Spraying and spreading with drones

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Spraying and spreading with drones

First observations:

Challenging regulations and even prohibited	➔ Developing and allowing
Low capacity	➔ Rapid refilling
Expensive	➔ Cheap? in constrast to machinery
Hard to operate and maintain	➔ Quite easy, but different

- Fast and precise?
- Not stamping the crops and the ground, changing practices?

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DJI Agras T40

DJI Agras T16

Draganfly

Hongfei HF T92

Hylio AG-272

XAG P100

Brand	Model	Tank volume (litres)	Spray Flow /min (litres)	Tank drain time (min)
DJI	Agras T40	40	12.0	3.3
DJI	**Agras T16**	**16**	**4.8**	**3.3**
Draganfly	Precision spray drone	10	3.0	3.3
Hongfeidrone	HF T92	92	24.0	3.8
HSE-UAV	TTA M4E	5	2.2	2.3
Hylio	AG-272	68	18.9	3.6
XAG	P100	40	6.0	6.7

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Spraying and spreading

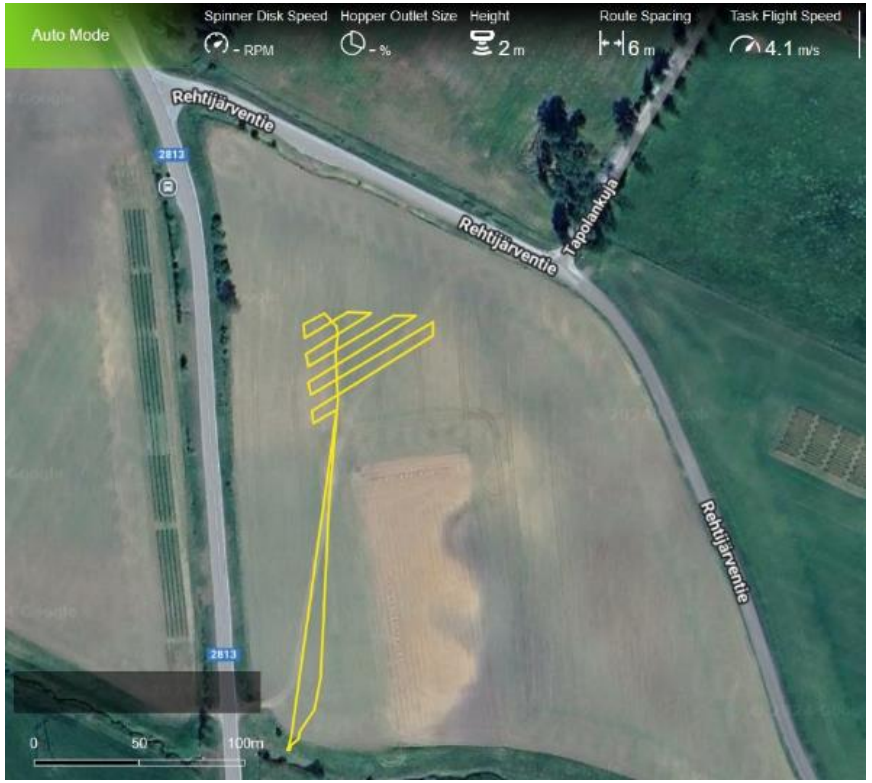
- Slightly different components
- how long it takes to spray/spread the whole tank
- How long it takes to refill the tank.
  - tap water 15l/min
  - nursing tank with submersible pump 100/150l/min)

