USING DRONES IN AGRICULTURAL AREAS

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Abstract

When the world population has approached eight billion, the worldwide focus shifted to supply food for it in a sustainable way. A new grip on precision agriculture has been led. This was identified as a farm management. This emerging concept is established to observe, measure, respond the crops and their inter and intra-field variability and versatility. To gain yield in a maximum level from the limited sources of a farm, this notion can be an efficient way for farmers to reach this aim. Meantime, the outcomes in terms of crop yields, plant health and other data have to be observed constantly while having a real-time feedback. They also require an analysis to be done objectively and equitably. Drones are considerably convenient to the farmers for helping to optimize the use of inputs such as fertilizers, seed and water. They are helpful for them to react quickly and on time to threats like weeds, pests and fungi. The farmers can also save time in treatment validation of the crop scouting, can improve the variable rate prescriptions in real time and can do an estimation about the yield to be given from a field in harvest seasons. Our environment and our food can be cleaned more and more from chemical load. The reduction of water use can be figured out more and better. Despite being a young technology, drone usage in agriculture is expected to increase significantly. Encouraging the farmers to use the drone with the aid of the government support and agricultural extension efforts, will help them to warm towards this technology and to become adherent to future technologies. In this paper, secondary data was used to show drone usage and benefits in agriculture and how it effects environment positively.

Keywords: Drone, environment, agriculture, sustainability, extension.

Introduction

In parallel with the developments in the economy and population growth in the world as a whole, the agriculture will come into prominence ascendantly. The estimations made by the scientists indicate that we will need more production of crop, in other words we will have to double it to meet the food supply, by the year 2050. To increase the productivity in agriculture is extremely significant for this demand (Snow, 2016). When the world population has approached eight billion, the worldwide focus shifted to supply food for it in a sustainable way. A new grip on precision agriculture has been led. This was identified as a farm management. This emerging concept is established to observe, measure, respond the crops and their inter and intra-field variability and versatility. To gain yield in a maximum level from the limited sources of a farm, this notion can be an efficient way for farmers to reach this aim. Meantime, the outcomes in terms of crop yields, plant health and other data have to be observed constantly while having a realtime feedback. They also require an analysis to be done objectively and equitably. The aerial images are easily taken by the aid of drones, which means they are very efficient tools to assemble these significant data (Snow, 2016). This paper will be an essay of analysing the drones that we have used as remote sensing devices in agriculture, up to the present. Additionally, we will be reviewing some approaches, such as competitive and traditional, which apply necessary technology; and we will be discussing the technology itself that provide many opportunities and challenges; we will find out our knowledge and finally we will talk about the drones in the future in agricultural era.

Definition of drone

The word 'drone' is the common name for an Unmanned Aerial Vehicle (UAV). Wikipedia describes drone as "An unmanned aerial vehicle (UAV), commonly known as a drone, is an aircraft without a human pilot aboar" and as "'*a powered, aerial vehicle that does not carry a human operator, uses aerodynamic forces to provide vehicle lift, can fly autonomously or be piloted remotely, can be expendable or recoverable, and can carry a lethal or nonlethal payload*.' By (Office of Secretary of Defense, 2005). The augmentation of the productivity and the regulation of the crop quality are due to the unmanned drones which are a particular innovation for the farmers. Today, they prefer to use drones more frequently and regularly to obtain best results from the informations taken. Before, more traditionally methods such as crop-monitoring from satellite photography or manned airplanes were remaining unsufficient while providing incomplete and/or delayed informations. The drones also are a member of the manned airplanes. But they seem more efficient than them because they can fly much closer to the crops and to the leaf level at the same time which make the drones more valuable in the eyes of the farmers who have more possibility to capture additional and expanded detailed information. Needing to combine photos taken by manned airplanes can be a problem since those ones have traditional flight paths. To overcome this issue, the drones are a beneficial choice by being able to fly over a fixed point for a period of time. The pesticides, herbicides, fertilizer and irrigation are detected on site-monitoring by the aid of the drones that can be equipped with infrared cameras, sensors, and other technologies. The drones can ensure them and fix them up within the collection of a variety of relevant data. And this will help the farmers to make a decision and to take precautions. The use of the infrared cameras mounted on drones is an example of this site-monitoring. It helps to mesure the productivity of the crops by visible and infrared radiation to designate whether the plants are in good conditions or not (Sunding et al. 2016).

