

# Spraying drones in agriculture from research perspective

CAPIGI webinar, 22.2.2022

Jere Kaivosoja, LUKE



# Jere Kaivosoja, Senior Scientist

Production Systems Unit

Farming technologies Team, Tampere

PhD: Aalto university, Geoinformatics

(remote sensing, GNSS, photogrammetry)

2003 -> precision farming research

2010 -> drones in agriculture

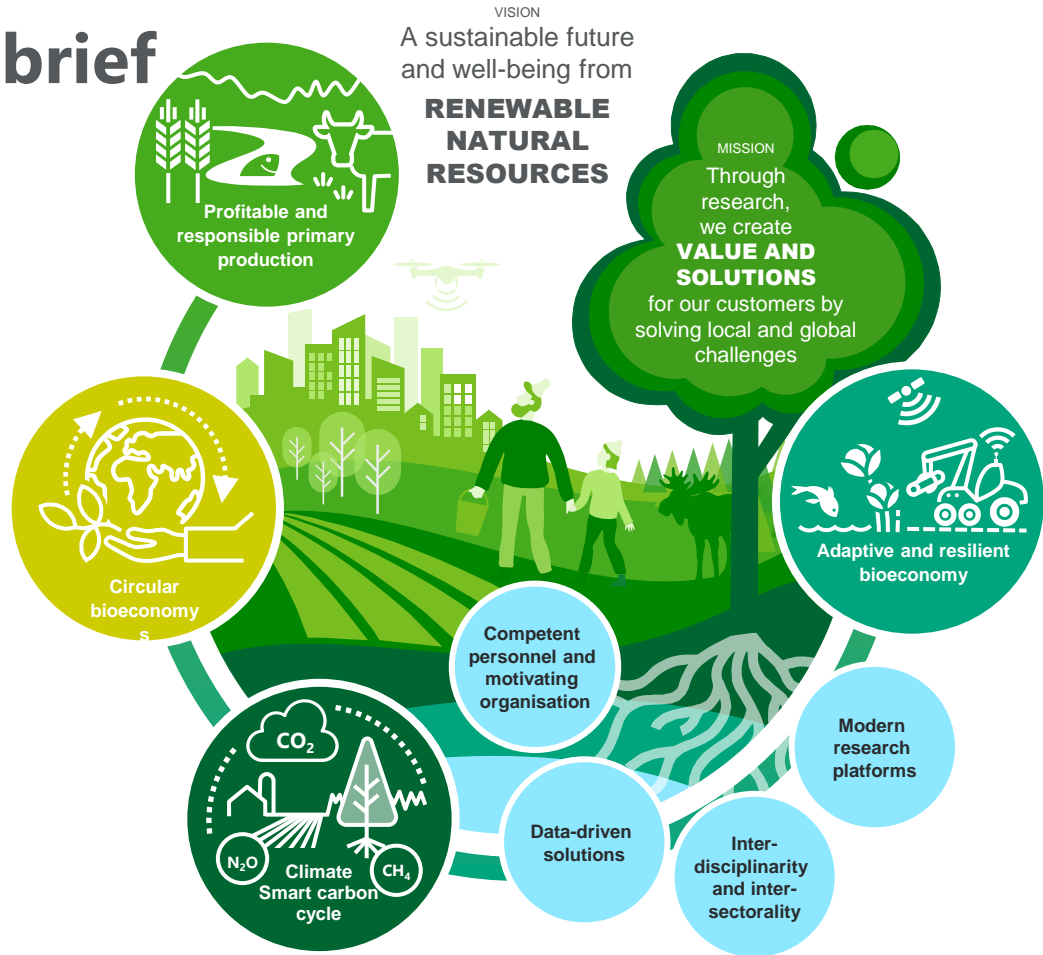
2014 -> drone operations

Current topics:

- Remote sensing
- ICT and robotics
- Data management



# Luke in brief



**129** M€

Turnover

**75** M€

Budget funding

**54** M€

External funding\*

**22**

Locations in Finland

HQ in Helsinki

Present in 12 campuses with  
universities, research institutes and  
polytechnics

