CLEAN ALPHA

Seeds of change: from the plough to the cloud

Algebris INVESTMENTS

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If we learned anything from Mark Watney in *The Martian*, besides the dangers and thrills of space exploration, it is that growing crops on a planet colonizes it and is key to survival. Throughout history we have thus awarded fundamental importance to agriculture as it is central for us to live and prosper as a species.

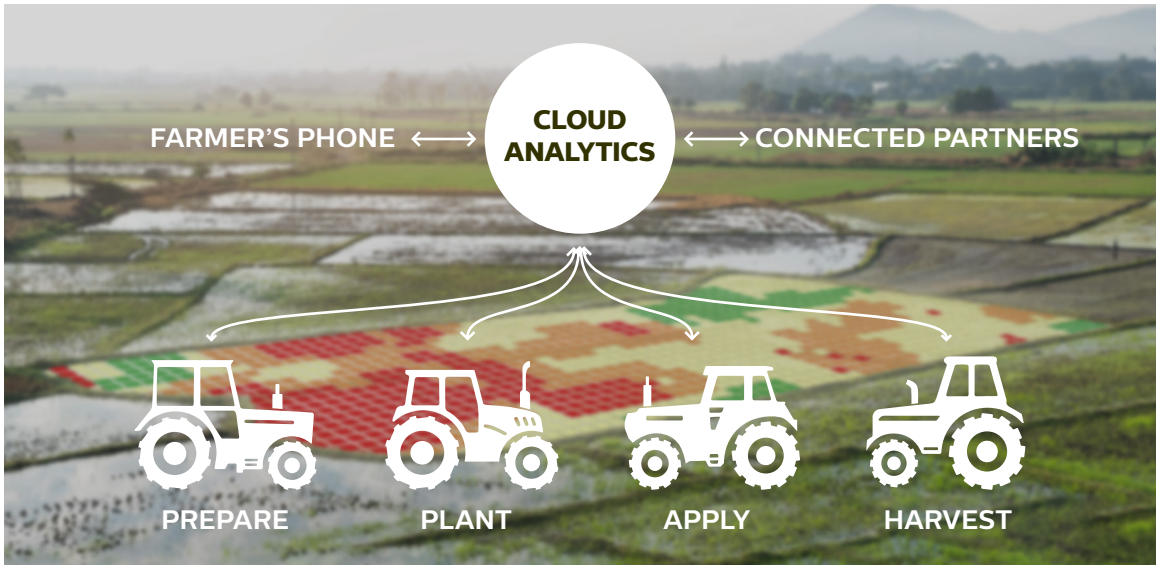
Today, however, we face an enormous challenge. Agricultural land use has been the main driver of the destruction of wildlife and nature over the last millennia, but in the coming years we will need to find a way to grow food for nearly 9 billion people; a number which, according to the UN, will grow to nearly **10 billion by 2050**. With this surge in population, global food production will need to substantially increase to sustainably meet demand.

Yet, with **80% of current arable land already being used for agriculture**, two looming questions emerge: Is this space enough to sustain the population growth rate we are experiencing today? And if not, can we increase output given a fixed amount of land while not detrimentally damaging the natural ecosystems that sustain us?

> **Can we increase output given a fixed amount of land while not damaging the natural ecosystems that sustain us? We believe Precision Agriculture allows us to produce more food with less land.**

We believe precision agriculture strikes the balance between maximizing output yield while allowing farmers to operate within our planet's natural boundaries: in other words, it allows us to produce more food with less land. At the same time, precision agriculture is improving unit economics for farmers and strengthening returns on capital employed (ROCE) for agriculture Original-Equipment Manufacturers (OEMs).

