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Year-end Status of the Ag. Mega-Mergers Software vs. Hardware vs. Nowhere Deere & Co. is becoming 'Monsanto in a Box'

Today's agribusiness mega-mergers are the first round in a contest – not just to see who will control the world's \$97 billion commercial seed and agrochemical market,¹ but who will command the \$400 billion market for all agricultural inputs. If the current wave of mergers and acquisitions is successful (and this is by no means certain) then a second wave is inevitable. The second round will see a faceoff between the seed/agrochemical monoliths on one side and the farm machinery giants on the other. Hovering on the sidelines – and bound to be subordinate to whichever sector wins – are the bulk commodity fertilizer companies. Technologically, this second round of mergers will be a battle between the Big Data genomics commanded by the seed/agrochemical companies and the Big Data satellites and sensors controlled by the machinery majors. Or, as silicon meets seeds, a battle between Software genomics and Hardware informatics.

Dueling Digits: This contest was set in motion when the US Supreme Court, in 1980, opened the door to the patenting of life forms (enter biotechnology and the infamous GM seeds), and was joined by farm machinery companies in 1984 when the US began clearing the way for the commercial mining of satellite map data.² On the software side, agrochemical companies began buying seed (plant genetics) companies in anticipation of using the first generation of genetically-modified crops to breed herbicide tolerant plant varieties. On the hardware side, the farm machinery majors began investing in satellite imagery in information management. It was only, however, around the time of the food price crisis in 2008 that advances in software genomics and hardware satellite sensors changed the game. With GM crops blocked up in regulatory limbo, the plant genetics/agrochemical companies began finding breakthroughs in a comparatively more precise and substantially less expensive series of genomic techniques that, in the last two years, have become known as gene editing and a panoply of digital DNA techniques flying under the banner of "synthetic biology" – and all of it moving under the radar of biotech regulators. Suddenly, it became practicable to alter the DNA of plant varieties or livestock breeds or whole species and change multiple characteristics. These new techniques are as much digital as biological and depend heavily on manipulating massive amounts of genomic data.

At the same time, the US and other governments dropped the other shoe on satellite information by allowing companies to access satellite maps at a resolution of one meter, with the probability that the resolution could soon be as precise as centimetres.³ Since at least 2001, the world's largest farm machinery company, John Deere (a.k.a. "*Big Green*") has had GPS embedded in its tractors, but in 2013 Deere doubled down on its investments and began snapping up start-up sensor companies and leaning over the fence to shape joint ventures with all six software genomics majors embroiled in the mergers.

With the seed/agrochemical companies deep into the Big Data of genomics (now, better described as "GenChems,") and the farm machinery majors mining information from their satellites and ground level sensors, (a.k.a. "DataMachs,") the opportunities for convergence between the two groups is clear.

GenChem: the big data enthusiasms of the farm machinery companies are problematic for the six genetics and agrochemical giants, Bayer, Monsanto, Syngenta, BASF, DuPont and Dow – each of whom's ag sales are half or less than Deere & Co's 2014 sales of \$26.4 billion. Monsanto, No.1 in seeds, had sales of \$12.2 billion and No.1 in agrochemicals, Syngenta – \$11.4 billion. The farm machinery market, overall, is significantly larger than either plant genetics or agrochemicals. Combined, however, GenChem (at \$97 billion) is close to the sales of farm machinery (\$114 billion), and a merged Bayer-Monsanto combination could go toe to toe with Big Green.

The business of mergers is, well, byzantine, but GenChem's seeds and agrochemicals have shared a technological focus on genomics for three decades or more and have no desire to succumb to the machinery behemoths.

If the mergers go through – again, this is uncertain – and the regulator-imposed divestitures are settled (some vegetables and pesticides are bound to be taken off the table), the top three GenChem giants will have about two-thirds of their market while the similarly-sized top three leading farm machinery companies will have a little less than half of theirs.