The significance and the usage of drone

I. We can mention UAS as an agricultural tractor. But singlehandedly it is not very useful in the field work without some kind of implement. Due to this, we can mount on some kind of tool such as a platform mounted cameras which will lead it to become useful for agriculture together with the farmers. The different aspects of plant health are assessed from simple visible-light photographs or more scientific multi-spectral imagery. The farmers can put inputs about seeds, fertilizers or chemicals according to their quotations to the larger and sophisticated UAS. However, we must take into consideration that the data will be collected by the UAS but its interpretation will be done by the farmer. In an agricultural area, to use of the aerial photographs or videos of the problematic part or parts visually explored, and then to visit it/them to diagnose the cause of the problem directly seems easy. Nevertheless, the diagnosis of problems is more like a direct interpretation and one of the biggest challenges when any aerial technology is used. Collecting many different potentially useful data is a possibility, but there is a use of information that can be employed to make management decisions - and the question is how to receive these useful informations. To comment and to provide management tools that work together to develop methods in several different universities, companies and services can lead us, however, this is not a trivial task (Anonymous1, 2017). Drones can be very useful while starting the crop cycle. One of their advantages can be that having higher quality and precision of the images. A satellite who takes pictures only in limited times such as once a week or once a month could not be sufficient for planting. Here comes the importance of the drones. However the multidimensional maps for early soil analysis are produced precisely by the satellites. The farmers use them in their planning seed planting configurations. Once the field and soil analysis are done, they can efficiently use drones to plant their land. The pods with seeds and plant nutrients can be shot by the drones into the soil. Thus and so, the plants can provide all the necessary nutrients for sustaining life. This also leads to lower the costs of planting, therefore is very advantageous for the farmers. Accordingly, the ground can easily be scanned by the drones. They can modulate and adjust the distance of spraying from the ground and the amount of liquid correctly; thus, they can realize the spraying in real time even in coverage. It results to a

satisfying degree of effectiveness: The efficiency is increased and the amount of chemicals that intends to penetrate into the soil and then the groundwater is reduced. And this is one of the most important motive. Furthermore, the different parts of a field can be identified with the sensors of the drones if they are dry and if they need an irrigation. Drones can also be used to tailor the usage of the pesticides, herbicides, fertilizer of the farmers. They help them for other applications too depending to their need and at a specific point of their field.

Where can we use drone?

1. To scout crop in a simple way

The farmers are watching, observing and checking up their crops to be aware of the time to step in and help as we are checking up our own health. They regularly examine their crops for signs of stress and of potential stress. This is significant for crop protection from weeds, pests, and disease (Anonymous2, 2017).

2. Health Assessment and its valuation

Visible and near infrared light is used by some drones to scan crops. The plants reflect and near-infrared light and its amount is identified by on-board light processing devices such as thermal sensor. The water use of the plants is one of the occurrence that can be identified by a thermal sensor. Accessing more water is appeared to be cooler in an image. The multi-spectral images are developed by the use of these datas. These images illustrate the health of the plants. Crop health is also painted and tracked by these images. In occurrence of any sickness, the farmers can also monitor the administered remedies (Anonymous3, 2017).

3. The inspection of irrigation

Many fields are spreaded out across a region and lage growers need more control for them. When the crops such as corn are reached a certain height, the inspection of irrigation nozzles and sprinklers commited in the mid-season become a troublesome situation, because the inspectors have to wade through crops to find the troubled ones. This task is very time-consuming. The better way to avoid the waste of time is to have professional drones that have camera zoom functionality.The parts of the field that have become dry can be identified by the drones which are equipped with hyper-spectral or thermal sensors. This ensures the precision and time gaining on promptly making irrigation(Anonymous3, 2017). Like water which is used more efficiently as input, the environmental resources are also conserved by them. The sustainable agriculture put emphasis to conserve the water in the production. Today, sustainable agriculture comes to meet society's needs without compromising the welfare of future generations. In addition, wireless technologies allow farmers to use water more efficiently and increase their earnings. Excessive irrigation of the plants causes the nutrient to dissolve the groundwater and mix with it. They are particularly mixed with fertilizer and nitrogen nutrients which have a negative effect on both local and global water quality. The food stream can contaminate the water in the surface. A major problem arising from the flow of water is the creation of “dead zones”. The nutrient flow from agriculture and other human activities causes the overgrowth of algeas which consume oxygen, creating anoxic conditions that can kill all marine life in this area. Stimulating algae overgrowth is emerging areas of dead zones. The significant impact of these dead zones are detrimental to the ecosystems, the seafood and the tourism industries(Sunding et al. 2016).

4. Precision spraying

Sprayed drones are designed for precise variable rate application of liquid insecticides, fertilizers and herbicides. Unmanned spray helicopters have been used for many years. The use of these drones in agriculture is a more efficient route in terms of cost and cost in managing their products. But the agent does not hold excess liquid. Thanks to the use of ultrasonic echo and laser, the drones can adjust the altitude by changing the topography and the geography. They have the ability to scan and

modulate the distance from the site, and evenly dispense the right amount of the desired liquid in real time. This results in increased productivity; because the amount of water penetrating the ground is reduced the most. It has been proven that spraying using Drones is faster than other conventional methods (Anonymous3, 2017).

