

## Utilizing Drones in Agriculture

As the world grows in population with the same amount of agricultural production area it will continuously become more important for farmers and ranchers to be more efficient. Farmers have always been trying to produce more of their commodity with fewer inputs. Ranchers can utilize drones for their operations as well. Drones in agriculture are becoming more useful and effective in the way agriculture products are produced. Selecting a drone for the operation at which the operator needs is very important.

Precision agriculture along with drones are aiding each other in the strive to produce more goods with fewer inputs of fertilizers. With the help of drones, problem areas of fields can be identified and fixed with variable rate fertilizers. This can be accomplished flying an entire field or a portion of a field with potentially low yielding areas. From the scan of the field, an NDVI map will be constructed, these maps tell the health condition of the plants. Once the overall health condition of the field is determined a variable rate fertilizer prescription map can be made. These variable rate maps allow for the proper amount of fertilizer to be applied to the crops reducing runoff. Depending on the application area it could be applied by a drone. Flights over a field with a drone and tell more than just where there is a lack of fertilizer. With NDVI and photographic imagery, a grower can see where other potential problem spots are. If there is a lower elevation spot in the field a farmer can note the area for adding in a tile system to allow the proper amount of water to be in the soil. Crop disease can also be detected from the flights over the growing field.

Livestock operations are increasing the demand for drones according to "Farming-Airborne Drones 2020". Ranchers can capitalize on the use of drones for taking care of their

herds. Drones with thermal cameras as well as regular cameras can be a benefit. Drones with thermal cameras can fly pastures at night during calving season to see if any cows or heifers are giving birth. This allows for more sleep instead of getting up all the time in the middle of the night to drive around and check the herd. A bison breeder in Onida, SD will use his drone to move his animals. This is much safer for him, while he is still able to do his job of taking care of his bison. Drones can also be used to get an overview of herd health. While flying a herd the operator can use the drone to make sure every animal is in good health, as well as make sure there is plenty of feed available for the animals. Ranchers can also fly fence lines to ensure everything is intact or in need of repair to keep the animals in their pasture. Drone use can also be helpful when building a new fence over hills to ensure that the fence is going in a straight line making sure that landowners on both sides of the fence get their correct amount of land.

There are many drones available on the market all over the world. The agriculture portion of that market is small but growing strongly and will continue to keep getting larger. Selecting a drone for an operation should start by knowing what you want the drone to be able to do. Andrew Nixon's article "Best Drones for Agriculture 2020: The Ultimate Buyers Guide" is a useful resource when picking out a drone that best suits an operation. When looking to cover a lot of ground in a shorter amount of time Nixon recommends going with a fixed-wing. One fixed-wing drone that is recommended is the senseFly eBee SQ. Nixon's recommendation for a multi-rotor drone is the DJI Phantom 4 pro with the NDVI upgrade, this quadcopter can produce NDVI maps.

Drones will continue to influence and aid agriculture as the population of the world continues to grow while the amount of land available stays the same. These drones will

continue to improve efficiency while lowering inputs. Drones are improving things for ranchers and livestock growers as well as crop farmers. While drones keep improving, they will become even more effective and useful for farmers and ranchers.

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