International Stocks   OVERWEIGHT

International Stocks
Robert Cheek
+822-3787-2261
r.cheek@hmsec.com

International Stock Market Weekly

Agricultural Robotics

The biggest thing to happen in agriculture since the invention of the gasoline-powered tractor in 1889 is the advent of precision agriculture and agricultural robotics. Indeed, agriculture is one of the final frontiers which has been in dire need of a revolution. But it is now under way and the victors will be those companies that have the technologies and capabilities to take control of this rapidly emerging multibillion-dollar opportunity.

At present, we see a triumvirate of companies emerging as the leaders of the pack in agricultural robotics. In order of preference, the ruling triumvirate in this business is composed of John Deere Company (NYSE: DE) and AGCO (NYSE: AGCO), both of which are from the US, and Japan's Kubota (US OTC: KUBTY). While startups are sprouting up like weeds around the world, these undercapitalized upstarts are unlikely to disrupt the agriculture business independently. We base our view on the fact that the agriculture equipment business has unique characteristics which give it a wide competitive moat and technology alone cannot win the day. Strong brands such as Deere, AGCO, and Kubota are trusted and have long-term business relationships with not only large corporate farms but independent operators as well. Indeed, for agricultural robotics startups to prosper they will need to take the same road to success that successful startups in the self-driving car race did, through either a) acquisitions or b) partnerships with a larger and more well-capitalized entities, in this case, the most suitable suitor would be a member of the aforementioned triumvirate.

John Deere Company (NYSE: DE) is the world's biggest manufacturer of agriculture equipment. The company manufactures agricultural, construction, and forestry machinery, diesel engines for heavy equipment, and law care equipment. In our view, it is also the dominant player in the agricultural robotics business and is in close competition with AGCO in the precision agriculture segment. While John Deere is the biggest player in the legacy agricultural equipment market, it continues to push the boundaries of innovation and is also of the strongest players in the precision farming and agricultural robotics domains. Because of its highly visible advancements and acquisitions of promising companies with advanced robotics programs such as Germany's Wirtgen Group and robotics startups like Sunnyvale, California's see-and-spray robotics maker Blue River Technology, along with the restructuring of the company as part of efforts to make it leaner, it is our current favorite in the agritech business.

AGCO (NYSE: AGCO) is a manufacturer and distributor or agricultural equipment and related parts. The company sells a range of agricultural equipment, including combines, tractors, hay tools, forage equipment, seeding and tillage equipment, self-propelled sprayers, implements, and grain storage and protein production systems. The company is actively involved in the development of precision farming technologies and products through the parent company and through its many subsidiaries such as Fendt, which is developing swarm agriculture robots.

Kubota (NYSE: KUBTY) is a tractor and heavy equipment manufacturer based in Osaka, Japan. The company manufactures and sells a range of machinery and other industrial and consumer products. The company has a strategic alliance with Microsoft (NASDAQ: MSFT) of the US. The company established innovation centers in Japan and the EU for proactive engagement with ICT, AI, robotics, and other advanced technologies to accelerate the creation of new businesses, products, and services. In addition, it collaborates with Las Gatos, California based SVG Ventures in the THRIVE Accelerator program for agritech.

Stock picks for the fourth week of December
John Deere Company (DE.US), AGCO Co. (ARGO.US), Kubota (KUBTY.US:OTC)

Dawning of the age of robot farmers

Farming is one of the most labor-intensive and inefficient processes and relies heavily on human workers and the heavy use of chemicals. However, the industry faces a panoply of challenges including labor shortages due to geopolitical tensions, pandemic-induced problems, and more. What is more, the inherent inefficiency of traditional farming methods makes the process untenable in its current state—for economic, environmental, and societal reasons. While there are many companies operating in the agricultural equipment business, the majority of them are simply biding their time until they go the way of the dodo. But even with agriculture, as in all industries, there are the few companies who come from legacy industries that have a vision and drive to define the future. In this business we have identified Deere, AGCO, and Kubota as the three who are positioning themselves to lead.