Image 1 | Example of a precision agriculture workflow



1 What is Precision Agriculture?

Precision agriculture enables farmers to leverage data and technology to reach this delicate equilibrium. It works twofold: It gathers **harvest data** through techniques such as **yield (and soil) monitors** and combines this with **global positioning and weather data**. Next, predictive analytics make use of this data in what is called **decision support systems**. These systems take the form of electronic maps such as **yield and soil maps** and **geo-location maps**. These decision support systems enable farmers to rely on **data-driven equipment** for the day-to-day management of farm activities. Data-driven equipment includes guidance systems, used to increase the efficiency of heavy machinery, and **Variable Rate Technology (VRT)**, key in streamlining resource consumption while farming.

But why would farmers want to undertake such a drastic change to their modus operandi?
We see two converging factors that support farmers' shift to precision agriculture.

- **Cost efficiency**, coupled with unlocking high agricultural output yields enable farmers to produce more with lower input costs, increasing their profits.

- **Employing sustainable farming techniques** would enable farmers to relieve climactic pressures. Climate change is strongly hindering farms' productivity with uneven weather patterns and the rising occurrence of extreme weather events making harvesting difficult. As a threat to their core business, it is imperative that they take action to minimize their risks to future harvests.

Thanks to these drivers, ever more farmers are leveraging data and implementing precision agriculture to maintain productive output; meeting demand while doing so sustainably. Of this shift, the main listed ag-tech companies such as **John Deere**, **AGCO**, and **CNH Industrial** are all beneficiaries.

2 Data: the new nutrient

Integrating technology in a historically analog industry is difficult. Yet, the agriculture industry is one where data has always been extremely beneficial. Rain patterns, soil quality, sun exposure, are only some examples of data points regularly tracked by farmers. Today, with much larger harvestable surface areas these measurements have been brought to scale.

Yield monitors observe soil properties to establish grain yield, moisture content in grain and supports farmers in the tracking and storage/drying of the harvest. Yield monitor adoption has been **growing at a Compounded Annual Growth Rate (CAGR) of 7%** between 2018 and 2022 and is predicted to grow at a CAGR of 6% by 2033 as crop screening shifts from a blanketing approach to a more targeted one (Future Market

Image 2 | CNH Hemisphere (GNSS) System

Source: CNH

Insights, 2023). The data they gather are analyzed and structured into **yield and soil maps**. They are key to enabling VRT and support resource allocation schemes. These yield and soil maps are an example of **decision support systems**.

Data for decision support systems also comes in the form of **navigation and positioning data**. Companies like CNH Industrial also make Global Navigation Satellite Systems (GNSS) that gather data to ultimately feed **geo-location maps** (Image 2). DS systems are essential for both **autonomous precision machinery** such as the guidance systems in AGCO and John Deere tractors. Their adoption by corn farms across the US has grown at an average growth rate of **19%** over the last 20 years, and this is only likely to increase.

Decision support systems act as bridges that tie precision agriculture together. They allow farmers to game out which lands in their farms need tending to and when, giving way for **data-driven machinery** to take the lead and streamline the agricultural process.

3 | Data-driven equipment

Tractors, harvesters, foragers, and ground care equipment can all be optimized leveraging data to ultimately enable machinery digitalization with **guidance systems and VRT**.

