864	6.9
8.	Tesco (UK)	57,563	6.6
9.	Seven & I Holdings (Japan)	54,322	6.3
10.	Edeka (Germany)	52,577	6.1
Total Top 10		868,261	
Global consumer spending food & beverage retail, 2017		7,932,000	

Source: Edge by Ascential

Sales of Leading Grocery Retailers, 2017

Rank	Company (Headquarters)	Edible Grocery Sales 2017, US\$ million	% market share of top 10 grocery retailers
1.	Walmart (USA)	293,285	32.0
2.	Kroger (USA)	86,446	9.4
3.	Schwarz Group (Germany)	86,153	9.4
4.	Seven & I Holdings (Japan)	84,943	9.3
5.	Aldi (Germany)	80,958	8.8
6.	Carrefour (France)	67,970	7.4
7.	Ahold Delhaize (Netherlands)	57,774	6.3
8.	Costco (USA)	55,964	6.1
9.	AEON (Japan)	52,585	5.7
10.	Tesco (UK)	50,054	5.5
Total Top 10		916,132	
Global consumer spending food & beverage retail, 2017		7,589,000	

Source: Edge by Ascential

- The top 10 grocery retailers control an estimated 11% of the global market.
- Walmart accounts for 27% of the revenues earned by the top 10 grocery retailers.

The big players have shifted position from 2017 to 2018 with the exception of Walmart, the far and away leader of the pack. The relatively low level of market concentration in the global grocery retail sector is deceiving due to the high level of institutional investment: according to researcher Jacob Greenspon, the asset managers Vanguard, BlackRock, Capital Research, Fidelity, and State Street are the five largest owners of Kroger; five of the six largest owners of Costco; and four of the seven largest owners of Target.¹³⁰ (These five big asset managers are also the biggest players in the seed sector; see above.)

Walmart, the world’s leading seller of food & beverages, is still controlled by its founding family, but asset managers now own more than 30% of the company – Vanguard, BlackRock, State Street and Fidelity are the top four institutional owners.

What’s Shaking Now

Back in the 20th century, when Amazon still called itself “Earth’s Biggest Bookstore,” the company had already set its sights on grocery e-commerce.¹³¹ But buying groceries online didn’t catch on as quickly as buying everything else online. Asia is currently home to three of the five biggest national online-grocery markets, but even so, online sales account for just 3.2% of the region’s total grocery sales.¹³² (Other sectors have been quicker to transition from brick and mortar to online sales; half of all electronics sales, for example, are online transactions.)

Everyone expects the grocery sector to catch up, quickly.¹³³ The race is on to “seamlessly” integrate offline and online buying experiences with the ultimate – arguably dystopic – vision of making every moment “shoppable.”¹³⁴

Companies have begun equipping brick-and-mortar grocery stores with digital content – including electronic shelf labeling (ESL) that enables instant price changes and provides smart phone interfacing.¹³⁵ QR codes on ESLs can link to nutritional information and product reviews. In addition, shoppers’ precise locations can be tracked through their smart phones, so they can be bombarded by digital advertisements for nearby products or they can be guided to other aisles with related products (known in the biz as “also-boughts”¹³⁶).

The world’s biggest retailers are now making robust investments in online grocery, either by backing the biggest regional online grocers or by partnering with tech giants to help with automation, robotics and voice technologies to sell more of their own groceries on the Internet. Amazon and Walmart are expected to battle for supremacy over the next five years, with online food sales expected to reach \$15 billion and \$14 billion, respectively.¹³⁷

Other noteworthy online moves include:

- In March 2018, France’s Monoprix (Casino) supermarket chain announced it would partner with Amazon to fulfill online grocery orders in Paris. In March 2019, the companies announced they would extend their partnership beyond the city limits.
- In April 2018, Alibaba acquired food delivery platform ele.me, valued at \$9.5 billion. Chinese data giants Alibaba and Tencent are battling for control of China’s fast-growing \$75 billion food delivery market.¹³⁸ China is the largest e-grocery market in the world – worth \$23.9 billion in 2016 and expected to climb to over \$47 billion by 2021. Of the top 10 e-grocery markets, China made up 32% of the world’s e-grocery retail sales in 2017.¹³⁹
- In May 2018, Kroger (#3) announced an exclusive partnership with Ocado, a leading online-only UK grocer with expertise in warehouse technologies and robotics. Kroger and Ocado plan to build 20 “sheds” (automated customer fulfillment centers) throughout the U.S. over three years.¹⁴⁰
- In June 2018, France’s Carrefour (#5) announced a strategic partnership with Google to boost online grocery sales.¹⁴¹ The alliance will make it possible for a shopper to stand in her kitchen and tell her Google Home smart speakers what needs restocking.
- In August 2018, Walmart (#1) completed its equity investment in Flipkart; Walmart now owns 81% of India’s biggest e-commerce retailer. Soon after the deal closed, the companies announced an employee-swap giving Flipkart employees the chance to learn how to handle groceries from Walmart employees; Walmart workers will learn technical and delivery logistics from their Flipkart colleagues.¹⁴²
- Walmart inked a deal with Japan’s giant online retailer, Rakuten, in 2018 to establish e-commerce stores that deliver US products directly to Japanese consumers. The deal presents a new lease on life for Walmart, which has struggled to make a dent in Japan’s market through its subsidiary Seiyu GK.¹⁴³
- In March 2019, India’s biggest online grocer, BigBasket, announced a new \$50 million investment by Alibaba, the e-commerce giant that accounts for more than 11% of China’s total retail sales (off and online). That’s on top of Alibaba’s investment of \$200 million in 2017.

Conclusions

Decentralizing control and democratizing food systems is key to feeding the world as well as (re)generating the ecosystems, knowledge systems and social systems upon which our future survival depends. Achieving this will require policy frameworks at every level of governance – from local law to international agreements – that support and empower small farmers and peasants all over the world.

Making the case for a decentralized, peasant-centered food system is difficult when the facts surrounding our currently centralized, highly concentrated and incestuously corporate global food system remain shrouded. The research presented in ETC Group's *Plate Tech-tonics* aims to shed light on the state of corporate control in agro-industrial food production – from seed to shelf (or, more likely, fulfillment center). In these conclusions, we identify five areas of Big Food that require further research, continued monitoring, action and resistance:

1) The Tragedy of the Common Shareholder

Asset management firms have dramatically raised their levels of stock ownership in major corporations over the past two decades – including in companies involved in Big Food. While “horizontal shareholding” – where an institutional investor owns shares in competing firms – is increasingly common, it remains largely invisible. In 2016, prior to the most recent round of Big Ag mergers, the world's five biggest asset management companies collectively owned between 12.4% and 32.7% of the shares of the then-leading seed/agrochemical firms: Bayer, Monsanto, DuPont, Syngenta and Dow. Not surprisingly, with so much “common ownership,” competing firms have little incentive to actually compete. Scholars have concluded that market concentration and horizontal shareholding are responsible for approximately 28% of US seed price increases for soy, corn and cotton in the period between 1997 and 2017.¹⁴⁴ Comparable research needs to be conducted on the impact of institutional investing and horizontal shareholding in other agri-food sectors, beginning with grocery retail, where the world's five biggest asset management firms are also heavily invested. Ownership of the Big Data firms (Facebook, Amazon, Alibaba, Microsoft, etc.) on which several agri-food sectors increasingly depend also needs to be monitored and impacts measured.

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Historically, institutional investors have kept a low profile when it comes to corporate governance, but that is changing with shareholder activism on the rise. The temptation is to risk a company's development and longevity in favour of “squeezing out short-term financial gains.”¹⁴⁵ Activist investors have the potential to shape R&D and the power to push for greater consolidation. While the long-term health of industrial agriculture's biggest players is not ETC Group's focus, the downstream impacts of horizontal shareholding in the food system – including on consumers, workers and the environment – require elucidation and action.