Rationale

Much of the world's food supply comes from agricultural giants in North America and Europe, while for the rest of the world most farming is still carried out in much the same way as it was hundreds of years ago. In fact, the majority of the world's farming remains in a preindustrial or early industrial state. The world's population is now approaching eight billion persons and is growing by roughly 1% per year while more than half of the Earth's habitable land is already used for agriculture. Furthermore, along with the existential threat posed by climate change and other environmental challenges coupled with the skyrocketing growth of plant-based dietary consumption habits in the developed world, makes traditional farming unsustainable. Accordingly, agricultural robotics is now playing a pivotal and rapidly growing role in the precision agriculture revolution.

The biggest growth opportunity within precision farming is agricultural robotics. While there are many startups in the space which are building great robots and which we are monitoring very closely, and there are companies such as Teradyne (NASDAQ: TER), which have versatile and low cost cobots that are being used in an ever-growing number of sectors, we think the big three in agricultural machinery—Deere, AGCO, and Kubota will emerge as the 800-pound gorilla triumvirate in agricultural robotics and precision farming. These companies are well positioned and have a deep understanding and knowhow of the agriculture business, funding to develop and acquire new robotics applications, as well as the sales and marketing networks to educate and sell these new systems en masse.

Sowing the seeds of growth

Agriculture robots are robots which are designed and deployed for agricultural purposes. Some applications for these intelligent machines are cloud seeding, planting, environmental monitoring, soil analysis, and weed control. Agricultural robotics is the natural extension of automation technology to bio-systems such as horticulture, forestry, greenhouses, and of course, agriculture.

The application of fungicides, herbicides, and insecticides is critical yet inefficiently executed and needlessly wasteful functions in agriculture today. As plants are subject to many diseases and pests which ultimately negatively impact yields, these are crucial for the protection of crops. While present manual or mechanical methods require human involvement, bringing with it the risks and inefficiencies which are inherent with human labor, including using too much pesticide, which then has a negative impact on the environment and exposes the farmers to these potentially dangerous chemicals, robotics technologies provide a superior alternative in terms of sustainability, profitability, and efficiency. And it enables farmers to provide healthier products to consumers.

For weed control, methods presently used include mechanical or physical means, biological and cultural control, herbicide application, and pre- or post-emergence tillage.

We see the future of agriculture as dominated by robots and these will come in myriad sizes and forms but ultimately, they will all have a shared goal—drive efficiencies, reduce costs, and increase profitability.

We expect to see the deployment of tractor-mounted real-time weed detection and control capabilities on UGTs on a large scale in the near future with companies like Deere and AGCO taking the lead.

Not just plows and cows…

At first glance it may seem that John Deer is simply a maker of farming machinery and lawn care equipment. But if we take a closer look at the company it becomes patently clear that it is really a technology company but, like the other three companies in this report, is not valued as such.

Indeed, John Deere won a CES Innovation Award in the robotics category in the 2021 CES Innovation Awards for its X Series combines which are equipped with its ActiveVision camera technology which is powered by proprietary algorithms and provides farmers with critical information and helps them gather data to enable them to make better decisions in the future. It is the second year in a row for the company to win the award.

With its continued push into precision agriculture and robotics, active R&D, and acquisitions of companies that are helping it to lead the agricultural technology business in the 21st century, we think investors would do well to take a position in the John Deere company to harvest good returns in the years ahead—both in the form of upside for the stock, robust dividend, and most importantly to harvest the fruit from the company which, in our view, is well placed to lead the precision farming and agricultural robotics business in the years ahead.

Fig 1. John Deere booth at Agritechnica

Fig 2. John Deere autonomous electric tractor

Source: Agritechnica, Hyundai Motor Securities

Source: John Deere, Hyundai Motor Securities
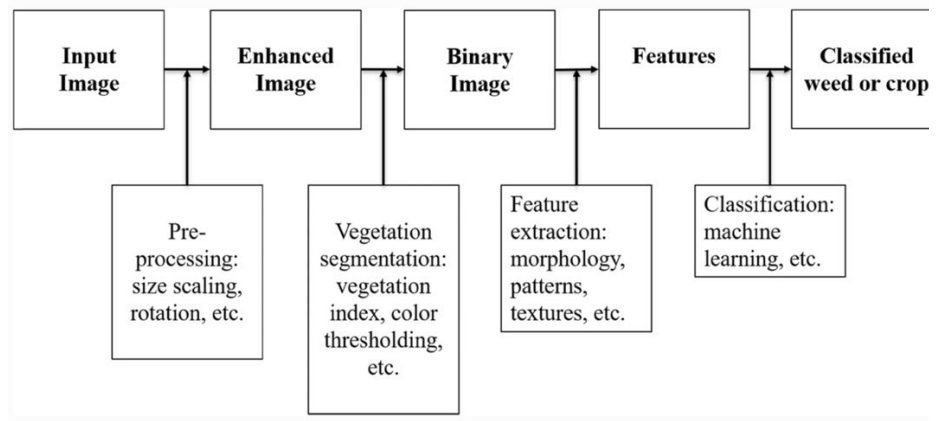
Fig 3. Romain lettuce detection

