



Agricultural Diagnostic Imaging

Artificial intelligence for surveying trials and production fields

Intro

For the last four years, we have used artificial intelligence to analyze agricultural images taken with drones, phones and cameras. We use deep learning and computer vision to identify, count, and measure onion umbels, speeding up and perfecting traditional field methods for crop surveying.




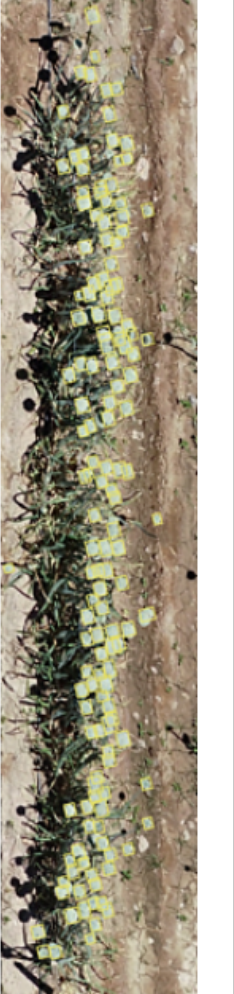

Trials methodology

For working with trials of onions for seeds, we follow the most effective methodology for that case: collecting between 400 to 700 images with a drone for building an orthomosaic like the image below. After that, we extract each plot to analyze them individually.



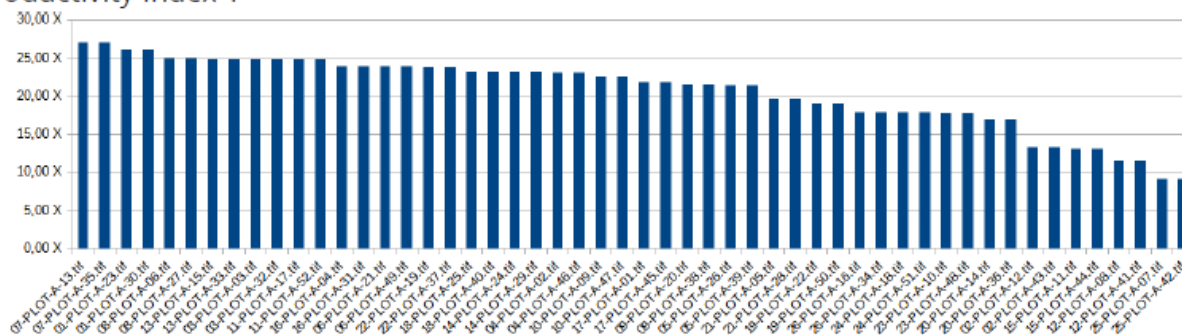
The following are images of the same plot with one week of difference between each one. We can see how the umbels change in number, area, and diameter.

Repetition A13

				
Plot 7 - Rep.A13 Oct. 12/2021	Plot 7 - Rep.A13 Oct. 19/2021	Plot 7 - Rep.A13 Oct. 26/2021	Plot 7 - Rep.A13 Nov. 02/2021	Plot 7 - Rep.A13 Nov. 09/2021
Count Diameter cm	Count Diameter cm	Count Diameter cm	Count Diameter cm	Count Diameter cm
15 4,15	70 5,86	106 7,79	144 7,82	143 8,6

The data of every plot goes to an excel file, where we can visualize the productivity of each material:

Productivity Index 1



Production fields methodology

The method for production fields directly analyzes the images taken by the camera, without the need to build orthomosaics.

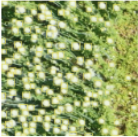


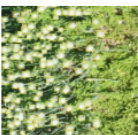
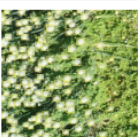
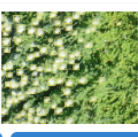
In this way, it is possible to take and analyze individual images. This reduces the number of images to 5/10 to analyze the most relevant and representative points of a production field. It also significantly reduces the flight time of the drone, and the transfer of images takes a few minutes.

This raw image analysis method increases the accuracy in terms of umbel recognition, counting and measurement.

To process the image, we take an image and split it into smaller ones:



Then we analyze each part of the picture individually:

Plot	Count	Total Área	Average Diameter	Image
DJI_0852_C1_R1.jpg	132	6102.96	7.54	
DJI_0852_C1_R2.jpg	144	6653.99	7.57	
DJI_0852_C1_R3.jpg	134	6048.52	7.47	
DJI_0852_C1_R4.jpg	113	4968.19	7.34	
DJI_0852_C1_R5.jpg	122	5020.3	7.03	
DJI_0852_C1_R6.jpg	102	4512.32	7.38	
<div>CancelarExportar XLSExportar AnotacionesGenerar PDF</div>				



Finally we summarize the data obtained from each part of the original image presenting the complete data: total number of umbels, the total surface area of the umbels in square meters and the average diameter.

Image DJI1256.jpg

Total amount of umbels	Total surface umbel area - m2	Average Diameter - cm
9715	34.86	6,71

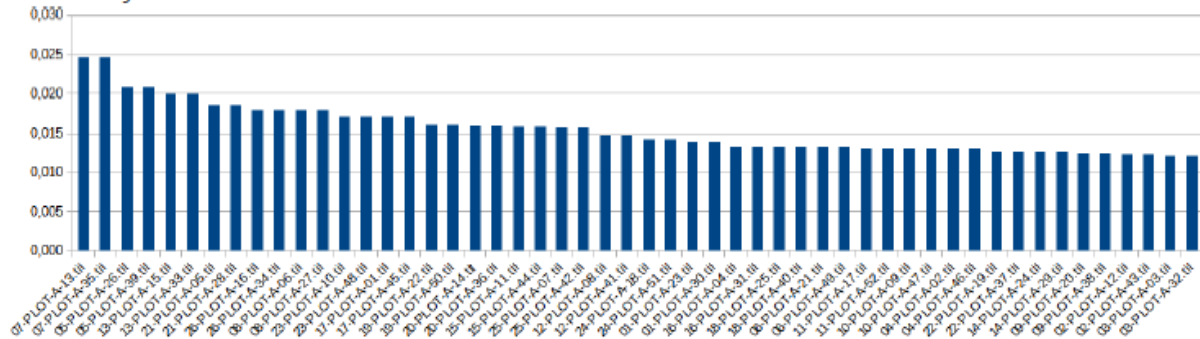


Side 1 =
12.28 m

Side 2 =
18.24 m

The data of every image goes to an excel file, where we can calculate the forecast of productivity of each production field:

Productivity Index 2



Conclusions

- The method for trials allows us to follow up on the development of the crops over time, and also compare the performance of different genetic materials.
- The method for production fields facilitates and increases the magnitude and the precision of the data taken from the crops, improving the quality of production forecasts.