Agricultural Robots and Drones 2017-2027: Technologies, Markets, Players

Description:
This report is focused on agricultural robots and drones. It analyses how robotic market and technology developments will change the business of agriculture, enabling ultra-precision farming and helping address key global challenges.

It develops a detailed roadmap of how robotic technology will enter into different aspects of agriculture, how it will change the way farming is done and transform its value chain, how it becomes the future of agrochemicals business and how it will modify the way we design agricultural machinery.

In particular, this report provides:

Market forecasts:
Granular ten-year segmented market forecasts for 14 categories including static milking robotics, mobile dairy farm robots, autosteer tractors, autonomous tractors, unmanned spraying drones, autonomous data mapping drones, robotic implements for de-weeding, autonomous de-weeding mobile robots, robotic fresh fruit harvesting, robotic strawberry harvesting, manned and unmanned robotic lettuce/vegetable thinning/harvesting and so on. Our market forecasts are also segmented by territory. All our assumptions and data points are clearly explained.

Technology assessment:
Detailed technology assessment covering all the key robotic/drone projects, prototypes and commercial products relevant to the agricultural sector. Detailed overview and assessment of key technological components such as vision sensors, LiDARs, novel end-effectors, and hyper/multi-spectral sensors. Technology roadmaps outlining how different equipment are increasingly becoming vision-enabled, intelligence and unmanned/autonomous.

Application assessment:
Detailed application assessment covering dairy farms, fresh fruit harvesting, organic farming, crop protection, data mapping, seeding, nurseries, and so on. For each application/sector, a detailed overview of the existing industry is given, the needs for and the challenges facing the robotic technology are analysed, the addressable market size is estimated by territory, and granular ten-year market projections are given.

Company profiles:
More than 20 interview-based full company profiles with detailed SWOT analysis, 40 company profiles without SWOT analysis, and the works of more than 76 companies/research groups listed and summarized.

Robotics in dairy farms will reach $8bn by 2023
Robotic and drones have already started to quietly transform many aspects of agriculture. Already, thousands of robotic milking parlours have been installed worldwide, creating a $1.9bn industry that is projected to grow to $8bn by 2023. Mobile robots are also already penetrating dairy farms, helping automate tasks such as feed pushing or manure cleaning.

Tractors become increasingly autonomous
Tractor guidance and autosteer technologies are also going mainstream thanks to improvements and cost reductions in RTK GPS technology. Indeed, more than 300k tractors equipped with autosteer or tractor guidance were sold in 2016, rising to more than 660k units per year by 2027. Unmanned autonomous tractors have also been technologically demonstrated with large-scale market introduction largely delayed not by technical issues but by regulation, high sensor costs and the lack of farmers’ trust. This will all change by 2022 when sales of unmanned or master-slave (e.g., follow me) tractors picks up.

Drones bring in increased data analytics into farming
Agriculture will be a major market for drones, reaching over $480m in 2027. Unmanned remote-controlled helicopters have already been spraying rice fields in Japan since early 1990s. Indeed, this is a maturing technology/sector with overall sales in Japan having plateaued. This market will benefit from a new injection of life as suppliers diversify into new territories and as low-cost light-weight sprayer drones enter the market.

The progress of drones is by no means limited to spraying. Their core function is to provide detailed aerial maps of farms, enabling farmers to take data-driven site-specific action. These light-weight low-cost drones are often loaded with small multi-spectral sensors, measuring key indicators about plant health, yields, water stress levels, nitrogen deficiency and so on.

This development will soon be entering into its growth years. This is because regulatory barriers for drone deployment are coming down and, more importantly, precision farming ecosystems is finally coming together meaning that farmers can act on what the data tells them. In time, the drone hardware will become commoditized and value will shift largely to data acquisition and analytics providers.

Robotics is the future of agrochemicals

Agricultural robotics is also rapidly progressing on the ground. Vision-enabled robotic implements have been in commercial use for some years in organic farming. These implements follow the crop rows, identify the weeds, and aid with mechanical hoeing. The next generation of these advanced robotic implements is also in its early phase of commercial deployment. Indeed, they are already thinning as much as 10% of California's lettuce fields.

The end game however is to turn these implements into general-purpose autonomous weeding robots. This means that swarms of these small, light-weight robots will locate weeds and take site-specific precise action to eliminate them.

This has already starting to occur with numerous companies and groups developing and deploying a variety of weeding robots. Indeed, whilst most products are in prototype or semi-commercial trail phase, the first notable sales have also taken place aimed at small multi-crop vegetable farmers.

This has far reaching long-term consequences for the farming industry, particularly affecting suppliers of crop protection chemicals. This is because it changes the way we farm as farmers will no longer need to broadcast spray chemicals uniformly across the entire field. Instead, they will move even beyond variable-rate precision towards ultra-precision agriculture where the farm is managed on an individual plant basis and where each plant is given only the exact dose of chemicals that it requires.

This is only a long term development at this stage but it will impact the total consumption of crop protection chemicals. It can convert volume commodity agrochemical business into speciality chemical operations, and can force suppliers to re-invent themselves as providers of crop protection, whatever its form, and not just chemical suppliers.

Agricultural machinery transfigured?

The advent of agricultural robots will herald a change in the way agricultural machinery is envisaged. Today, bigger is better because the productivity of the skilled driver/operator is improved. Mobile robots could change this by taking the driver out of the equation.

Indeed, emerging mobile agricultural robots are likely to be slow, unmanned, light-weight and modular. Their slowness means that more attention is given to each plant, their lightness means no soil compaction, and their small size means potentially lower cost.

The latter point is critical if such mobile robots are ever to leave the drawing board because slower and small machines are inherently less productive therefore need to be lower cost, in some cases by as much as 24 times. This cost requirement alone will prevent uptake in the medium-term.

Today, most examples of such robots are only in the prototypes or early stage commercial trial phase but the direction of development is clear. The technological challenges will soon largely been solved and the industry will enter the phase of making and proving a commercial case, whether as an equipment or a service.
Farmers' conservatism will however turn this potentially revolutionary change into an evolutionary, incremental one.

Robotics finally succeed in fresh fruit harvesting?

Despite non-fresh fruit harvesting being largely mechanized, fresh fruit picking has remained mostly out of the reach of machines or robots. Picking is currently done using manual labour with machines at most playing the part of an aid that speeds up the manual work.

Progress here has been hampered by the stringent technical requirements. The vision system needs to detect fruits inside a complex canopy whilst the robotic arms needs to rapidly, economically and gently pick the fruit. The lack of CAD models has also prevented rapid iterations in product development. The absence of universal applicability has also put off large investments as each harvester is likely to work on a narrow segment.

This is however beginning to change, albeit slowly. A limited number of fresh strawberry harvesters are already being commercially trialled. Some versions require the farm layout to be changed and the strawberry to be trained to help the vision system identify a commercially-acceptable percentage of strawberries. Others are developing a more universal solution compatible with all varieties of strawberry farms. Market adoption will start from 2020/2021 onwards.

At the same time, fresh apple robotic harvesting has also reached the level of late stage prototyping. Here, novel low-cost end-effectors are being developed together with low-cost good enough robotic arms that will work in parallel. Market adoption will start from 2022/2023 onwards.
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