Source: Liu, B., Bruch, R. Weed Detection for Selective Spraying: a Review. Curr Robot Rep 1, 19–26 (2020), Hyundai Motor Securities
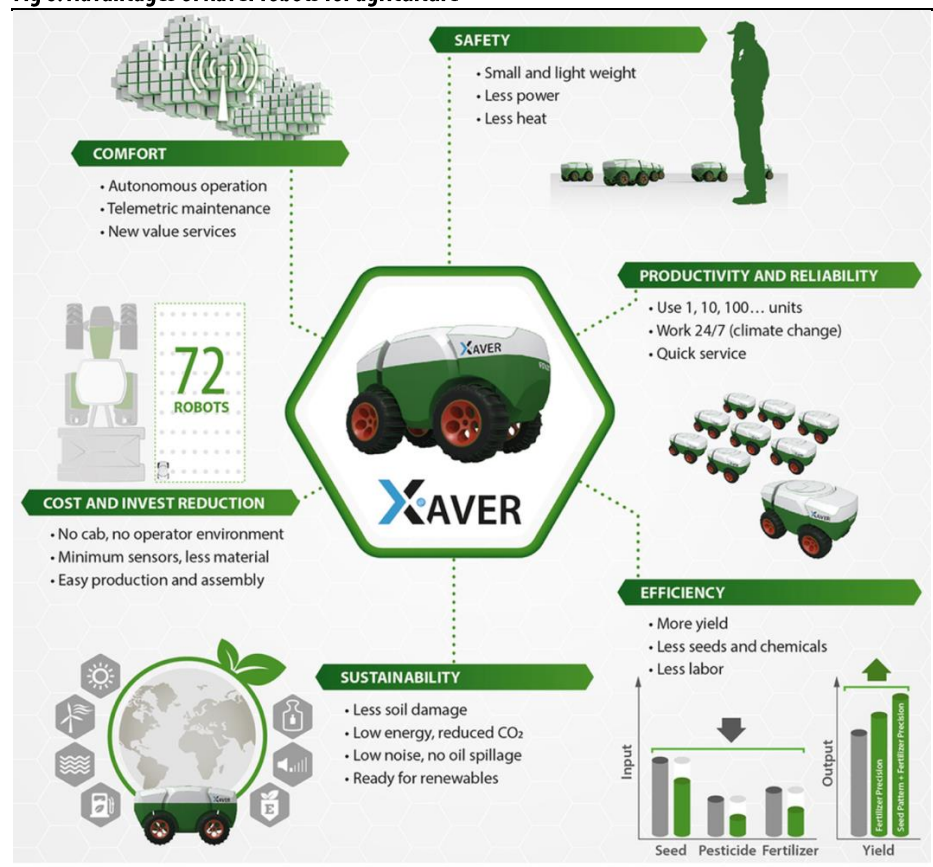
Fig 4. Autonomous electric rollers