Tests

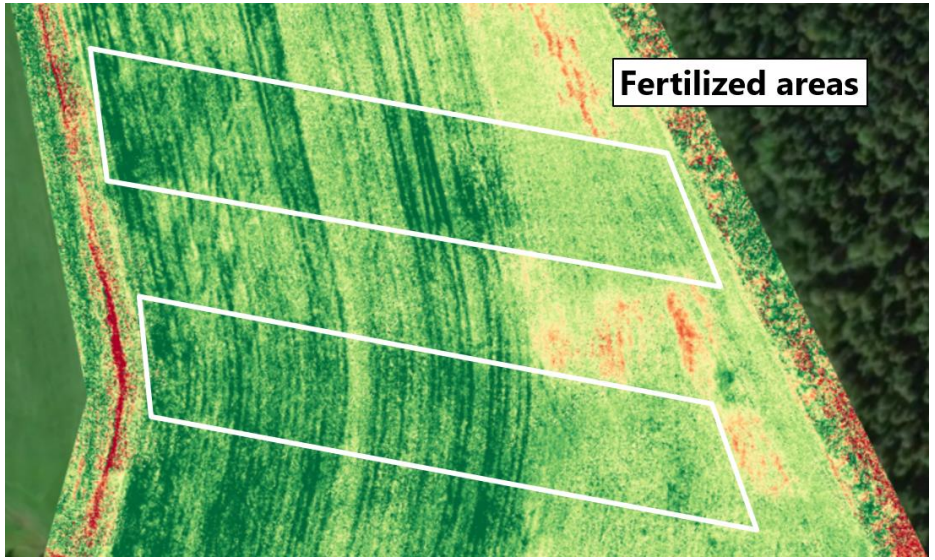
Field trials, 2024. In Jokioinen and Maaninka

- Operational flying time is about 15 min
- Single battery can be charged in 20min (20A)
- We spread 100kg YaraBela granules to 1 ha in 30 min.
  - 5 refills
  - One battery replacement
  - 1000rpm and 40% outlet size
  - 2min spreading per flight: 10min of active spreading, 20min to transitions and refilling.

- Single flight route



Fertilization effect later in NDVI



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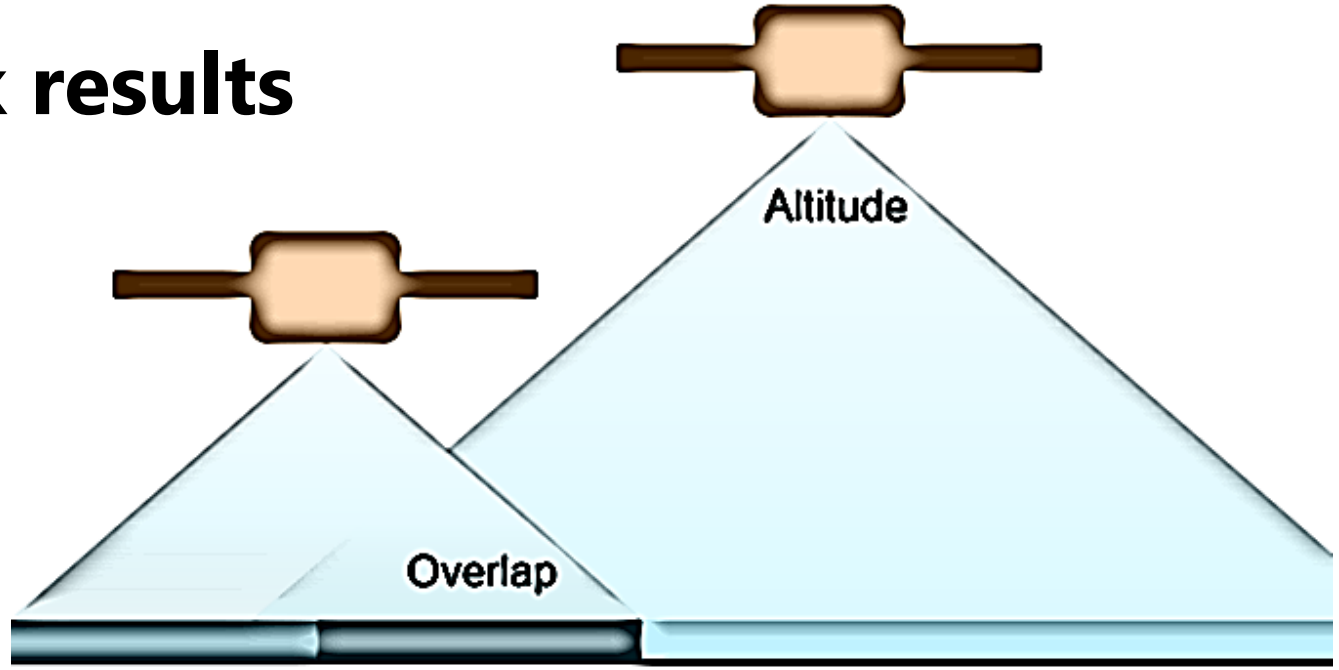
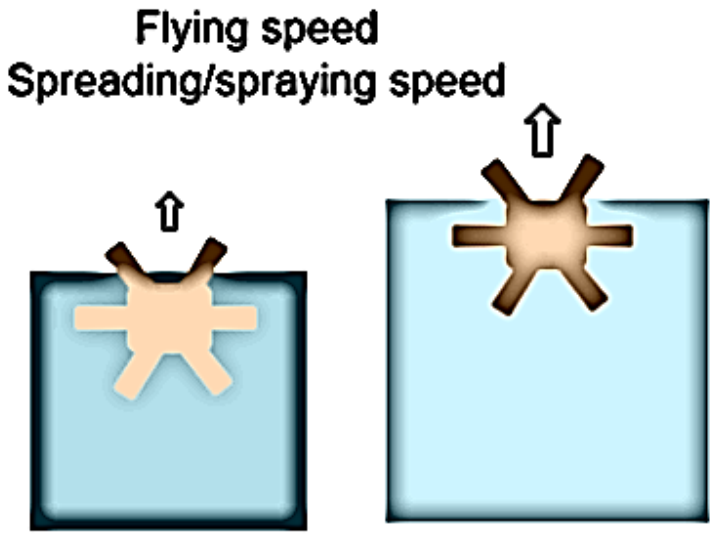
Variation in the work results