I | Guidance Systems

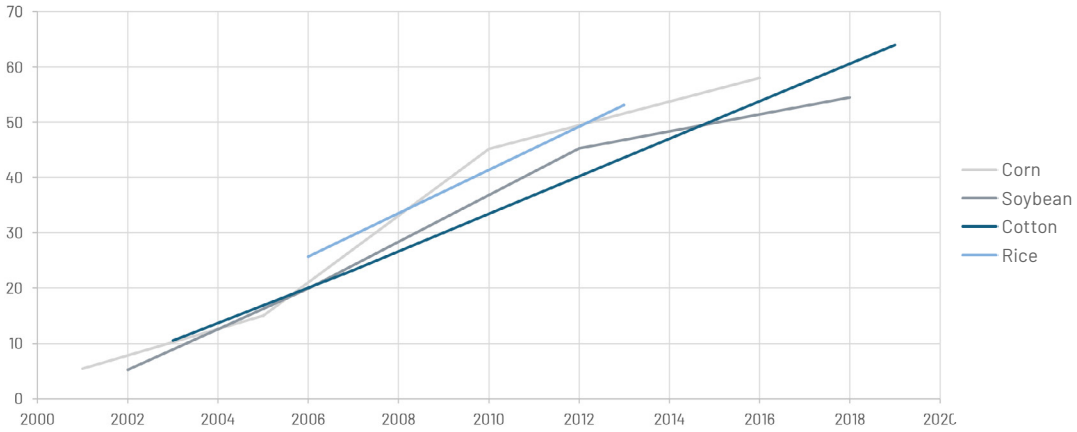
Guidance systems provide farmers with real-time visualization of equipment positioning in the field. This technology embedded in **John Deere** and **AGCO**'s tractors and machinery (Image 3) is used to minimize skips and overlaps of rows or fields alike. Using these tractors, farmers benefit from cost reductions given that, with more precise routes, fuel consumption by machinery decreases. Better on-farm workflow also trickles down to more informed seed, nutrient, and pesticide usage. Optimized resource application means less waste and thereby lower costs.

Image 3 | Heavy machinery with integrated guidance systems

Source: John Deere

Adoption rates have thus surged since 2019, albeit with variations across different crop types. For instance, adoption rates for planted soybean and corn acres ranged from **54.4% to 58.4% between 2016 and 2018** and are only poised to grow in the years to come as we fight a growing scarcity of resources (Chart 1).

Chart 1 | US croplands farmed with guidance systems (2000-2019)



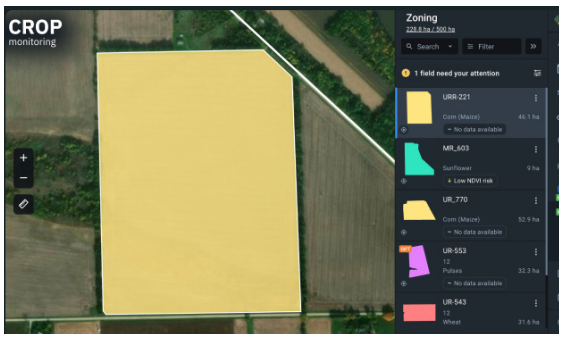
Source: Algebris Investments, USDA, Economic Research Service and USDA, National Agricultural Statistics Service, Agricultural Resource Management Survey, Data as of 1998-2007, 2009-13, 2015-19.

II | Variable Rate Technology

VRT is a technology which allows farmers to apply inputs such as fertilizer, seeds, lime, or pesticides at varying rates to match crop requirements at every specific location (see Image 4). VRT offers an extra layer of control over variable inputs, potentially leading to **more efficient applications without sacrificing yields**.

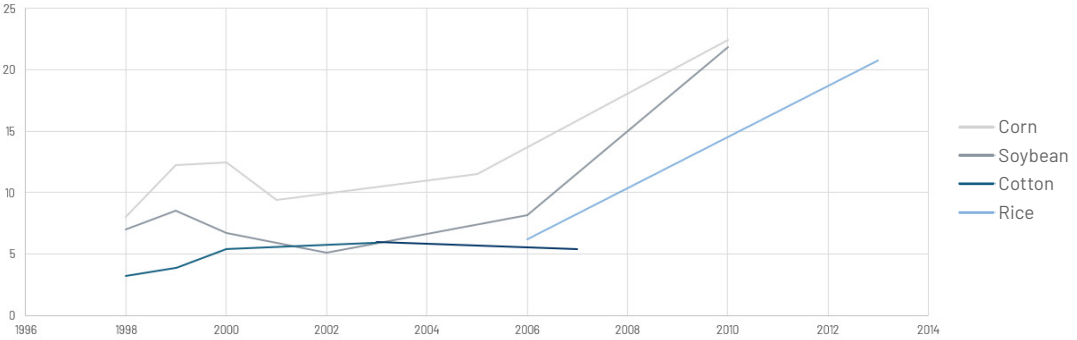
VRT usage has grown significantly in the last years (Chart 2). In 2019, the US Department of Agriculture (USDA) reported that **45% of farms** are making use of this technology extensively.