5. Maps of individual fields or segments

Individual fields or pieces require more knowledge and expertise than pressing the flying drone's record button to create maps. "Orthomosaic photography" requires knowledge of how to create it. An orthomosaic geometric scale is an aerial photograph that can be corrected : there is the same imperfection as distortion of the photo map. Not like uncorrected aerial photographs, an orthophotograph can be used to measure distances on the Earth as it has a representation (such as areas and field segments). The greatest advantage of an agricultural drone via satellite or a plane is shown by taking the photo of a specific area. The pictures taken are sufficiently clear to determine whether the difficulties are in which of the sections if there are any. Detailed informations that is collected by the drones is so useful by showing the only part to be fixed, you'll be able to treat the problem. This detailed information for each portion of the field allows you to specify which part of the field requires cure. So, you don't have to spend money for spraying the whole area, you can save your money by targeting a specific area. You can develop three-dimensional maps by your agricultural drones and your nearby field can allow you to have a better idea of the layout. You can be help by the maps that can help you to better identify your direction with tools such as water flow and sink holes. You can develop water and land management plans for your area and even register your areas for insurance purposes with the aid of this data. It can additionally be used to determine the nutritional and fertility levels of different parts of individual areas, at the same time, with the power of computers and people (Anonymous4, 2015).

6. Analysis

We can use drones to make also the soil and field analysis. 3-D maps created by the drones helps us to analyzing soil on soil property, moisture content, and soil erosion. Seed planting patterns need this study. Once the processing of planting finished, we can keep this information to use in the irrigation and the management of the nitrogen level in the soil both (Anonymous3, 2017).

7. Planting

Although not yet widespread, some manufacturers have found any systems which unable to shoot capsules that contain seeds into prepared soil. This deeply lowers the costs of planting.

Disadvantages

In addition to the advantages, various problems arise when using the UAV. The performance of current UAVs, in terms of transport load, range and/or accuracy, is still limited. VTOL-tools (able to set up vertically) can be well positioned, but have limited payload due to the power required for lift. With fixed-wing vehicles, you can carry more tools, but they can not be placed having a suitable position when flying. In existing models, there is an autonomy and they can mostly follow the road signs, but still unlikely to intervene if an operator is needed for task scheduling and some problems occur. Moreover, the UAV should resolve the ethical issues when implementing various commercial applications. Especially while UAV makes its observational tasks, the ownership, the security and the privacy questions arise about the breach. One of the disadvantages is that they should be kept under continuous observation in the sense that is seen as a privacy invasion because of their constantly surveillance. Drones can carry high-power zoom lenses, night vision and imaging properties. These clearly need to be addressed and must be sorted out. Like all new technology, it's probably desirable for efficiency and reliability reasons, however, there is a discussion on the replacement of human labour of the people in the field (Vroegindeweij et al. 2014).

Results and discussion

Drones are considerably convenient to the farmers for helping to optimize the use of inputs such as fertilizers, seed and water. The drone, especially in the field of precision farming, includes various aspects that can show greater benefits when applying it to the agriculture. One of its facility is the monitoring tasks. Its human observation from the satellites or based on the repeatability of the current system, has the potential to achieve much better performance in terms of accuracy and timing. Whenever the appropriate processing technology is provided, at the same time, the coordination of operations are performed by farmers, machines or robots in the field, as well as some methods to be developed allows for the manipulation of AUAV by themselves (Vroegindeweij et al. 2014). They are helpful for them to react quickly and on time to threats like weeds, pests and fungi. The farmers can also save time in treatment validation of the crop scouting, can improve the variable rate prescriptions in real time and can do an estimation about the yield to be given from a field in harvest seasons. Our environment and our food can be cleaned more and more from chemical load. The reduction of water use can be figured out more and better. Despite being a young technology, drone usage in agriculture is expected to increase significantly. Encouraging the farmers to use the drone with the aid of the government support and agricultural extension efforts, will help them to warm towards this technology and to become adherent to future technologies. While supplying the product increasing within the on-site and on-time interventions, the sustainability will be supported by increasing the efficiency of the resource utilization. The drone's use in agriculture is assumed to keep on growing. New wireless technologies as found in computing or smart phones, is also available for agriculture; it has made possible the use of drones for farmers to indicate the entities such as soil moisture levels, weather, and irrigation equipment to be able to access critical information in real time about tools. With this information, farmers can make a more effective decision for irrigation of crops and. The farmers increase their profits within this increased decision-making authority, they can save on water and water quality is improving correspondingly. Finally, as a matter of fact, the use of drones becomes extemely popular (Sunding et al. 2016).

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