Altitude
Flying speed
RPM, outlet size
Wind





Theoretical calculations:

1. How many refills per hour are needed (1 pitstop 2 min)
2. How many liters per hour can be spread
3. How long it takse to spread 5ha (150l/ha)
4. In case of 3, how many refills are needed?
5. How much can we cover in one hour (100l/ha)
6. How much can wa spray in one day (6h, 200l/ha)

				1	2	3	4	5	6
Name	Tank volume (litres)	Spray Flow /min	Tank drain time	Refills / h	Liters / h	5 ha, 150l/ha (h)	Refills (5ha)	2h max, 100l/ha (ha)	200l/ha, daily max 6h (ha)
DJI Agras T40	40	12.0	3.3	7.2	288	2.6	19	5.8	8.6
DJI Agras T16	16	4.8	3.3	7.2	115	6.5	47	2.3	3.5
Draganfly	10	3.0	3.3	7.2	72	10.4	75	1.4	2.2
HF T92	92	24.0	3.8	6.8	625	1.2	8	12.5	18.7
HSE-UAV TTA M4E	5	2.2	2.3	8.3	41	18.2	150	0.8	1.2
Hylio AG-272	68	18.9	3.6	7.0	475	1.6	11	9.5	14.2
XAG P100	40	6.0	6.7	5.1	206	3.6	19	4.1	6.2
Average	39	10.1	3.8	7.0	260	6.3	19	5.2	7.8

Spraying and spreading in field trials?

- Possible accurate operation
- Temporal spreading might be a challenge, spraying can be more fluent: Spreading constant lines, spraying might be possible with separate plots.

- Need more studies to be able to verify work patterns and results.

Spraying and spreading with drones

Remaining challenges

Evolving regulations
Permissions, licenses, insurances, all developing
Required infra for the continuous working, nursing tanks etc.
Too specific tool to be used couple of times per year
Disruptions are yet to come, not solely to replace tractor spraying etc.

DEMO LATER TODAY IF THE WIND IS NOT TOO BAD.

Luke