The Rise of the Drones in Agriculture

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Figure: 1.

Introduction

Drones Create the Expectation of a Large Swing in the Way We Grow Crops

For years now, drone advocates have cited precision agriculture - crop management that uses GPS and big data - as a way to increase crop yield while resolving water and food crises. Unfortunately, drones haven't had a significant impact on agricultural practices, at least until recently. A lot is happening lately on the subject of drone applications in agriculture and precision farming. From the ability to image, recreate and analyze individual leaves on a corn plant from 120 meters height, to getting information on the water-holding capacity of soils to variable-rate water applications, agricultural practices are changing due to drones delivering agricultural intelligence for both farmers and agricultural consultants.

Unfortunately, many of the promises being made to farmers, drone service providers simply couldn't deliver, even backed up by proper research yet. Until now airspace controllers did not open segments of airspace above agricultural areas for commercial drone agricultural research to take place. A shift in regulatory policy in this respect allows certified drone service provider firms - many of which are in a start-up phase - to assist both large and small farming operations with water and disease management and a charge for these services. The service providers - with an open airspace to a specific flight height will also be able to use drones to provide better planting and crop rotation strategies and to provide a higher degree of all-around monitoring of how crops are progressing on a day-to-day basis in different parts of a given crop field, as well.

In the coming years all of the possible uses for drones will be fleshed out by drone service providers and farmers itself. A boost in crop intelligence will make farms more efficient and help smaller operations compete with their more well-heeled Big Agriculture competitors.

A widely-cited drone report released by the Association for Unmanned Vehicle Systems International predicts that the legalization of commercial drones will create more than €70 billion in economic impact (such as revenues, job creation) between 2015 and 2025, and that precision agriculture will provide the biggest piece of that growth. For now here are five drone agricultural applications already being implemented in the field.

Drone Applications in Agriculture

Mid-Season Crop Health Monitoring

The ability to inspect in-progress crops from about 100 meters height using Normalized Difference Vegetative Index (NDVI) or near-infrared (NIR) sensors is, thus far, the premier application for drones in farming. This was a task traditionally performed by often-reluctant college interns walking into the fields with a notepad. Drones from the present generation, allow for coverage of more surface area in a much shorter time stretch, as well as the capturing of data that cannot be seen by the human eye (like the NDVI or near-infrared). Moreover, it removes much of the human error aspect of traditional inventory work, though a physical inspection of an area of concern after viewing the imagery is still recommended.

Irrigation Equipment Monitoring

Managing multiple irrigation pivots is well...., it is laborious, especially for large growers with many fields spread out across a county or region. Once crops like corn begin reaching certain heights, mid-season inspections of the nozzles and sprinklers on irrigation equipment that deliver the much-needed water really becomes a painstaking exercise.

Mid-Field Weed Identification

Using NDVI sensor data and post-flight image processing to create a weed map, farmers and their agronomists can easily differentiate areas of high-intensity weed proliferation from healthy crop areas growing right alongside them. Historically, many farmers haven't realized how pronounced their weed problem is until harvesting was performed.

Figure: 2.

Variable-Rate Fertility

Though many will argue that ground-based inspections combined with satellite imagery, along with a dedicated grid soil sampling program is more practical for the purpose of refining Nitrogen, Phosphorus and Potassium applications in agriculture, drones do have their fit. A drone service start-up company in the US has used NDVI maps to direct in-season fertilizer applications on corn and other crops. By using drone-generated, variable-rate application (VRA) maps to determine the strength of nutrient uptake within a single field, the farmer can apply 300 kg/ha of fertilizer to struggling areas, 200 kg/ha to medium quality areas, and 150 kg/ha to healthy areas, decreasing fertilizer costs and increasing yield.

Cattle Herd Monitoring

Many growers during periods of depressed commodity prices made the call to diversify their farms by adding cattle or swine operations. Drones are a solid option for monitoring herds from overhead, tracking the quantity and activity level of animals on one's fields. They are especially helpful for night-time monitoring due to a human's eye's inability to see in the dark.

Conclusion

As conclusion, it can be stated that as the calendar starts to turn to 2016, the examples given in this Editorial are current and common uses for drones in precision agriculture. This application list is bound to undergo quite some growth in the near-future as more and more research takes place and will take place and certainly when in the European Union, airspace will be opened for certified drone equipped agricultural service providers.

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