

Side-by-Side Comparison: Unmanned Aerial System Versus Manned Airplane



Introduction

In order to compare the efficacy of UAS and manned airplane herbicide applications, Hylio performed custom applications on RiceTec hybrid seed rice production fields to conduct a side-by-side comparison of the two methods. Two adjacent rice plots, each approximately 20 acres in size, were sprayed on the same day within 2 hours of one another; one was sprayed by a Hylio AG-122 AgroDrone and the other by a traditional manned crop-duster airplane.

Application Information	
<i>The information in this chart pertains to both the UAS and manned airplane applications.</i>	
Date of Application	July 18, 2022
Product Rate	3 qt/acre
Product Applied	Defol-5
Active Ingredient	Sodium Chlorate
Purpose	Defoliant; eliminate green biomass (rice plants, in this case)

Chart 1

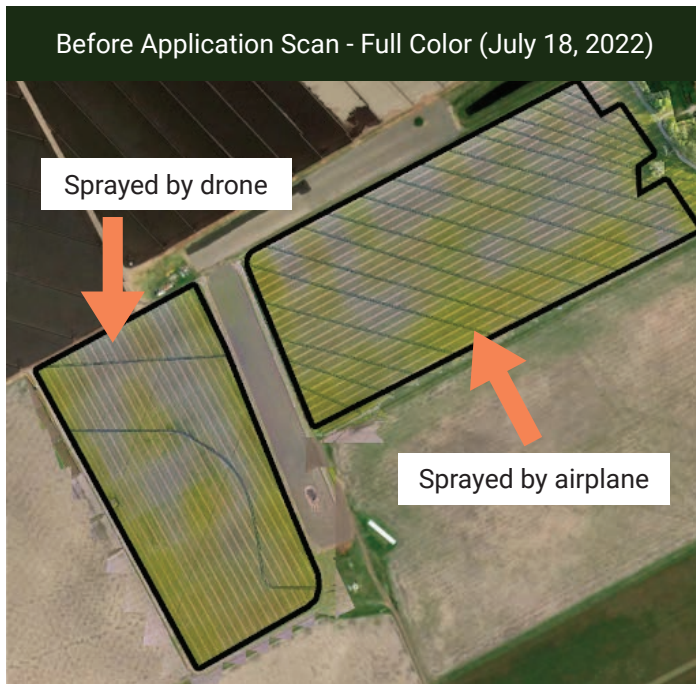
Key Application Difference – Total Solution Dosage		
	Drone	Airplane
Total Solution Dosage	3 GPA	5 GPA

