

Drones: Application of pesticides by drone

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(Views expressed here are those of the presenter and do not necessarily represent those of the OECD.)



House of Switzerland

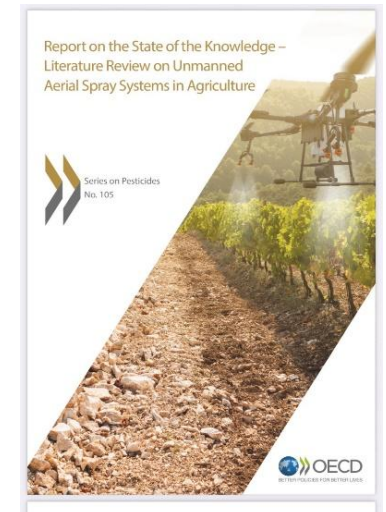
Drones: status in EU law

- Currently considered to fall within the scope of the definition of aerial spraying in Directive 2009/128/EC (EU legal advice to Spain (copied to Member States in 2017)).
- Recognition though that risks arising from spray drift created by current drone technology and situations of use are unlikely to be at levels that necessitated the ban/prohibition and derogation procedures.
- Proposed new definition of 'aerial spraying' and 'unmanned aircraft system'.
- New article 9a
 1. By way of further derogation from Article 9(1), Member States may, in the case of professional users, exempt from the prohibition laid down in that Article, the aerial spraying of pesticides by unmanned aircraft systems identified pursuant to paragraph 2.
 2. Pesticides to be used for aerial spraying by such unmanned aircraft systems shall be explicitly authorised for that use by the Member State under Regulation (EC) No 1107/2009 following a specific assessment addressing risks from aerial spraying.

The Commission shall adopt a delegated act by [OP: please insert the date = 4 years after the entry into force of this Directive] in accordance with Article 20a supplementing this Directive to identify the types of unmanned aircraft systems that have lower or equal risks compared to the risks arising from land-based application equipment for the same use.'

Phase 1 of the OECD work

- OECD Working Party for Pesticides establishes sub-group of regulators, industry and researchers from the Americas, Europe, Asia and Australasia.
- Initial work to establish the State of Knowledge.
 - factors that determine how risks differ (drone design, working practices, products) from established application technologies.
 - limited amount of evidence to support risk assessment (big focus on human health and environmental exposures/risks resulting from spray drift and handling and filling operations).
- [Report](#) published in October 2021 – number of recommendations to outline approach to assessment.
- Established Task and Finish Group to organise subsequent programme of work.



Phase 2 of the OECD work; projects

Work package 1	Work package 2	Work package 3	Work package 4	Work package 5
Database of spray drift and deposition data and empirical model. Mechanistic model.	Classification of UASS. Operational practices data gathering.	Best practice guidance	Report on development of standard methodologies.	Development of ISO standards.
Database and empirical model currently held by UAPASTE (includes data identified in Phase1 and newer third-party data) UAPASF trials data being evaluated. Guidance on conducting trials. Mechanistic model (AgDisp update)	Features that will enable classification of drone types identified and being agreed. Survey of work on operational practices.	Best Management Practices developed in conjunction with, and presented to, a range of stakeholders. Regional versions being developed.	Addendum to update on progress published shortly Summary report to document state of knowledge. Will document strengths and weaknesses of information and tools.	ISO 23117 (originally 4 parts – now 2). Part 1 Environmental requirements. Adopted. Good start/identify issues to address Part 2 Test methods assessing horizontal transverse spray deposition.

Spray Drift

- SUD prohibition on aerial spraying (with derogation) due to concerns over drift to bystanders and watercourses (Recital 14 and Para 4.1.3 of Impact Assessment).
- Drones not a technology employed when SUD was negotiated and implemented.
- Emerging evidence – drone drift typically equates to broadcast air-assisted, but depends on many factors.
- Range of studies being conducted - suite of evidence is increasing.
- UAPASTF Database. Empirical model drift data/curve – being evaluated. Emerging view at end of year. Publish in Summary Report in 2027.
- Mechanistic model – longer term project.