Image 4 | Use of Variable Rate Technology on croplands



Source: EOS Data Analytics

Chart 2 | Adoption rates of VRT per crop in the US (1998-2014)



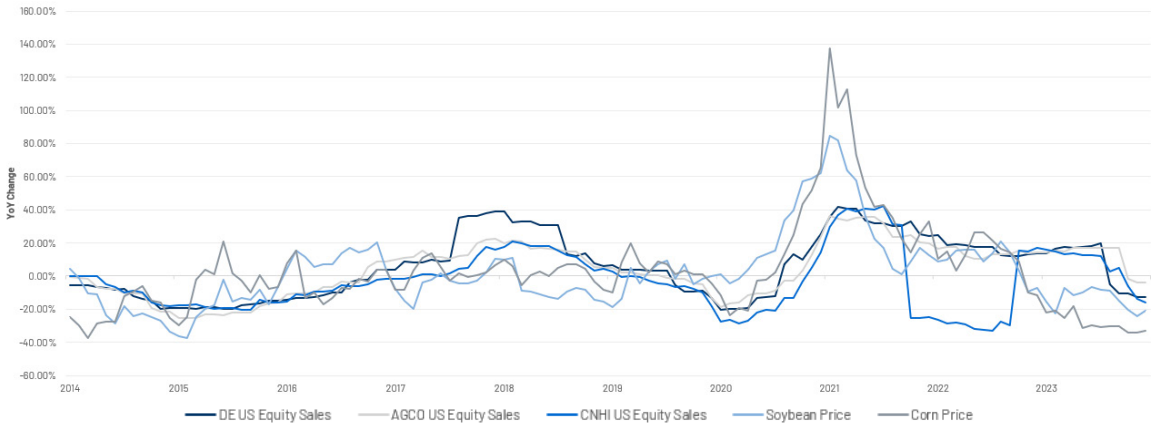
Source: Algebris Investments, USDA, Economic Research Service and USDA, National Agricultural Statistics Service, Agricultural Resource Management Survey, Data as at 1998-2007, 2009-13, 2015-19.

Variable Rate Technology also helps with the challenge of sustainability mentioned at the beginning. Thanks to adjusted application rates, accurate resource use is paired with reduced rates of fertilizer leaching or runoff leading to **mitigated environmental damage** from agriculture on farms across the US.

4 | Precision agriculture drives ROCE expansion

The agricultural industry is very cyclical as farmers tend to spend money when raw material prices increase, which increases their profits. As shown in Chart 3, we see a strong correlation between farmers' willingness to spend (reflected in OEMs sales growth) and the price of the underlying raw materials (such as corn & soy).

Chart 3 | Higher commodity prices mean higher sales for farmers & therefore ag-tech companies



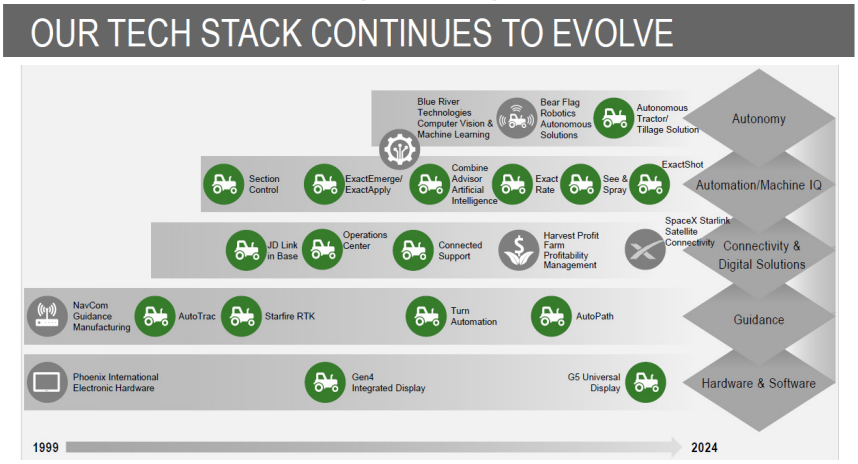
Source: Algebris Investments Data: Bloomberg Finance L.P., Data as at 02/05/2024

Despite this cyclicality, since the 2000s, precision agriculture has been steadily added into the business mix of many OEMs and introduced into the day-to-day activities of farmers. Today, we see that the growth in adoption of precision agriculture has been beneficial for both farmers and OEMs.

