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Work Package 6 - Groundkeepers



FARMING SMARTER

Groundkeepers - Potato volunteers

Why are there so many groundkeepers?

- Less frost in the winters
- Different varieties grown
- More wheat crops after potatoes
- Less pre-harvest Glyphosate
- Bigger threat if Glyphosate is banned



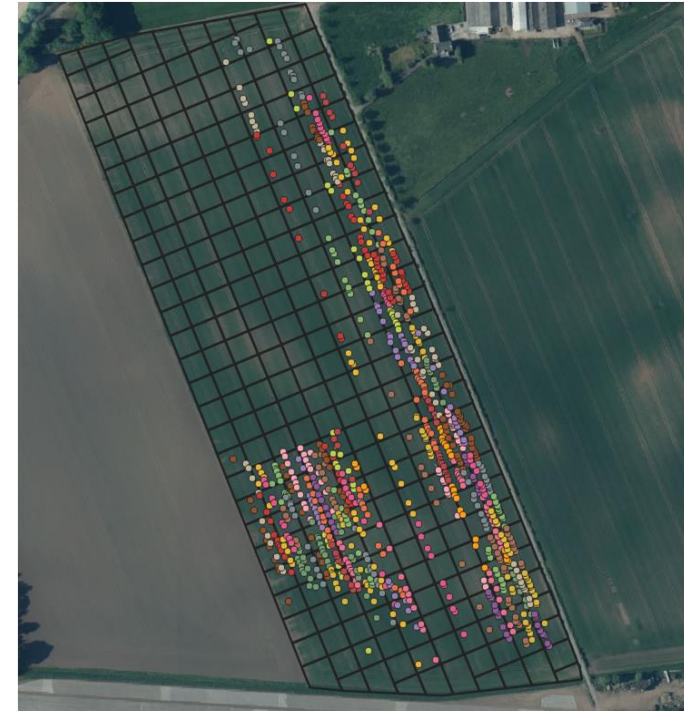
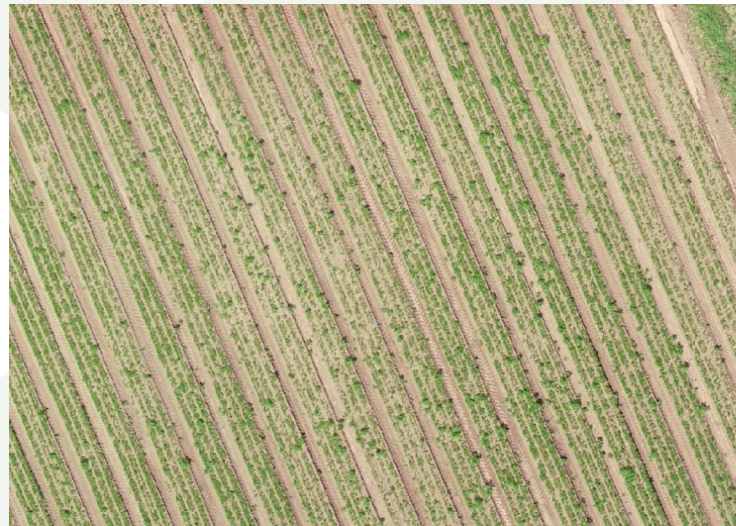
Negative impact of groundkeepers

PCN and groundkeepers can stay in the same location for a long time. We rely on a clean break to allow PCN numbers to decline naturally. If no clean break then PCN numbers increase rapidly year on year. It has been shown that potato resistance to PCN can be broken by continual challenges.

Groundkeepers Problem

Project approach to determine how bad the problem is

1. We flew the drone over the field to detect and record groundkeepers
2. We collected PCN soil samples – around 200 samples
 - 1 core was taken at the groundkeeper and another was taken 1m away - this was done for 10 plants to make up 1 sample.
3. Samples analysed by SASA
4. Results back - basically groundkeepers increased PCN on average in 1 year



Groundkeeper Detection - Drones



- High resolution drone, 7mm resolution. DJI M300
- 35 fields flown in 2021
 - Many carrot fields have a major groundkeeper infestation
 - Most carrot fields in a rotation with potatoes
- 15 fields flown in 2022
 - Different crops - Peas, Grass, Winter Wheat, Hemp
 - Re-flown some fields from 2021
- Images are georeferenced to within 10cm (RTK). Each groundkeeper is accurately georeferenced, and we can navigate back to that location in the future

