Guest: Dr. Francisco (Paco) Gonzalez

Institution: USDA-ARS

Interview Date: 05-06-22

Background:

Dr. Gonzalez is a Research Plant Physiologist with the USDA-ARS Forage Seed and Cereal Research Unit stationed in Prosser, WA. He has a Ph.D in Horticulture from Washington State University focused on agronomy applications in potato. He recently accepted a Research Physiologist position with the USDA-ARS focused on agronomy in hops.

Paco’s experience has been sort of unique. UAS data collection was not part of his Ph.D project. His graduate study advisor was not excited about using this technology. It was generally felt that UAS was unnecessary and a waste of time and resources. He really felt that UAS could be a useful tool to capture their trials from a different perspective and that could end up being a useful management tool. He purchased a personal drone and began flying his experimental fields in Othello, WA every two weeks. He started with and DJI Inspire 1 but found that the battery capacity was too small (12 minute flight time) and that the imagery from the camera wasn’t great. He wanted to upgrade to a multispectral camera and purchased a used MicaSense RedEdge camera. Next he bought a DJI Mavic 2 Pro which provided great RGB images. This drone performed well due to good stability and accurate GPS coordinates (usually < 3 meters of variation between images).

Once he showed his advisor data from the field season they could see clear spatial patterns within the field (some regions of the field had strips of yellow foliage) which enabled them to exclude those plot data from the trials because the data was not representative of the overall field experiment.

1. *What do you consider the biggest barriers to entry for implementing a UAS into a research program?*

Convincing other folks that these data types have value. Can you make this work within your program for your research question? He acknowledges that this may be a challenge in hops which have a much different growth habit than potato.

Getting the FAA Part 107 license can be a major limiting bottleneck.

Also finding a UAS system that provides the appropriate level of functionality at a modest price point has been historically difficult. The entry price point is particularly high for someone interested in using multispectral sensors.

*2. What do you consider to be the most and least promising applications of UAS-based imaging for agricultural research?*

Field scouting to narrow search space. It is much easier to look for problems in the middle of field using a drone than needing to walk into the field and look. If problem areas can be identified from a drone than more time can be spent looking at regions that look potentially problematic for diagnosis, etc.

Building digital surface models for fields can be very helpful for understanding water dynamics. This is really important for wheat growers in the Palouse region. The need to know where to install drainage tiles.

1. *What are some of the things you wish you had known before you began using a UAS for data collection?*

Color/radiometric calibration and correction is really important for interpretation of multispectral data.

*4.      What educational resources have you found most useful when developing your own skillset with UAS-based imaging?*

Google is a great resource. Identifying the correct search terms can sometimes be difficult. He also recommends private courses and believes that YouTube would benefit from people developing practical video tutorials on that resource.

*5.      Are there other comments you believe would benefit an agricultural researcher considering implementation of a UAS into their research program?*

Talk to others already working in this domain before you begin. Particularly to folks how find value in the technology and those who don’t. He recommends listening to advice from experts in the field and if possible trying out a drone and sensor platform before you purchase one yourself.

His general feelings are that satellite imagery will be the source of remote sensing data for industry (most farmers and agricultural companies) whereas drones are better for agricultural research (smaller, plot based studies).

In regards to field design, it is useful to have good separation between experimental plots. Weed control is important. Ground control points are important. He uses at least 8 in a 15 acre field and spreads them out as evenly as possible. The coordinates for each point are determined using a RTK module.

Generally, during his Ph.D study he collected ground truth data (petiole nutrient analysis) every 2 weeks during the field season.

In the past he has found Agrisoft Metashape a very useful tool for generation of orthomosaics but notes that use of this software is no longer allowed by USDA-ARS. He previously used the FIELDImageR package for plot level data extraction.

Areas that he feels would help adoption include:

1. Easy access to training resources, particularity for FAA Part 107 licensing and recertification.
2. Creation of data extraction programs and workflows that are easy to use (Agrisoft Metashape for example).