For farmers, a strong growth in demand for precision agriculture has been fueled by tangible cost reductions through efficiency gains in resource use coupled with increased yields. As calculated by BNEF (Bloomberg New Energy Finance), GPS guidance systems on tractors could save a typical 1,000-acre farm approximately $13,000 in variable costs every year. From an industry standpoint, even if only adopted by 10% of US farmers, GPS guidance for planting seeds could save 16 million gallons of fuel, 4 million pounds of insecticide, and 2 million quarts of herbicide per year, reducing waste and improving the environmental impacts of farming (BNEF, 2018). While precision agriculture technologies may initially appear expensive for farmers, their long-term return on investments coupled with production boosts far exceed those of traditional methods.

For companies like **John Deere**, the current market leader in precision agriculture, a similar narrative appears. John Deere introduced **IoT- and data-based products in 1998** (Image 5) and has since continued to grow this segment supported by stronger CAPEX and R&D given supportive underlying demand from farmers. While these investments have taken a toll on John Deere's FCF generation in the short run, long term EBITDA margins and ROCE have benefited greatly, increasing 2x and 3x respectively in the last 20 years (Chart 4).

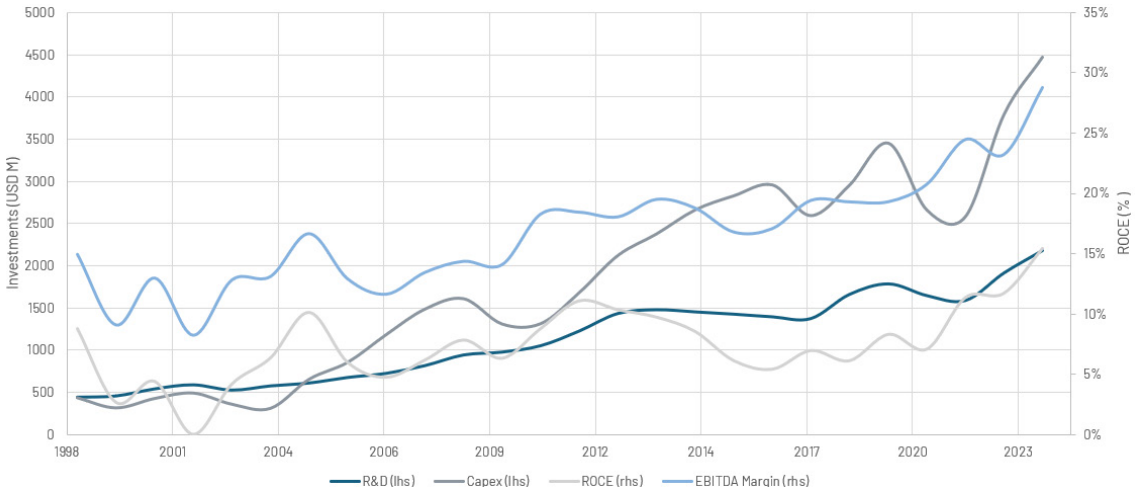
Image 5 | John Deere precision agriculture segment development (1998-2024)



Source:John Deere Quarterly Presentation 2024

Today, the strong integration of precision agriculture – with the underlying corollaries of IoT and data-backed machinery/software – into the agriculture industry has enabled **sustained sales growth** for OEMs through **service-based revenues** that did not exist in the past. **With a much stronger baseline, OEM revenues have become much more resilient rather than cyclical like the broader agriculture industry.** With lower EPS variability, the companies in Chart 5 can now be considered less affected by cyclical downturns and capable of sustaining higher ROCE compared to the past, thus becoming even more attractive from an investment perspective.