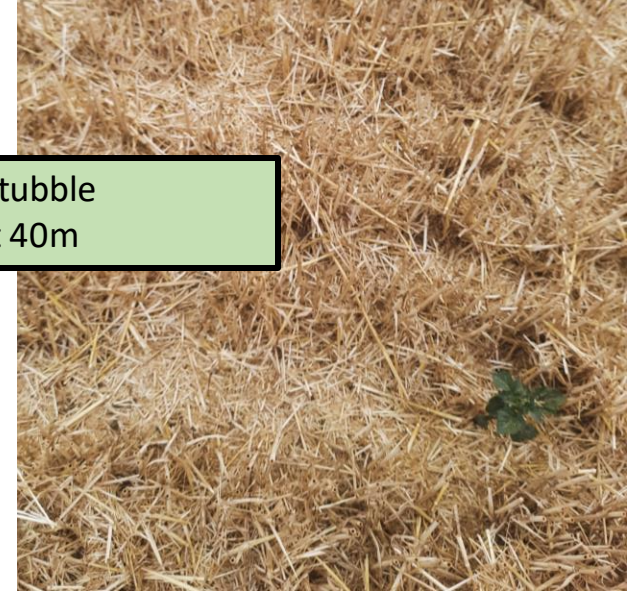


Groundkeeper Detection - Drones

Carrots
Flown at 60m



Wheat stubble
Flown at 40m



Newly sown grass
Flown at 60m



Winter Wheat

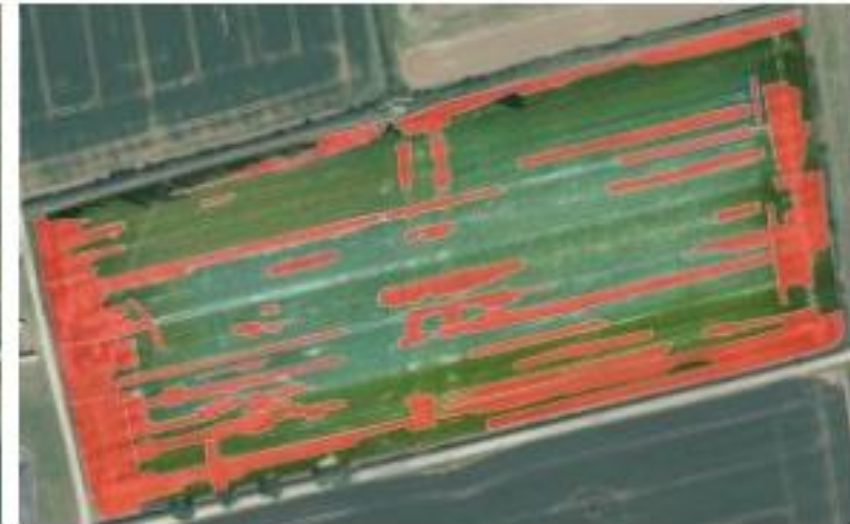
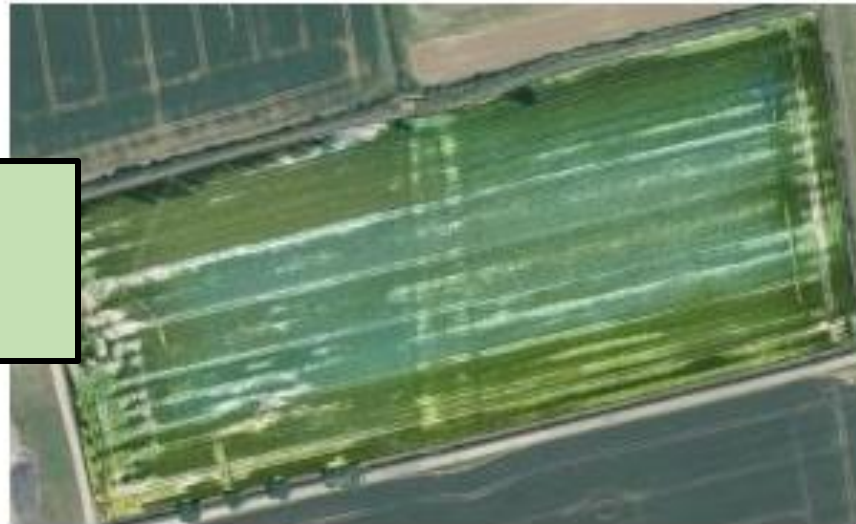


Groundkeeper Control

- Glyphosate currently the main option but under great pressure from regulatory authorities
 - Therefore need to minimise volume of glyphosate applied to crops but maximise the benefits
- Can zone spray areas of crops by targeting with drones and normal sprayers

Field with Black grass in England

Drone was flown, taking many images. Areas with Blackgrass are marked and a spray map is created.



Groundkeeper Control - SKAi



- Retractable Camera System
- Target and spray Groundkeepers in real time
- Vehicle mounted cameras use artificial intelligence to identify and spray a defined size covering a detected target
- Potential saving of 70% to 90% on glyphosate



Groundkeeper Control - SKAi



Groundkeeper Control - SKAi



- A camera mounted on a tractor to identify and spot spray groundkeepers
- Real time potato detection model for vehicle mounted camera trained on 3000 images and applied to 38000 image dataset
- Model accuracy is around 90% on images from fields that the training algorithm hasn't seen before
- Current model runs around 22 frames per second
- Currently working on potatoes in onion crops in Netherlands.



