Formulating Crop Protection products for drone application: challenges and opportunitites

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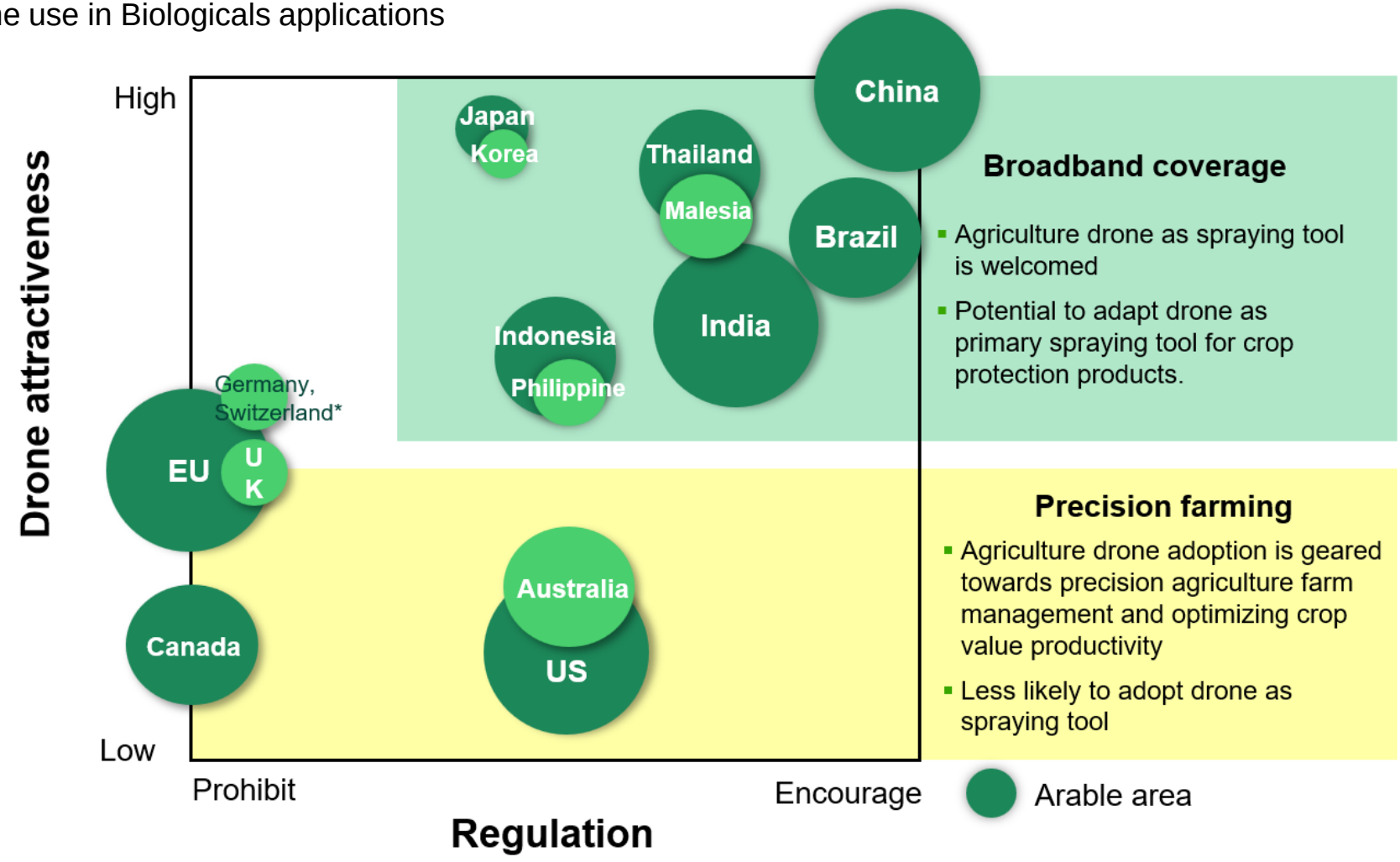
Drone adjuvants market and Regulatory landscape

Opportunities and drivers for drone use in Biologicals applications

- Reduces costs and improves spray efficiency
- Easy adoption using existing farm infrastructure
- Ideal for high-value crops and precision biologicals
- Enables more targeted and efficient spraying
- Supports sustainability by saving water and reducing carbon emissions



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Regulatory landscape in Europe

Drone applications

Aerial spraying ban (Directive 2009/128/EC)

- EU bans aerial spraying of PPPs, including drones
- Drones are classified as aircraft under current rules
- Ban applies despite drones being more precise and eco-friendly
- Limited exceptions: some countries allow drone spraying in special cases (steep vineyards, railway vegetation)
- Requires strict control of flight and drift

Push for legislative reform

- Stakeholders urge EU to revise drone rules
- Proposals include reclassifying drones by risk
- Call for a specific framework for precision agriculture

EASA's Role and Risk-Based Framework

- EASA defines drone use by risk level: Open, Specific, Certified
- Agricultural spraying falls under Specific category
- SORA 2.5 simplifies approval for low-risk operations
- National-Level Variability
- EU aims for harmonization, but national rules vary
- Ex.: Hungary certifies drone pilots with training levels

Future prospects

- EU Drone Strategy 2.0 supports precision agriculture
- Expected updates: targeted exemptions, remote sensing
- Aligns drone use with Green Deal and Farm to Fork goals

Adjuvants in drone applications

Lack of harmonized framework

- Adjuvants are not classified as PPPs
- Regulation requires specific rules (Art. 58)
- No EU-wide regulation yet; countries act independently

National-Level lists and approvals

- UK has an official list with product details
- Defines usage conditions with approved PPPs
- Evaluation includes toxicity, compatibility, and drift risk.