Chart 4 | John Deere capital expenditure and ROCE between 1998 and 2023



Source: Algebris Investments Data: Bloomberg Finance L.P., Data as at 29/04/2024

Chart 5 | Peers

	Price	Currency	Mkt Cap (bn)	EV/Sales 2024	EV/Sales 2025	EV/Sales 2026	EV/EBITDA 2024	EV/EBITDA 2025
DEERE & CO	400.6	USD	112	2.5	2.5	2.5	11.4	11.4
AGCO CORP	114.1	USD	9	0.7	0.7	0.7	5.5	5.7
CNH INDUSTRIAL NV	11.6	USD	14	0.9	0.8	0.8	6.6	6.2
KUBOTA CORP	2507.0	JPY	2,950	1.7	1.7	1.5	11.7	11.2
Average				1.4	1.4	1.4	8.8	8.6
Median				1.3	1.2	1.2	9.0	8.7

	Price chg				
	1M	3M	6M	1Y	YTD
DEERE & CO	-2.9%	3.0%	5.9%	5.1%	0.2%
AGCO CORP	-6.7%	-6.6%	-3.1%	-6.3%	-6.0%
CNH INDUSTRIAL NV	-9.3%	-6.4%	2.5%	-18.1%	-4.6%
KUBOTA CORP	1.0%	13.1%	19.8%	20.6%	18.1%
Average	-4.5%	0.8%	6.3%	0.3%	1.9%

	Price	Currency	Mkt Cap (bn)	EBITDA % 2024	EBITDA % 2025	EBITDA % 2026	EBIT % 2024	EBIT % 2025
DEERE & CO	400.6	USD	112	21.7%	21.9%	23.1%	20.4%	20.5%
AGCO CORP	114.1	USD	9	13.1%	13.0%	13.4%	11.0%	10.9%
CNH INDUSTRIAL NV	11.6	USD	14	13.0%	13.4%	12.7%	11.4%	11.7%
KUBOTA CORP	2507.0	JPY	2,950	14.1%	14.8%	14.4%	10.7%	11.2%
Average				15.5%	15.8%	15.9%	13.4%	13.6%
Median				13.6%	14.1%	13.9%	11.2%	11.5%

	EV/EBITDA 2026	EV/EBIT 2024	EV/EBIT 2025	EV/EBIT 2026	P/E 2024	P/E 2025	P/E 2026
DEERE & CO	10.7	12.1	12.1	11.0	14.9	14.6	13.6
AGCO CORP	5.3	6.7	6.8	6.4	9.3	9.2	8.6
CNH INDUSTRIAL NV	6.1	7.5	7.1	6.5	7.7	7.6	6.9
KUBOTA CORP	10.7	15.5	14.8	14.0	13.3	12.5	11.4
Average	8.2	10.4	10.2	9.5	11.3	11.0	10.1
Median	8.4	9.8	9.6	8.8	11.3	10.8	10.0

	EBIT % 2026	Net Debt/EBITDA 2024	Net Debt/EBITDA 2025	FCF Yield 2025	Div Yield 2025	EPS CAGR 2024-2026	ROCE 2025
DEERE & CO	22.5%	0.3	0.3	6.0%	1.6%	4.6%	48%
AGCO CORP	11.3%	0.2	0.2	7.9%	3.1%	3.6%	26%
CNH INDUSTRIAL NV	11.8%	5.2	2.7	9.4%	3.8%	5.4%	47%
KUBOTA CORP	11.0%	3.8	3.5	2.7%	2.3%	8.0%	6%
Average	14.1%	2.4	1.7	6.5%	2.7%	5.4%	32%
Median	11.6%	2.0	1.5	6.9%	2.7%	5.0%	36%

Source: Algebris Investments Data: Bloomberg Finance L.P., Data as at 06/05/2024

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NOTES

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