Source: John Deere/Wirtgen Group, Hyundai Motor Securities

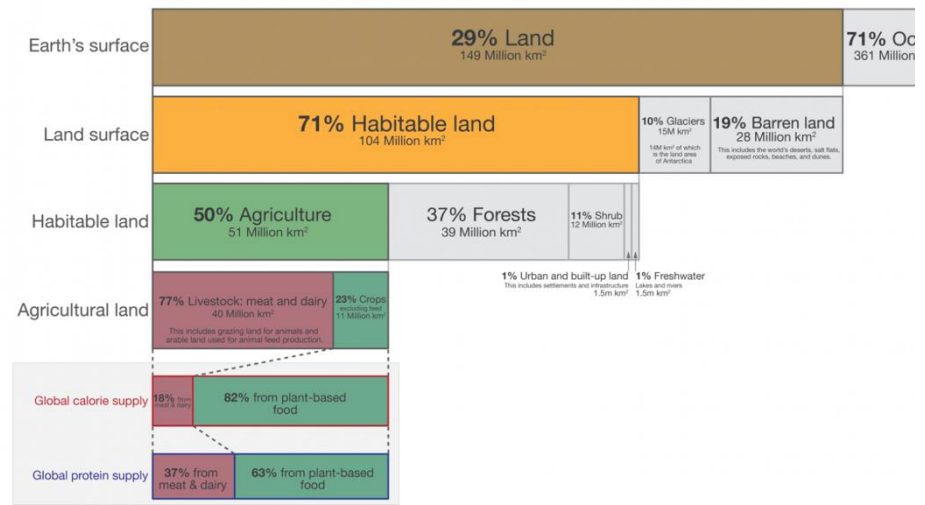**Fig 5. Typical image processing procedures for weed processing**

Fig 6. Advantages of Xaver robots for agriculture

Fig 7. Global land use for food production

The big three are all on an acquisition spree

AGCO and Kubota, ploughing ahead to the future

AGCO and Kubota are also promising companies in the precision agriculture business. While AGCO is developing a swarm technology farming robot, Kubota has an extensive roadmap and plan to offer fully autonomous products and solutions. The latter just announced a partnership with Santa Clara, California's Nvidia (NASDAQ: NVDA) to continue to the development of self-driving tractors. In 2017, Kubota launched its Agrirobo line of tractors, but they used radar to map their surroundings, required human supervision to operate and were not equipped with AI. Through the partnership, Kubota will likely build fully autonomous tractors which will have Nvidia GPUs and AI and be equipped with cameras to collect data. The company also invested in Menlo Park, California based Abundant Robotics, which makes automated orchard harvesting robots. AGCO, on the other hand, has the advantage of being behind some of the world's biggest names in farm equipment, making it one of the major operators in the farm equipment business with an extensive sales and partnership network in North America and Europe.

Precision farming is inevitable and will reward those who identify and invest in the right technologies and companies. We think John Deere, AGCO, and Kubota are among those companies which investors would do well to add to their portfolios. However, as race has just started and as all of these players are directly and through subsidiaries and partnerships, making rapid inroads into agricultural robotics we are monitoring the lot with keen interest to see when a decisive lead is clear. What is evident at this time is that these companies offer an opportunity to invest in what are, in fact, tech companies which will see meaningful growth going forward.

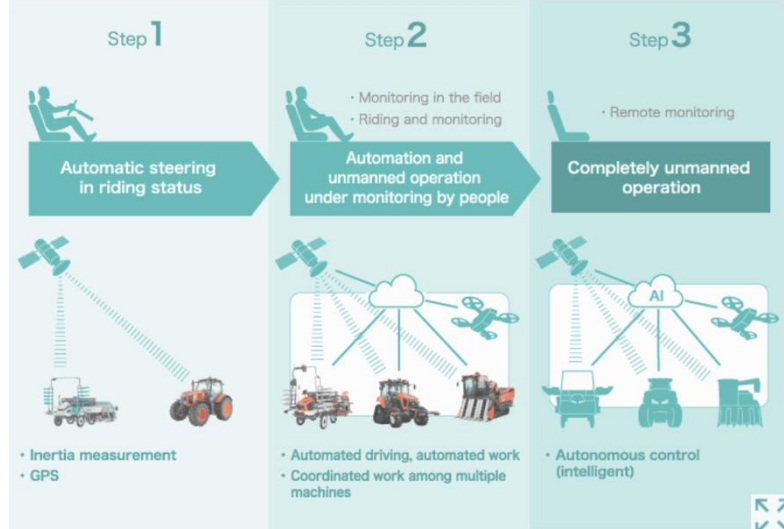**Fig 8. Global market share of h/w solutions for precision farming 2018-25**
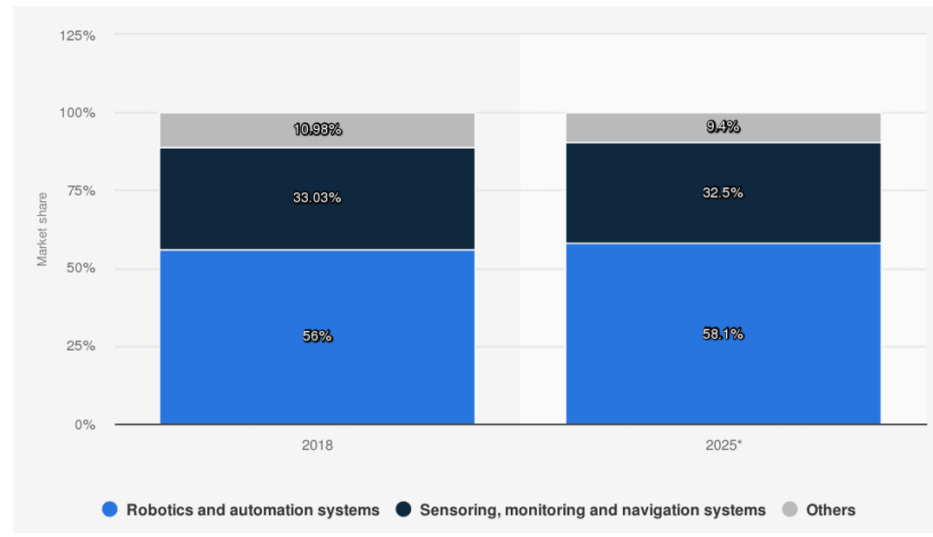
Source: BIS Research, Hyundai Motor Securities