2) Corporate Shadow Boxing: No Real Competition

While horizontal shareholding has been characterised as “the greatest anticompetitive threat of our time,”¹⁴⁶ it is just one (more) way that companies have found to undermine the very notion of competition. Patent pools and cross-licensing, joint ventures and strategic alliances all help keep assets ‘in the family’ and keep authentic competitors at bay. Governments are powerless in the face of runaway corporate power, and the United Nations has allowed itself to be boxed out by the World Economic Forum. The outsized influence of dominant firms made possible by mega-mergers and other practices that weaken competition must be reined in. Today's anti-trust and competition laws are outmoded and incapable of addressing 21st Century corporate power, especially related to Big Data behemoths.¹⁴⁷ One way for governments to begin is to step up at the United Nations and to negotiate a Treaty on Competition that has a mandate wide enough to consider not just the implications of the M&As on the horizon, but also the long-term implications of anti-competitive practices for livelihoods, the environment and health, and the control of technologies.

3) The Internet of All Things

Internet-based giants such as Google, Amazon and Alibaba have put themselves in the driver's seat of global e-commerce. Unlike their brick and mortar predecessors, digital merchants have bypassed virtually all regulations and avoided paying taxes in both the Global North and South. (In 2018, US-based Amazon made \$11.2 billion in profit but paid no federal taxes.)

While the WTO has enthusiastically launched plurilateral negotiations on e-commerce to facilitate electronic trading – an initiative dreamed up by a handful of industrialized countries on the sidelines of the World Economic Forum – most developing countries remain skeptical.

By design, data is fast becoming an agricultural input – as fundamental as seeds or fertilizer. What makes data ‘fertile’ is connectivity. Without connectivity, precision agriculture can’t work; it is the prerequisite for making use of Big Ag’s algorithms that determine the ‘tech support’ and farm prescriptions via paid digital farming platforms. The privileging of data over dirt – of digital information over the knowledge systems of indigenous communities and women who nurture crops and breeds across generations – points to an alarming trend: the de-materialization of biological and genetic resources that are the foundation of the food system, but also the erosion of rights, the disempowerment and invisibility of peasants and the rich cultures, practices and knowledge systems that underpin diverse agricultures around the world. We must acknowledge and defend these complexities.

4) Shifting (and Oscillating) Consumer Trends

Rising income and an expanding middle class in developing countries are key drivers of a steadily increasing demand for meat. Rising demand, in turn, pushes industrial livestock and poultry producers to raise faster-growing animals more “efficiently,” which relies on a narrow range of genetically uniform breeds. At the same time, growing health consciousness and awareness of the climate effects from industrial farming, especially among millennials, has spurred a demand for alternative sources of protein (non-animal protein). Big Food, of course, sees the opportunity for profit and has begun investing in – or swallowing up – promising start-ups with the potential to meet the demands of health-conscious / climate-conscious consumers. The actual healthfulness of alternative meat – for our bodies or the environment – is far from certain.¹⁴⁸ The role of “consumer-facing” social technologies is central here – as companies seek to influence our buying decisions and make every moment of our lives “shoppable.”

5) China's Big Ag Ambitions

China – often through conglomerates in which the government is heavily invested and has a controlling stake – has become a global giant in agrochemicals, synthetic fertilizers and meat processing. Following (and then re-writing) the playbook from the United States and Europe, China’s Big Ag players are consolidating, and they’re acquiring former rivals in the U.S. (Smithfield Foods) and Europe (Syngenta). The merging of state-owned ChemChina and state-owned SinoChem – which is happening incrementally, if not officially – will create the world’s largest chemicals group with annual revenues above \$100 billion. Far away from the spectacle of the headlining fight between Trump and Xi Jinping, China is flexing its muscles in the global agriculture policy arena with the election of its former vice-minister of agriculture to the Director General post at the UN’s Food and Agriculture Organization. China, of course, is leading the way in food e-commerce and its ascendant role requires monitoring and assessment.