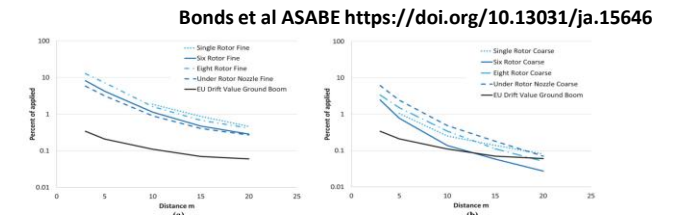


Figure 2. Drift assessment with four different UASS applied at 2 m/s travel speed and 1.5 m altitude compared to the EU basic drift curve for ground boom sprayers applied with two different drop size: (a) fine drop size, and (b) coarse drop size.

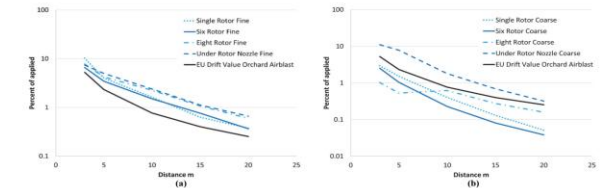
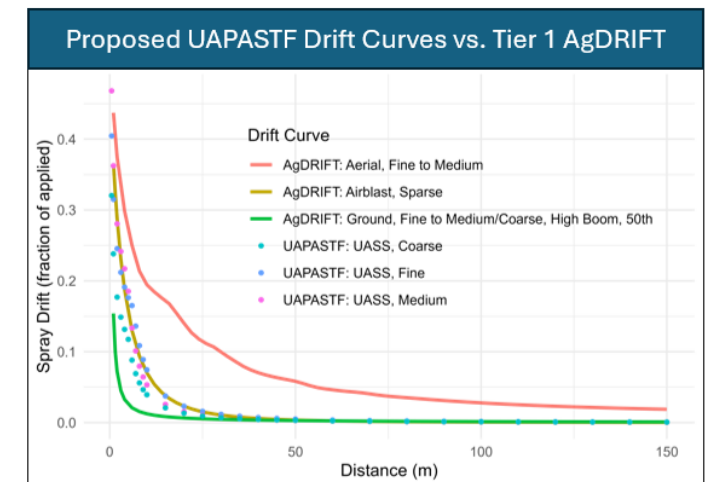


Figure 3. Drift assessment with four different UASS applied at 2 m/s travel speed and 3.5 m altitude compared to the EU basic drift curve for orchard airblast sprayers applied with two different drop size: (a) fine drop size, and (b) coarse drop size.



Operator Exposure

- Lack of evidence on what the working day for a drone operator looks like and implications for bystander exposure.
 - How distinct are practices/risks from conventional applications;
 - Management of bystander exposures;
 - Implications of 'operational-scale activities' number and duration of activities (smaller capacity of spray mix tanks may lead to more daily handling and filling operations). Exposure to concentrate, spray mix, residues; and
 - Implications of product type and application (use of low and ultra-low volume mixes).
- Survey (UK Government (Europe, Asia, Africa, New Zealand) and UAPASTF (US, (Latin America and Australia to follow))).
 - Characterise operational workflows;
 - Identify exposure-relevant job-steps; document mitigation practices used in routine operations; and
 - Highlight where additional information may be required to support regulatory risk assessment.
- Plan to bring together UK and UAPASTF information where we can. Publish findings in scientific journal for peer-review.
- OECD Drone Subgroup to develop a view on findings towards the end of this year and presented in Summary Report due for publication in 2027.