DataMachs: Who will win? You have to bet on the machinery companies. This may seem counterintuitive – flying in the face of the perceived wisdom of Silicon Valley – that the smart guys thrive by dominating the knowledge intangibles like A, C, G, and T and ones and zeros, staying away from bricks and mortar, while only the losers put their money into fixed assets. But Google is shifting from its open-source Android strategy to selling its own phone and home systems. Amazon is ditching FedEx and the Postal Service and not only buying its own trucks and drones but also opening grocery stores. Uber is buying cars and buying into deals with car manufacturers along with Alphabet and Apple. Farm machinery companies like John Deere, CNH and AGCO have been into Big Data for years combining their hardware with Silicon Valley's software.

What is shifting gears in Silicon Valley is more apparent on the farm. The companies that sell seeds or agrochemicals or fertilizers may have the data that tells them to whom and where they are selling, but Deere has sensors in the nozzles that deliver the plant genetics, agrochemicals and fertilizers centimetre by centimetre while the same machine is hooked up

to GPS satellites and drones. That's the same machinery that's in the field throughout the growing season and at harvest time able to report, again centimetre by centimetre, on the yield and soil conditions. Deere owns the box that GenChem and fertilizer companies have to put their products in. Deere has 15 years of proprietary Big Data on weather, and decades more open-source climate data that it can link to its ground sensors that report on every detail of the farming process. Companies like Bayer and Monsanto are coming to understand that the A, C, G and T of DNA can be monitored and manipulated by the 1's and 0's of digital information, and are even more alarmed that the DataMachs also have the box they need to

The State of the World's Mega-Mergers

The late September Bayer-Monsanto announcement cast a pall over all of the mergers as governments and even the business press saw oligopoly threats to food security and agricultural innovation. When Brazil blocked Monsanto's sale of Precision Planting LLC to Deere in mid-November (as did US regulators in August) nervous shareholders began worrying that regulators in a few countries in Africa, Asia and Latin America could destroy shareholder value and make approvals in Washington and Brussels irrelevant., Here's where things stand now...

Bayer-Monsanto (\$66 billion, Bayer No.7 Gen & No.2 Chem; Monsanto No.1 Gen & No. 5 Chem) Betting is 60% chance that acquisition will go through major jurisdictions late in 2017; 20% chance it will drag on into first half of 2018. Possible divestitures include glyphosate business and cotton seeds. Fate of Precision Planting subsidiary remains uncertain. With profits around \$8 billion, Monsanto is the key merger target.

Dow-DuPont (\$130 billion, Dow No.5 Gen & No.4 Chem; DuPont No.2 Gen & No. 5 Chem) Analysts give approval in major markets at 60% sometime in 2017 – possibly not until the second half. DuPont-Pioneer has axed one third of its workforce already with more cuts expected. Together, the two companies ag divisions would have annual profits of no more than \$3 billion – less than half of Monsanto's. Rumour is that Dow will eliminate its entire plant breeding division. Regulators are concerned this means major decline in agricultural R&D and innovation.

ChemChina-Syngenta (\$43 billion, ChemChina No.7 Chem; Syngenta No.3 Gen & No. 1 Chem) Approval in major jurisdictions given 90% chance first half of 2017. By itself, Syngenta has profits of about \$3.4 billion. Concerns are that SinoChem may purchase Chem China after Syngenta deal. ADAMA may be reduced or spun off to protect GM seeds and fungicides in China and Latin America. Deal would be jeopardized if either Argentina or Brazil regulators blocked national markets.

BASF - ? (*No.3 Chem*) BASF assumed waiting to see outcome of other mergers before either scooping up divested seed and chemical businesses or possibly striking deal with Deere or another farm machinery major.

deliver their products.