Fig 9. Estimated value of ag robots in the US from 2014-25, USD mn
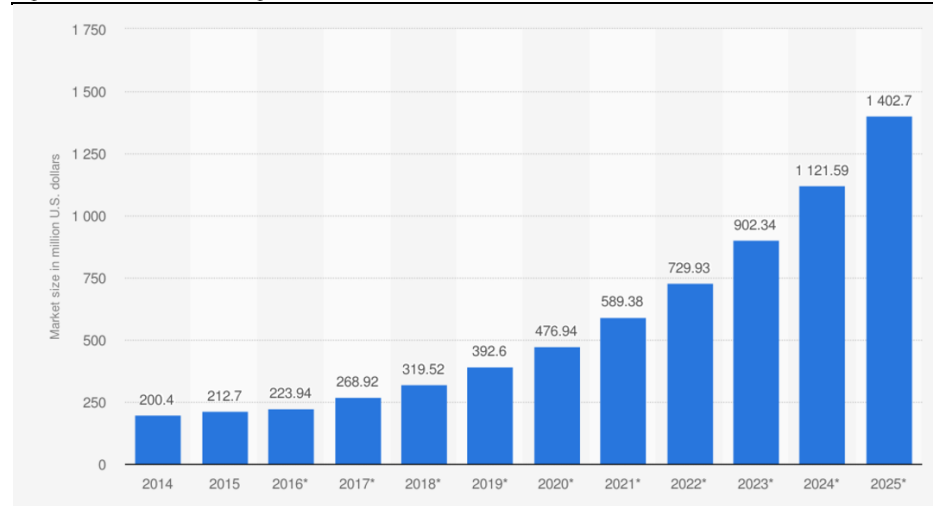
Source: Grand View Research, Hyundai Motor Securities

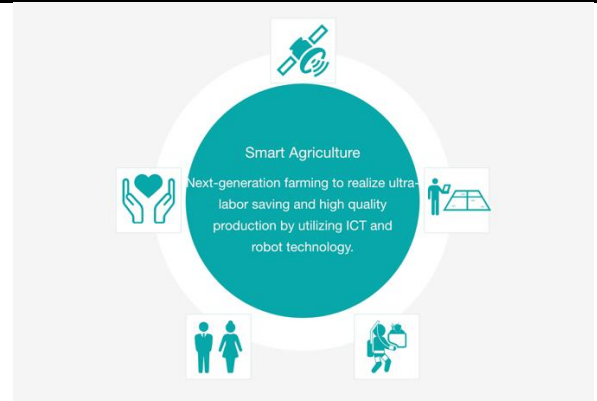**Fig 10. Kubota's roadmap for automatic/unmanned agricultural machinery**