Chart 2

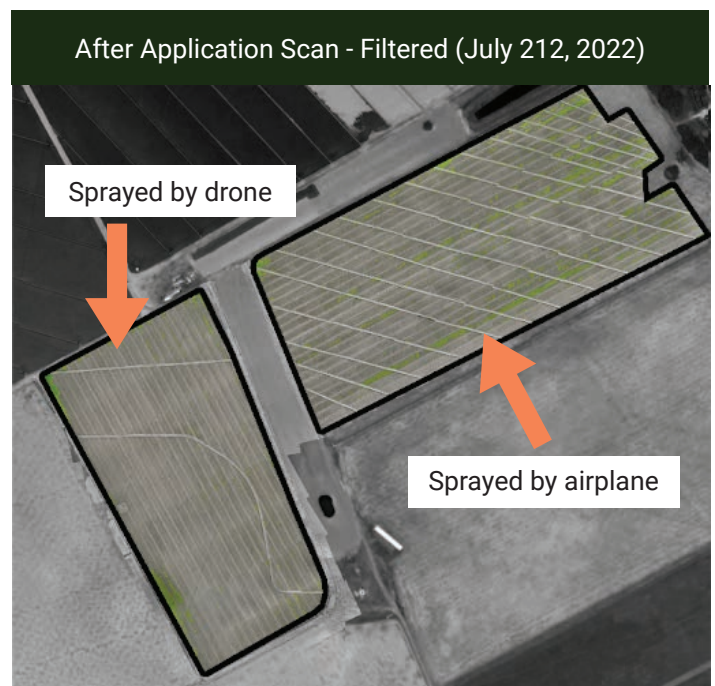
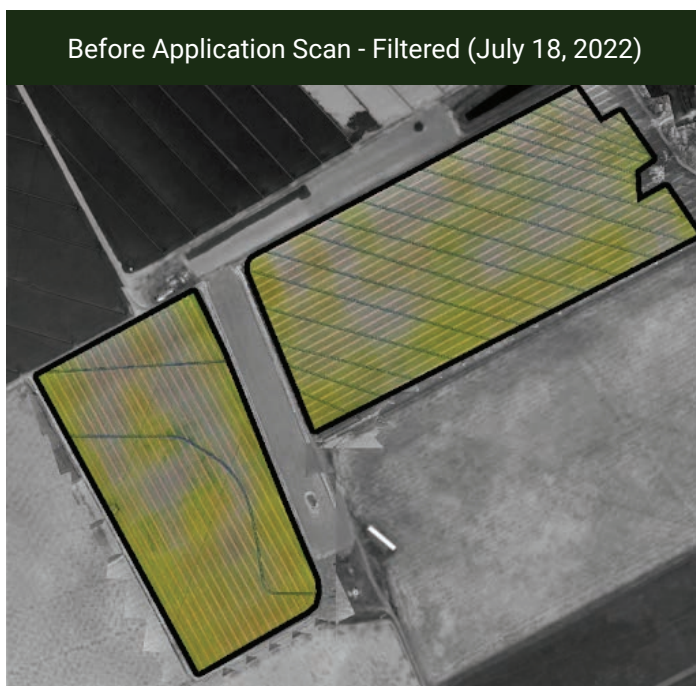
Note that the one key difference between the two applications is that we utilized a lower solution dosage for the drone when compared to the airplane. For the drone application, we utilized a 3GPA solution dosage. For the airplane, we utilized a 5 GPA dosage (see Chart 2 above); the amount of Defol-5 used per acre remained constant for both the drone and airplane applications.

Application Analysis

The following two images show before and after orthomosaic scans of the lots that were treated for this comparison. The imagery was captured using an Autel Evo Pro II with 1" CMOS sensor and the orthomosaic stitched images were processed using Pix4D Fields.



We utilized OpenCV to perform a pixel analysis on the before and after orthomosaic scans in order to obtain a relative understanding of the amount of biomatter that was successfully eliminated through either application method.



From the After Application Scan image above, it's evident that the drone was able to eliminate significantly more of the targeted green biomass when compared to the airplane; the airplane treated plot has a considerable amount of green matter remaining throughout the field whereas the drone treated field appears to be much more barren.

Utilizing the following simple formula, we were able to make an objective comparison of the performance of the Hylio drone versus the manned airplane:

Number of Green Pixels

Total Number of Pixels within Field Boundary

Drone		Airplane	
Before Application	After Application	Before Application	After Application
<div><i>Green Pixels</i></div> <div><i>Total Pixels</i></div>	<div><i>Green Pixels</i></div> <div><i>Total Pixels</i></div>	<div><i>Green Pixels</i></div> <div><i>Total Pixels</i></div>	<div><i>Green Pixels</i></div> <div><i>Total Pixels</i></div>
76%	2.7%	78%	8.2%

Chart 3

	Drone Application	Airplane Application
Percentage of Biomass Eliminated	96.4%	89.5%
Percentage of Biomass Remaining	3.6%	10.5%

Chart 4

Conclusions

When comparing the desired defoliant objective between the two lots, the drone was approximately 291% more effective at eliminating biomass than the airplane application was (3.6% vs. 10.5% remaining biomass - see chart 4 above). Not only does this demonstrate that the drone application was more efficacious at its intended purpose of defoliation, but it required less solution volume overall to do so. These are exciting results that seem to indicate that drones are physically capable of depositing solution in a way that is more consistent and efficient than traditional manned aircraft. Hylio will continue to conduct research with partners like RiceTec to further explore the characteristics of application by drone.