The Joy of Not Being Monsanto: The DataMachs aren't just bigger (and becoming more so) they have the advantage of not being the GenChems. While Monsanto is Public Enemy No.1, all of the GenChems have poisoned their water with GMOs and pesticides and it is already clear that their push into GM 2.0 with gene editing and synthetic biology are seen as a desperate attempt to get around regulators with a still more dangerous technology. On the other hand, DataMachs are championing non-bio, non-toxic precision machinery that may alarm farmers but not consumers. And the precision market is booming: demand for agricultural drones, robots, sensors, cameras, etc. is expected to grow from \$2.3 billion in 2014 to \$18.45 billion in 2022⁴ – and to keep on going. As importantly, the precision potential is highest in Europe and North America (where the seed/pesticide business is stagnating) but also has great hopes for the big farms and plantations in the global South. Comparatively low-profile companies like Deere may get away with touting the bells and whistles on their tractors while pumping new genomic seeds and pesticides in their boxes.

Hardware, Software, Nowhere: Outside and looking in on the merger battle is the largest input sector (\$183 billion in sales) – the fertilizer industry. Unlike the R&D-intense GenChem ("software") giants and Big Data-driven farm machinery ("hardware") companies, fertilizers are a bulk commodity and while the companies may talk about enhanced soil nutrients and even GM microbes, it all comes down to N, P, K (nitrogen, potassium and phosphate). The top three companies have only 21% of their market and, if its merger with Agrium goes through, the largest fertilizer company, Potash Corporation, will still have just over half the sales of the merged Bayer-Monsanto combination. They know little about genomics and not much more about big data informatics. It is not clear whether the fertilizer sector could become a takeover target or, because of its bulk commodity character and geographic dependence (especially for phosphate and potash mines), it is doomed to servitude under Big Data.

Cloud Seeding? Anti-competition regulators examining the monsoon of seed and agrochemical mergers may consider it too fantastic that today's combinations could trigger a round of takeovers between the GenChems and the DataMachs. Just because there are synergies between some inputs and farm machinery doesn't mean that two different links in the food chain are going to be soldered together anymore than bread bakers must merge with butter makers, for example. True enough, but the same was said during the last round of agricultural input mergers that began in the 1970s. Then, agrochemical companies bought seed companies under the noses of regulators who couldn't believe that the mergers could create a GenChem oligopoly. Regulators didn't understand that the market power and the profits would go to the companies that could develop and sell herbicide-tolerant plant varieties using biotechnology. Today, GenChems and DataMachs converge, technologically, in the clouds. Led by Monsanto, the old seed and agrochemical crowd has been working hard to

catch up and use GPS mapping to advise farmers on plant variety and agrochemical choices. Monsanto, for example, claims to have 10 meter square maps and historic data on all of the 30 million agricultural fields in the United States⁵ and is ready to sell the information to farmers who buy their products. But, the farm machinery companies got into the clouds first and John Deere began building links to the genomics and agrochemical companies in 2013. Deere has deals with each of Monsanto, Dow, DuPont, Bayer, BASF and Syngenta. The technologies overlap; the markets overlap; the companies are already connecting; and the company that can hide all the Big Data together behind one cloud will be the most profitable. If the first mergers go through, the second round is just a matter of time.

At Stake: Almost half a trillion dollars in annual input sales – oligopoly over the production links in the food chain.

Making an Offer Farmers can't Refuse? A third round of mergers or takeovers is still possible. Who will dominate is less clear. At the end of the day, the company that knows the most about the planting inputs, the harvest outcomes as well as the historic and real-time market conditions is the company most likely to benefit from farm insurance – an industry earning \$30 billion globally in premiums – its value quadrupling since 2005.⁶ The farm insurance company is able to dictate the conditions under which the insurance is made available – what crops and varieties; what growing regimes; what monitoring capacities, etc. whether you think this is utopia or dystopia, it is real. John Deere and BASF (interestingly, BASF is the only one of the six GenChem majors not involved in merger talks ... as yet) have a joint insurance venture already making this offer to farmers.

The insurance industry could see agriculture as an important industry at a time of technological disruption. Climate change makes most kinds of insurance in many parts of the world problematic – potentially profitable but definitely hazardous. Yet, one area of insurance is becoming so safe as to risk extinction. Automobile insurers are already assuming that driverless cars will mean a steep decline in insurance claims – to the point where auto manufacturers pre-negotiate dispute settlements. If so, maybe its time for the insurers to leave the Chevy at the levy and saddle up Big Green's finest?