Source: Kubota, Hyundai Motor Securities

Fig 11. AGCO's driver optional electric autonomous tractor

Source: AGCO, Hyundai Motor Securities

Fig 12. Smart agriculture summary

Source: Kubota, Hyundai Motor Securities
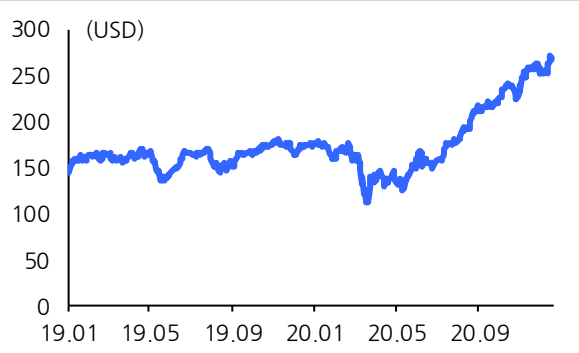
Fig 13. AGCO/Fendt Xaver swarm field robots

Source: AGCO/Fendt, Hyundai Motor Securities

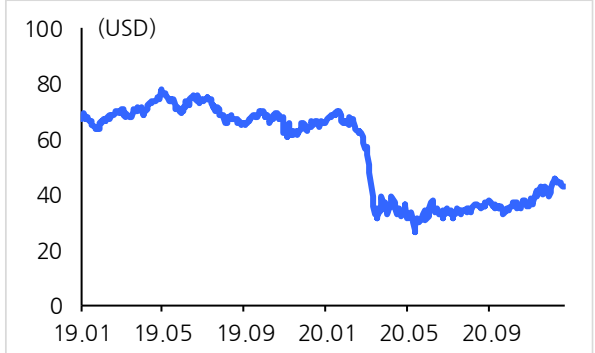**Fig 14. Kubota autonomous electric "Dream Tractor"**

Source: Kubota, Hyundai Motor Securities
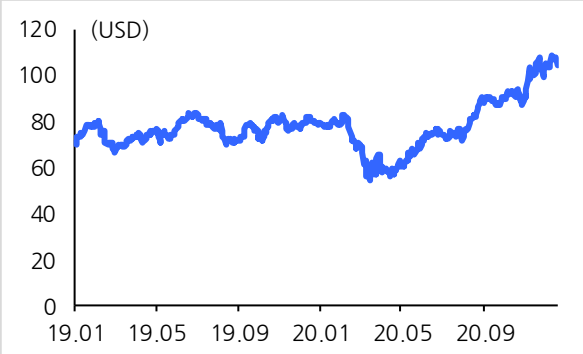
Fig 15. John Deere Company Stock Price

Source: Bloomberg, , Hyundai Motor Securities

Fig 16. ARGO Stock Price

Source: Bloomberg, Hyundai Motor Securities

Fig 17. Kubota Stock Price

Source: Bloomberg., Hyundai Motor Securities

Compliance note

• The author(s) of this report does(do) not have any interests in the company(ies) covered herein.
• Hyundai Motor Securities has not disclosed the material contained in this report to any institutional investor or third party prior to its publication.
• The author(s) of this report does(do) not own more than 1% of the shares of the company(ies) covered in this report.
• The company covered herein is an affiliate of Hyundai Motor Securities
• This report accurately reflects the author(s)'s professional views and was written without any undue external influence or interference.

Investment rating

Hyundai Motor Securities offers three sector investment ratings based on six-month forward fundamentals and share price outlook.
   • OVERWEIGHT: Sector-wide fundamentals and share prices are expected to turn up.
   • NEUTRAL: No meaningful fundamental improvement is expected.
   • UNDERWEIGHT: Sector-wide fundamentals and share prices are expected to turn down.

Hyundai Motor Securities offers three company investment ratings based on the relative return expected in the following six months, based on the closing price on the date of rating declaration.
   • BUY: Excess return of +15%p or more
   • MARKETPERFORM (M.PERFORM): Excess return of between -15%p and +15%p
   • SELL: Excess return of -15%p or less

Stock ratings distribution (January 1-December 31, 2019)

Rating	Count	% of rating category
BUY	135	85.99
MARKETPERFORM	22	14.01
SELL	0	0.0