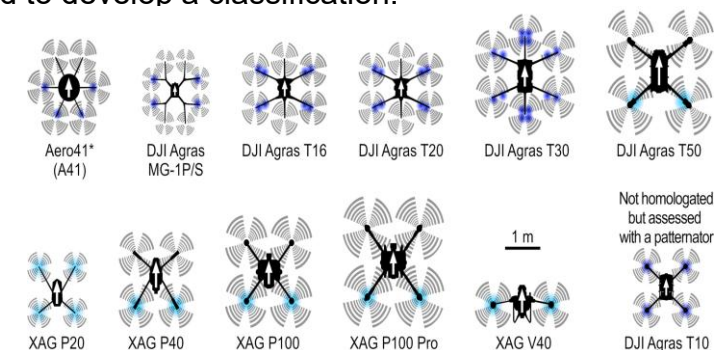


Operator Exposure Survey: Data collected

- Geographical distribution (41 full responses from Europe).
- Respondent roles (66% contractors/farmers).
- Crops treated (cereals/field crops, orchards, vineyards, specialty crops, oilseeds, forestry).
- PPP-types (fungicides, then insecticides, herbicides and PGRs).
- Drone models (DJI, XAG).
- Formulation type (Liquids, water soluble solids, solid granule).
- Area treated (0-100+ ha/day, varies by situation).
- Liquid and solid formulation volume application rates.
- Operational configuration (targeted application, height and speed above target, drone configuration, nozzle types and tank capacities, use of 'swarms').
- Work structure and team organisation (pilots, operator, spotter, also battery charging/replacement, calibration and storage, payload operation, etc) and direct interaction with PPP.
- Task organisation and sequencing. Number and time spent on activities (transport to site, calibration, preparation of 'spray' (including use of low and ultra-low volume mixes), filling/refilling, application, battery tasks, spotting, etc)
- Handling and cleaning (pre-planned/on-site, parts of drone cleaned and when/where, use water/detergents/dry materials/PPE).
- Transport and containment (open and closed transport platforms)
- Operator distance during application.
- Bystander protection (exclusion and buffer zones, warning communications, drift reduction technologies, spotters, stop procedures).
- Summary of: published literature on exposure pathways.
- Recommendations on possible future activity.

Classification of drone types

- Possible Regulatory options.
 - Risk no worse than aerial application, authorise on that basis, with resulting mitigations. Likely to overestimate risk, prevent optimal use of technology.
 - Next step – develop ‘generic’ drone assessment based on realistic ‘worst-case’ scenario (better than aerial-application assessment, but likely to prevent optimal use).
 - Possible step – develop assessment based on drone type.
 - Above thinking relevant because of rapid pace of development with drone model physical design. Can we optimise use/minimise regulatory burdens on applicants by grouping certain drone configurations together (on basis that they have a sufficiently broadly equivalent risk profile).
- More challenging than originally anticipated – lack of regulatory quality data on which to make assessment. Producing a view based on expert judgement.
- Developed ‘base-line’ classification – identify features that will shape risk. But further work required to develop a classification.
 - Physical features (size and weight; tank size; width of boom; number of rotors and rotor diameter; type and spacing of nozzles; vertical distance between the rotors and nozzles).
 - Spray quality (flow rate range (maximum and minimum); flow per individual nozzle; atomised droplet range; manufacturer recommended swath width).
 - Flying practice (height and speed above are being treated). Recent [German research](#) here also relevant.
- Swiss system of homologation in operation – similar principles.



Other issues (1 of 2)

- ISO Standard 23117 (parts 1 and 2)
 - Part 1, drone design. Successfully identifies key design improvements to improve sustainability of use.
 - Part 2, conduct of drift trials. OECD Drone Subgroup is forming a view.
- Guidance from UAPASTF on:
 - [Best Management Practices for Safe and Effective Application of Pesticides Using Unmanned Aerial Spraying Systems](#) (OECD Drone Subgroup members consulted during preparation).
 - [Recommendations for Conducting UAV Field Drift Trials](#) (OECD Drone Subgroup members consulted during preparation/being reviewed against more-recently published ISO Standard).
- Nozzles. Current suite of drift data based on hydraulic nozzles. Spray drones now tend to be supplied with rotary atomisers. Also flow rates set by controller – do the nozzles perform as directed? Be aware - but not critical issue in determining risk.
- Downdraft and crop interception. Downdraft increases low altitude and speed. Turns to outwash if forward speed exceeds downdraft. Not known if force of downdraft affects interception in positive or negative fashion (not major consideration in OECD work (not considered by all regulatory jurisdictions)).



