

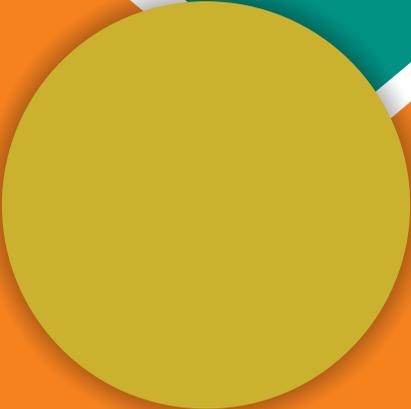
# Unmanned Aerial Systems (UAS) For Precision Agriculture



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To meet the surging needs in the food and most importantly to optimally use the key resources like water, nutrients, etc., in the crop-fields, the Agriculture sector is being transformed into Precision Agriculture. Precision Agriculture (*Precision Farming*) is a farming management concept based on the observation and the measurements of the respective inter-field / intra-field variations that trigger a timely response to address the problems in the crops. This strategy consequently keeps the things well under control which ultimately leads to deliver a rich yield. Traditionally, different treatments related to the irrigation, nutrients, pesticides, herbicides, etc., are applied uniformly on the whole crop-field. This practice involves an excessive use of the resources which is certainly not required. The inter-field / intra-field variations are generally projected through the maps developed by processing the digital images captured through satellites or Unmanned Aerial System (UASs). Due to the high spatial and temporal frequency with high quality imagery, the use of (UASs) for site-specific farming is acknowledged globally. Given the growing critical situation of the Agricultural resources, this technology can be effectively used to assist in getting better yield at the cost of minimal resources.

## Significance

The unmanned aerial systems offer notable advantages in Precision Agriculture over the traditional remote sensing platforms, i.e., the satellites. For instance, the UAS provides the aerial imagery with very high spatial resolution. This is achieved by capturing the imagery at some optimal heights or by adjusting the focal length of the sensors being used with the UASs. The use of UAS also gives the researchers or farmers an extraordinary flexibility in scheduling the flight plan, something not possible with the satellites. The quality of the imagery data through UASs is much better than the satellite imagery data as the satellite imagery is more prone to the noise, weather, etc. Moreover, the operational cost for using the unmanned aerial systems is much more affordable as compared to the satellite imagery. All these striking features make the unmanned aerial system a smart tool to perform different tasks in the context of Precision Agriculture.

## The Technology at the University of Agriculture - Faisalabad

The University of Agriculture – Faisalabad is the very first university in Pakistan to use the unmanned aerial systems for R & D applications in our agriculture sector. At present, we have two state-of-the-art systems, i.e., a multicopter system and a fixed wing system. Both systems are equipped with the specific sensors suitable for different agricultural applications. The following derivations can be realized with the said systems:

- NDVI
- GNDVI
- SAVI
- Canopy Segmentation
- R-channel / G-channel / B-channel / NIR channel
- Thermal

These derivations assist in estimating the following:

- Crop-health
- Water-stress
- Nutrient-stress
- Weed-detection
- Crop-diseases
- Quantification of plant-density
- Crop cover estimation
- Crop yield estimation

