

Pesticide-spraying drones in farming crops, and its contribution in sustainability

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Image source: Adobe Stock

Existing pesticide spraying methods

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Ground sprayers (human, spray vehicles):

High precision, easy manoeuvring

Cannot operate if soil is **inaccessible** (e.g. wet soil, dense crops, complex terrains) [3,5]

Exposure **risk** to worker's **health** [1,5]

Image source: Stefan Krause



Aerial sprayers on planes and helicopters

Large coverage, time efficient [4]

Costly operation [5]

Requires **large, flat area** for landing/takeoff [5]

Spraying Drones



Image source: Adobe Stock

- **Handle** complicated topologies [2,4,5]
- More **accurate** on smaller fields [2,3]
- **Remotely** controlled → **Reduce health risk** to workers [1,2,3]
- **Low-cost** operation [5]
- Can also **inspect** crops **visually** (e.g. tar spot detection) [5,6]

Sustainability development of spraying drones



Increase the quantity of healthy farm products



Reduce health risk due to chemical exposure and hunger



Potential of innovation in agriculture industry



Farm production pattern: maintain robustness to pests & diseases

Limitations

Operation efficiency:

- Slow operation [5]
 - Short battery life: less than 30 minutes [1,2]
- Not good for large crops

Ease of use:

- Requires control fluency [4]
 - Each plant/chemical product requires **different** spraying procedures [5]
 - Flying restrictions in some areas [5]
- Requires detailed knowledge before usage

Possible directions



Improve flexibility: adjustable to different conditions and requirements



Improve efficiency: tracking, reduce battery consumption, speed/spray rate optimization, etc.



User experience: make the drone easier to operate



Smart system: Combine extra functions that drone outputs (i.e. images) can bring

Conclusion

- Spray drones has the **potential to utilize** in crops with small area or complex terrains, and is able to **supplement** traditional methods.
- Spray drones contribute to UN SDGs 2, 3, 9 and 12 through improving the agriculture production.
- Its current limitations hint **possible development aims**:
 - Capacity: **process optimization**
 - Expertise requirement: **improve user-friendliness**



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