The next merger battle will be between...

Software vs. Hardware vs. Nowhere



Recent Hardware/Software Developments ¹		
2001	Deere builds GPS link to its farm machinery;	
2007	Deere and Syngenta create a "fully integrated" <i>Force</i> CS insecticide delivery system;	
2009	US Commerce Dept. authorizes commercial sale of 1-meter resolution radar imagery; ⁷	
2012	Monsanto acquires Precision Planting Inc. for \$250 million; ⁸	
2013	Deere and DuPont-Pioneer launch a collaboration linking Pioneer Field 360, a suite of precision agronomy software with John Deere Wireless Data Transfer, JD Link and MyJohn Deere; ⁹	
	Deere announces collaboration with Dow AgroSciences to "help farmers link data with expertise for advanced product precision"; ¹⁰	
	Deere and BASF partner to develop sustainable yield enhancement solutions; ¹¹	
	Monsanto acquires The Climate Corporation, a software company for \$930 million; ¹²	
2014	Bayer CropScience joins Deere in developing digital tools to move from "precision to decision"; ¹³	
	CNH Industrial and Monsanto's Climate Corp. announce a licensing agreement for Precision Planting Technology. ¹⁴	
	DuPont and AGCO announce Global wireless data transfer collaboration; ¹⁵	
2015	AGCO announces a deal with Monsanto's Precision Planting to outfit its planters;	
	BASF reveals "Farm Management Information Systems" partnership with AGCO; ¹⁶	
	BASF launches the Compass Grower Advanced, a "all-in-one" farm data management system powered by Microsoft that communicates directly with Deere and CNH equipment; ¹⁷	
	Bayer and AGCO join forces to "drive the Future Farm in Zambia"; ¹⁸	
	Deere Insurance Company and BASF collaborate to offer "Risk Advantage" Insurance; ¹⁹	

¹ This chronology and the accompanying graphic ("Cloud Seeding") are a work in progresso. ETC Group continues to discover new linkages.

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	Deere agrees to buy Monsanto's Precision Planting LLC; ²⁰
	Deere reaches an agreement with Monsanto's Climate Corporation, allowing its equipment to connect with the company's <i>Climate FieldView</i> platform wirelessly; ²¹
	Deere in a joint venture called <i>SageInsights</i> with DN ₂ K, a developer of software systems that "remotely monitor, display and control important assets"; ²²
	Deere acquires Monosem, a European precision-planter manufacturer; ²³
	Sentera and Agribotix (both drone and software companies) tie up with Deere Operations Center; ²⁴
	Agribotix and AGCO sign deal to use the start-up's software in the AGCO agricultural drone; ²⁵
	<i>Raven Industries,</i> an agricultural drone maker and CNH Industrial reach supply deal. ²⁶
2016	CNH launches its ACV- Autonomous Concept Vehicle, a cab-free tractor controlled through sensors and followed through computer or tablet wirelessly; ²⁷
	Deere buys majority stake in <i>Hagie Manufacturing</i> , maker of high-clearance sprayer equipment. Deere will integrate its precision technology into Hagie sprayers; ²⁸
	DuPont makes investment in Precision Hawk, a drone manufacturer specializing in agriculture. ²⁹
	Raven Industries becomes sole distributor of Ag Eagle's agricultural drones. Raven has partnerships with both Deere and AGCO; ³⁰
	SOLO AGCO Edition drone is equipped with GoPro cameras and can scout about 240 acres in 20 minutes to provide high-resolution aerial field maps; ³¹
	US Department of Justice files an antitrust lawsuit to prevent the merger of Precision Planting LLC and Deere in August ³² followed by a similar action by Brazilian authorities in November. ³³
	AGCO Corp. announces partnerships with <i>Aglytix</i> and <i>Farmobile</i> , two agriculture software companies. ³⁴





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