Heli guy



HSE

Other issues (2 of 2)

- Swarms. Use of multiple drones to treat a target area will result in different patterns of drift/deposition. Can this be modelled?
- Efficacy. Position in 2021 - Lacking regulatory dataset; higher concentration spray mixes may impact crop safety; limited data suggests lower efficacy than ground-based application methods (systemics better). Not major consideration in OECD work (not all regulatory jurisdictions require). Interesting (unevaluated) information from Canada: [here](#); [here](#); [here](#); [here](#); [here](#); and [here](#).
- Residues. Some soon-to-be-published research from Canada. Previous assumption, residues sufficiently similar to that applied by crewed aerial application.
- OECD Addendum to the 2021 State of Knowledge Report being prepared for publication – published later this year.
- Other OECD-related projects complete end of 2026/early 2027. Will then prepare Summary Report detailing findings for adoption/publication in 2027. Conclude work of Drone Subgroup.
- Interest in keeping expertise on OECD grouping together in new form – to explore.



Cleantechnica

Some SUD-related issues/UK approach

- User training and qualifications (Article 5 and 9).
 - SUD requirement to make training available (in UK application equipment specific training/qualifications).
 - Qualification details to be provided as part of application plan required to enact derogation on aerial spraying prohibition.
 - UK awarding bodies developing qualification/Government in the process of officially designating.
- Inspection of application equipment (Article 8).
 - Five, then three, yearly inspection for aerial application equipment. Industry standards may require annual testing.
 - UK inspection organisation (National Sprayer Testing Scheme) developing test (SPISE also?)
- Permitting process (Article 9 derogation):
 - capability and capacity. In UK each spray job is notified/maps supplied (works where aerial application is on a few hundred non-agricultural sites, not appropriate for potential drone use in agricultural/horticultural cropping). Reinterpret/redesign?
 - No spraying in 'close proximity to residential areas'. What does this mean given lower drift from drones? Also:
 - risk assessment/authorisation/label conditions will manage potential exposures to acceptable levels;
 - national pesticide legal requirements on confining spray to 'target areas' (accompanied by Codes of Practice/training describing practices) and warning the public and preventing access to treated areas; and
 - national aviation legislation consents controlling flying in public spaces.

The mandate: What does 'lower or equal risk for the same use' look like?

- Multitude of risks considered (both with the context of pesticide regulation and more widely).
- Same use:
 - crop/situation; field of use; product rate and number of applications; timing and growth stage.
 - Application type: broadcast; row; patch; spot, etc
 - Drone type and operating parameters (height and speed above crop).
 - Product/application efficacy.
- Broadcast air-assisted comparison. Is land-based, but used in relatively limited range of circumstances (for example, not used to apply herbicides – would see greater exposures than typically expected for sensitive non-target plant species and neighbouring crops).

Discussion

- Are drones used to apply pesticides in Moldova? On what crops/situations are they used /where is there a demand to use drone technology?
- What approach does Moldova take/ is thinking about taking to assessing the risks of pesticides applied by drone?
- Are there any significant gaps in your knowledge or evidence available to Moldova that would prevent you from being able to confidently regulate the application of pesticides by drone?
- Where would Moldova obtain necessary advice/evidence to enable confident regulation of pesticides applied by drone?

Conclusions

- Precision agriculture and new technologies – always a feature of pesticide application. But speed and impact of change, adoption of practices and ability to control now exerting pressure on regulatory regimes to adapt to unlock benefits for society.
- OECD work on drones demonstrates way industry, research and regulatory community are able to work together to look at developing existing regulatory approaches.
- Need for proportionate regulatory response/anticipation of developments and adapt to national circumstances.
- Challenging and exciting times that require all interested parties to pool knowledge, expertise and other resources to optimise benefits of technological development.

Thank you

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