The pressures from and consequences of all five of the above trends have the potential to push the focus of food system governance further in the wrong direction – away from local and national governments, farming communities, civil society and social movements, and into the hands of a limited number of increasingly dominant multinational firms that prioritize profit over the public good. More mega-mergers will further consolidate an already oligopolistic agri-food system. Agri-food companies have become too big to feed humanity sustainably, too big to operate on equitable terms with other food system actors and too big to deliver the types of innovation we need – especially in a world of rapidly changing climate.

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About ETC Group

ETC Group works to address the socioeconomic and ecological issues surrounding new technologies that could have an impact on the world's poorest and most vulnerable people. We investigate ecological erosion (including the erosion of cultures and human rights); the development of new technologies (especially agricultural but also other technologies that work with genomics and matter); and we monitor global governance issues including corporate concentration and trade in technologies. We operate at the global political level. We work closely with partner civil society organizations (CSOs) and social movements, especially in Africa, Asia and Latin America.

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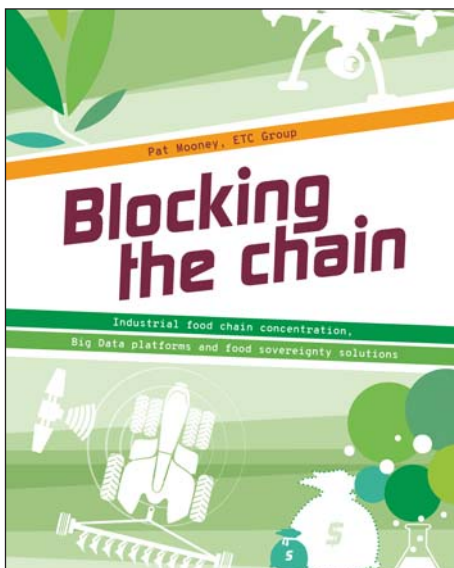
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- Big Meat / Protein
- Grocery Retail

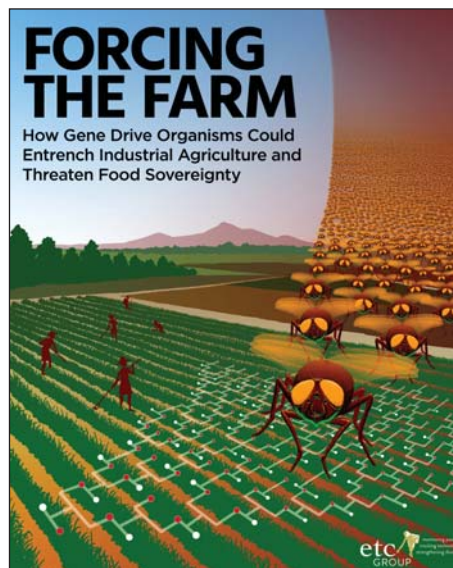


Plate Tech-tonics examines an array of technological and financial disruptors that are driving consolidation and corporate power in Big Food including expansive Big Data platforms, genome editing, blockchain and the oversize influence of asset management firms. These “Tech- tonic” disruptions create fault lines that can be traced throughout the global agri-food system all the way to our dinner plates.

This report is meant to accompany three recent ETC Group publications that provide in-depth analysis of impacts and implications of concentrated corporate power driven by new technologies:



Blocking the Chain: Industrial food chain concentration, Big Data platforms and food sovereignty solutions, October 2018.



Forcing the Farm: How Gene Drive Organisms Could Entrench Industrial Agriculture and Threaten Food Sovereignty, October 2018.



Too Big to Feed: Exploring the impacts of mega-mergers, consolidation, concentration of power in the agri-food sector, published by IPES FOOD in October 2017.