Groundkeeper Control - SKAi

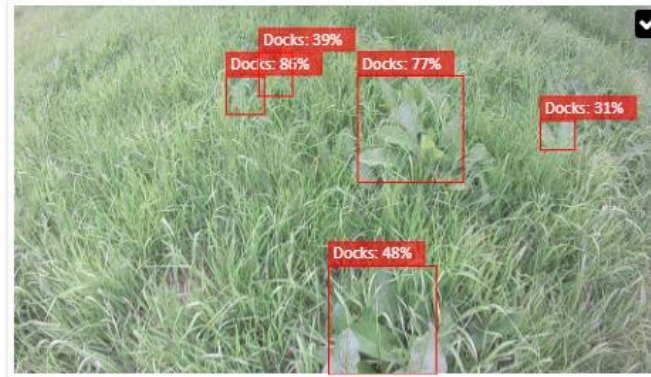


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Detections: 0

camera_0_frame_2559.jpg

1.45 MB



Model: SE GV -SSDMobNetV2 - Stitched - CMap Data v7.1

Detections: Showing 5 of 5

camera_0_frame_2663.jpg

1.38 MB

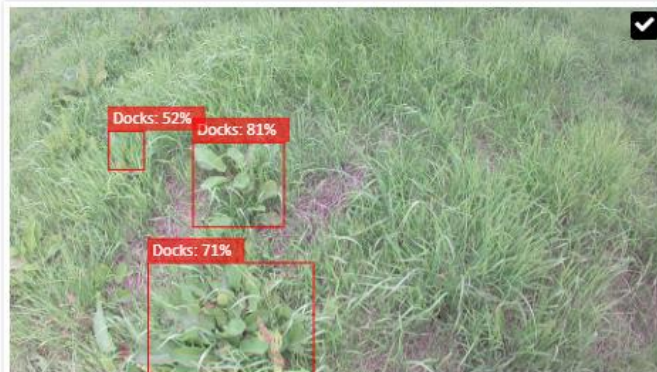


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Detections: Showing 1 of 1

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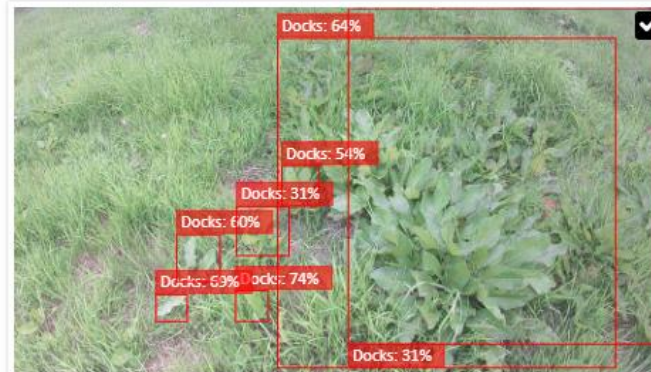


Model: SE GV -SSDMobNetV2 - Stitched - CMap Data v7.1

Detections: Showing 3 of 3

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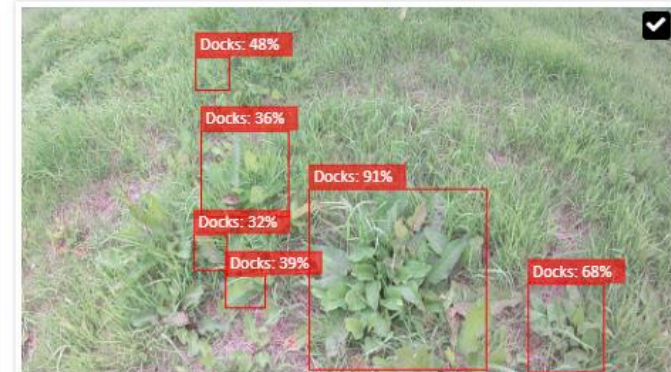


Model: SE GV -SSDMobNetV2 - Stitched - CMap Data v7.1

Detections: Showing 7 of 7

camera_0_frame_3396.jpg

1.41 MB



Model: SE GV -SSDMobNetV2 - Stitched - CMap Data v7.1

Detections: Showing 6 of 6

camera_0_frame_6424.jpg

1.4 MB

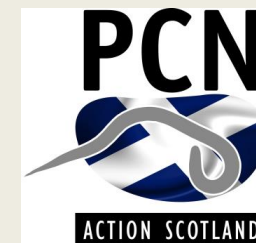


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Thank you!

Q&A



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