



## Summary

This research evaluates the operational performance of a custom-built agricultural drone focusing on the flight conditions, energy consumption, drone design and mission planning.



## Measurements

The flight missions were carried out with multispectral and thermal cameras. The flights were done four times of the day to evaluate the influence of the field conditions on the camera images.

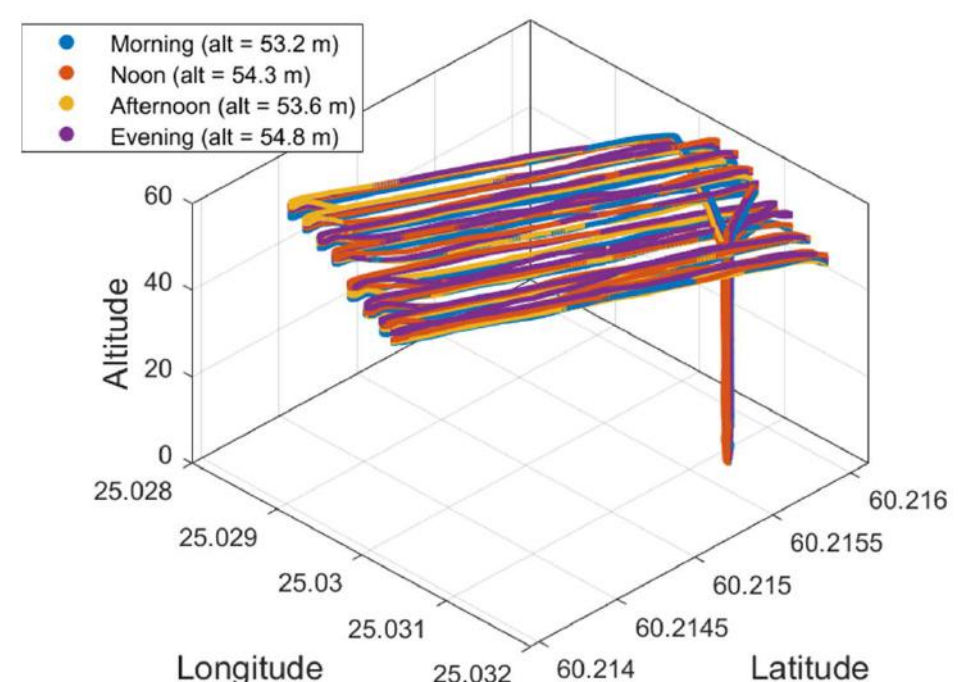
The custom-built drone has six 18-inch rotor blades and electric motors having continuous power about 800 W. The drone is powered by one lithium-ion battery pack which has six cells in series and capacity of 14000 mAh.

## Results

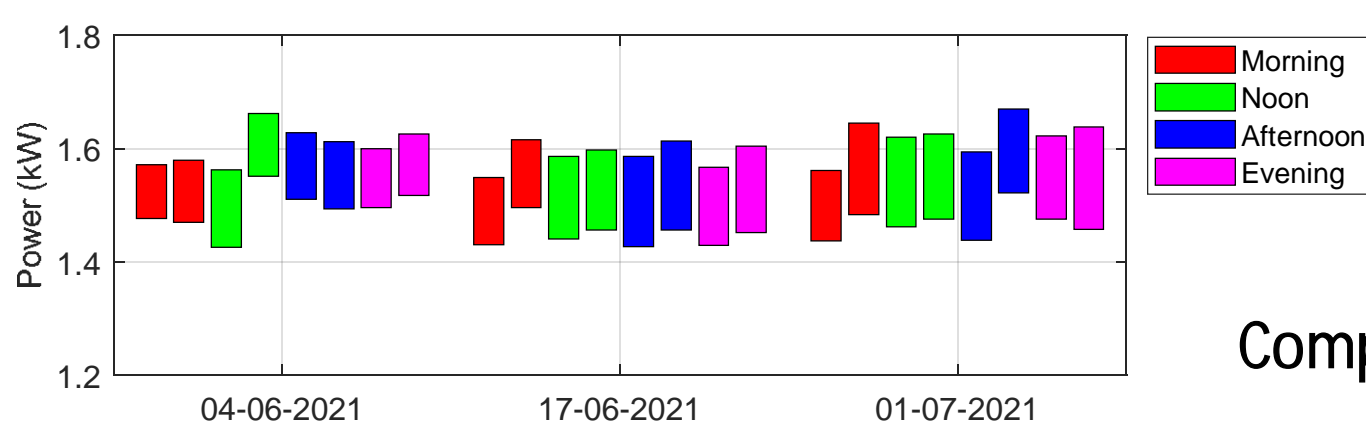
### Flight data summary for one of the fields

Date (day-month-year)	04-06-2021	17-06-2021	01-07-2021	13-07-2021	26-07-2021
Flight duration (min)	8.1	8.1	8.1	8.1	8.1
Meas. duration (min)	6.5	6.5	6.5	6.5	6.5
Altitude (m)	52.2	52.0	54.0	54.7	55.1
STD Altitude (m)	0.7	1.0	1.1	1.0	0.8
Ground speed (m/s)	4.9	4.9	4.9	4.9	4.9
Covered area (ha)	1.57	1.57	1.56	1.57	1.56

### Flight mission trajectories for one day



### Power demand variation during the flight missions



The custom-built drone showed robust operation during the measurements.

The energy consumption of the drone with 12 kg of total weight was between 135-150 Wh/ha depending on the field conditions. The drone weight and battery performance are the key elements for increasing the operational performance of agricultural drones.

### Comparison of an aged and new battery operation