**1274**

Employees

14 Management

44 Research professors

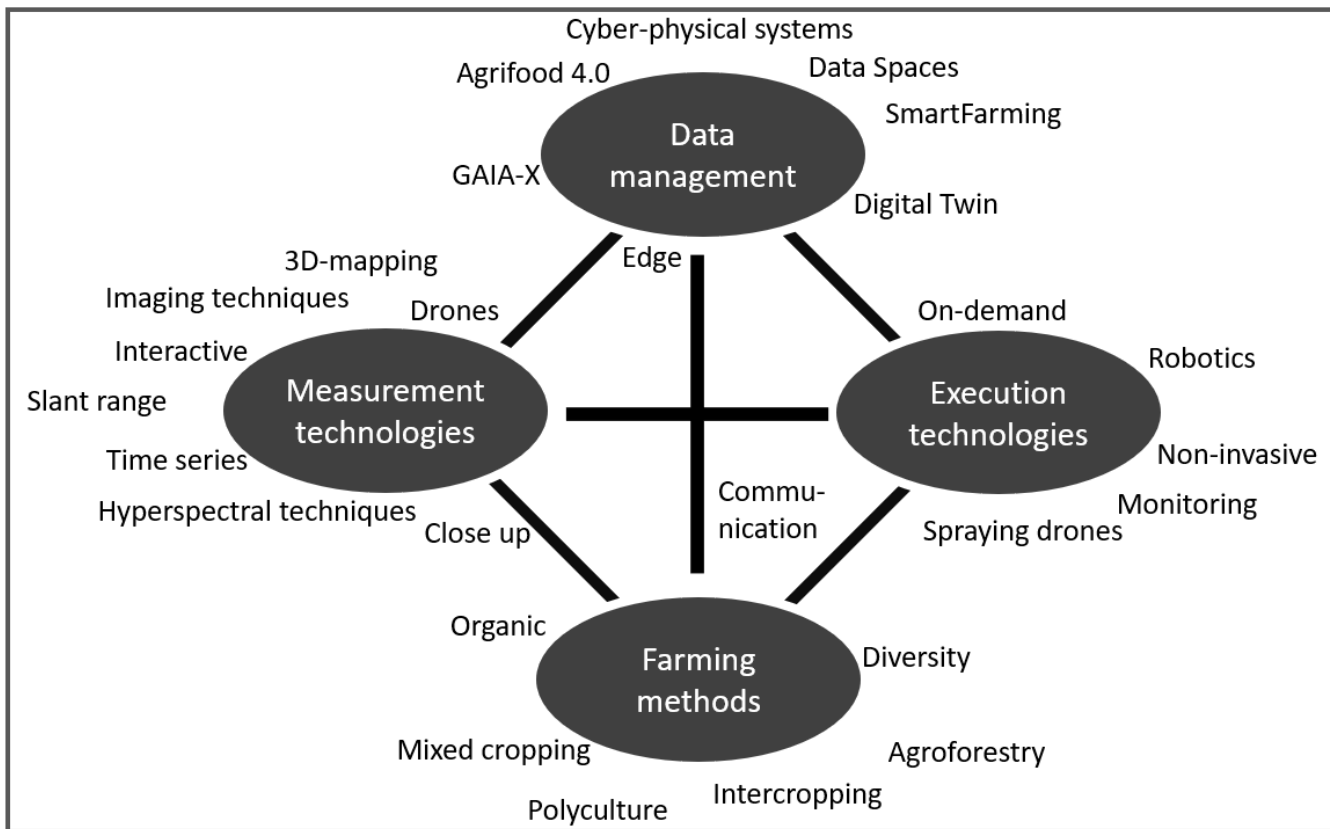
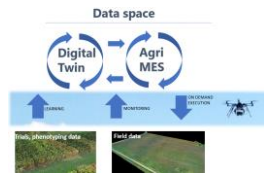
603 Researchers

613 Other specialists

*\* Includes profits from co-funded, collaboration and  
customer-funded projects and other income. Information  
from the year 2020.*







### Drones with cameras

- Measure relative differences
- Absolute values (volume, height)
- Overview / overall picture
- Basis for the precision farming tasks
- Individual counts
- Anomalies / occurrence

### Drones for work

- Spraying pesticides
- Spraying fertilizers
- Spreading fertilizers / seeds
- Pollination
- Biological control
- Planting

# Spraying drones: basics in agriculture

- Not stamping the vegetation
  - can work on demand
- Soil properties / wetness does not matter
- Good for separate locations
  - Hotspots, golf greens etc.
- Exposure to pesticides, people contacts
  
- Is less than 100 litres enough?
- Aviation challenges, 1-3 meter elevation
- Rapid development of technology
- Costs around 15 000 – 30 000€





# When will spray drones lift off?

Based on national study with local authorities 2021

*Unmanned aerial spraying systems*

- Spray drones will **not** lift off (in large scale) before ISO 23117 is ready (3-5 years)
- EU Commission identifies drone spraying separate from aerial (aircraft) spraying (SUD renewal 3-5 years)
- Risk estimation tools of plant protection products for drone spraying are developed (approval of PPP 5-8 years)
- Other minor obstacles
- Limited category for the operations
- Testing of spray drones in use (5-10 years)
- Large scale testing in use (5-10 years)
- **In limited regions and use-cases you can spray from drones in Europe already**

# When will spray drones lift off?

## Practical point of view

- Aviation regulations & Machinery directives & Pesticide regulations
- Carrying and dropping dangerous goods
- Suitable applications (alternative or rethink)
- Regulations, constant changes
- Spraying authority (pilot has to have one?)
- Transportation, cleaning, storage, management, logistics for liquids

# Rapeseed pest management



FLEXIGROBOTS



Drone survey mission



DJI Mavic 2 zoom, 1.5m



Pests



Pest clusters per image, AI

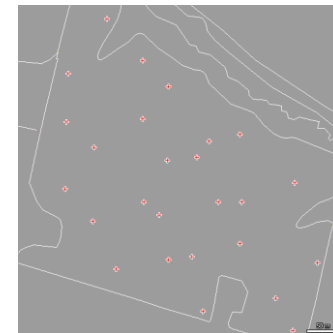
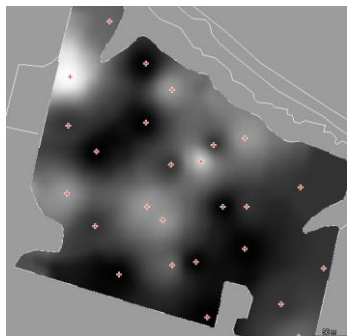
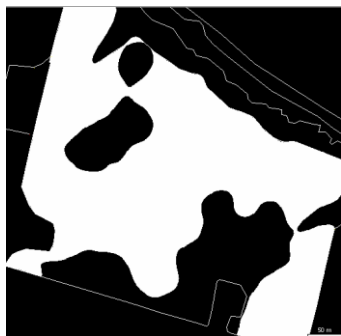


Image coordinates, tot 26



Spatial interpolation of pest clusters



Threshold mapping 0.8, 69% coverage



Spraying drone mission, KML



Spraying

<https://www.oecd.org/chemicalsafety/pesticides-biocides/literature-review-on-unmanned-aerial-spray-systems-in-agriculture.pdf>

# Thank you!