EFSA and EASA Considerations

- EFSA does not fully include adjuvants in data guidelines
- EASA regulates drone operations, not chemical formulations
- Spraying systems must meet environmental safety standards

Future prospects

- Pressure to create unified EU rules for adjuvants
- Initiatives like DRONSafe and EUPAF explore precision spraying
- Adjuvants help reduce drift and improve effectiveness

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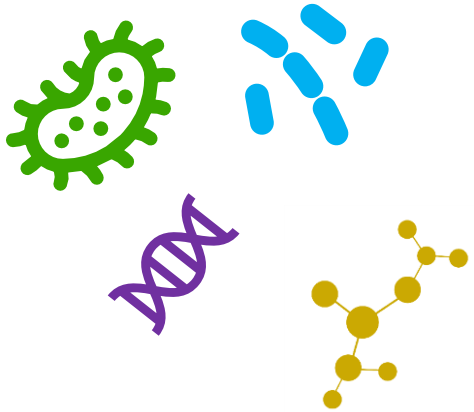
Challenges in drone application

Main issues and points of attention for effective drone use in biological formulations

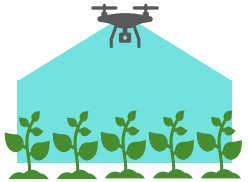
In the drone tank

- Low dilution rates or absence of water
- Lack of agitation
- Mixtures with other AI
- WP formulations
- Mechanical shear
- Contamination
- Photosensitivity
- Application time

Maintain microbial viability and biomolecules integrity, and guarantee biologicals performance

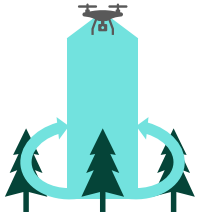


On target



Field operation

- Drift
- Wetting and retention
- Uptake



Orchard operation

- Penetration through canopy
- Fast evaporation
- Not full tank capacity

Adjuvants in tank mixes play a critical role in ensuring biologicals are applied effectively

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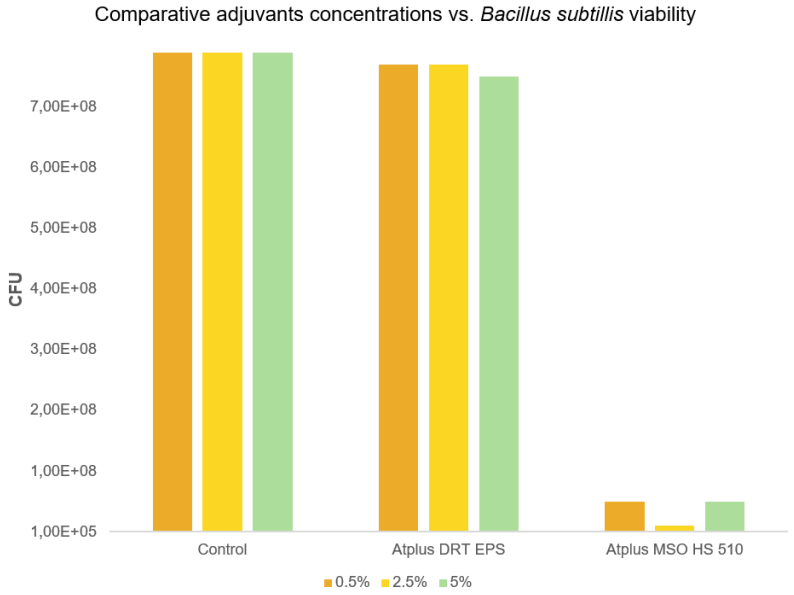
Adjuvants as enablers of effective biological applications

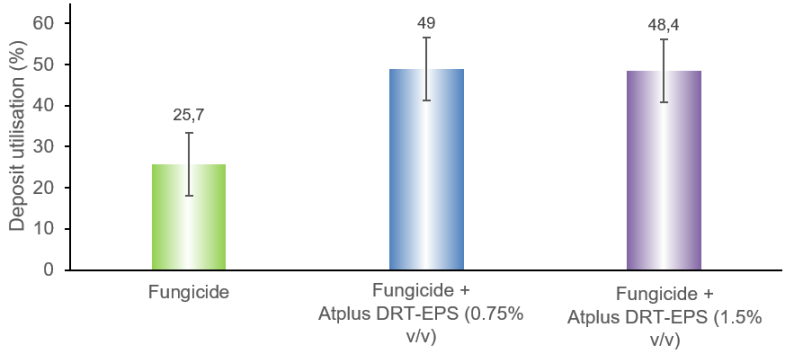
Key benefits of **ATPLUS™ DRT-EPS** in drone spraying: compatibility, adhesion, and operational efficiency

Ensure compatibility with microbes and preserve their viability



- ATPLUS™ DRT-EPS enhance adhesion without compromising microbial viability

Improve adhesion under low-volume spray conditions



Model: DJI T20 (6 rotors) | Capacity: 20 L | 8 nozzles Teejet 11001 | Wind speed: 0-3.6 m/s | Flight height: 2.0 m | Flight speed: 4 m/s | Spray width: 4.5 m | Spray volume: 23 L/ha | Plot size: 2300 m^2

- Field trial data - significant increase ($P<0.05$) in the percentage deposit utilization when incorporating ATPLUS™ DRT-EPS as a tank mix adjuvant in drone applications

ATPLUS™ DRT-EPS

OMRI LISTED For Organic Use

- Foliar adjuvancy including spray retention and droplet wetting
- Improves biological efficacy
- No phytotoxicity
- Less potential to damage neighboring surrounding
- Compatible with multiple active ingredients, nozzle types and spray pressures
- Suitable for drone application
- Supports field and orchard operations
- OMRI certified

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What is next? Converging Technologies in Precision Ag

Trends on Biologicals

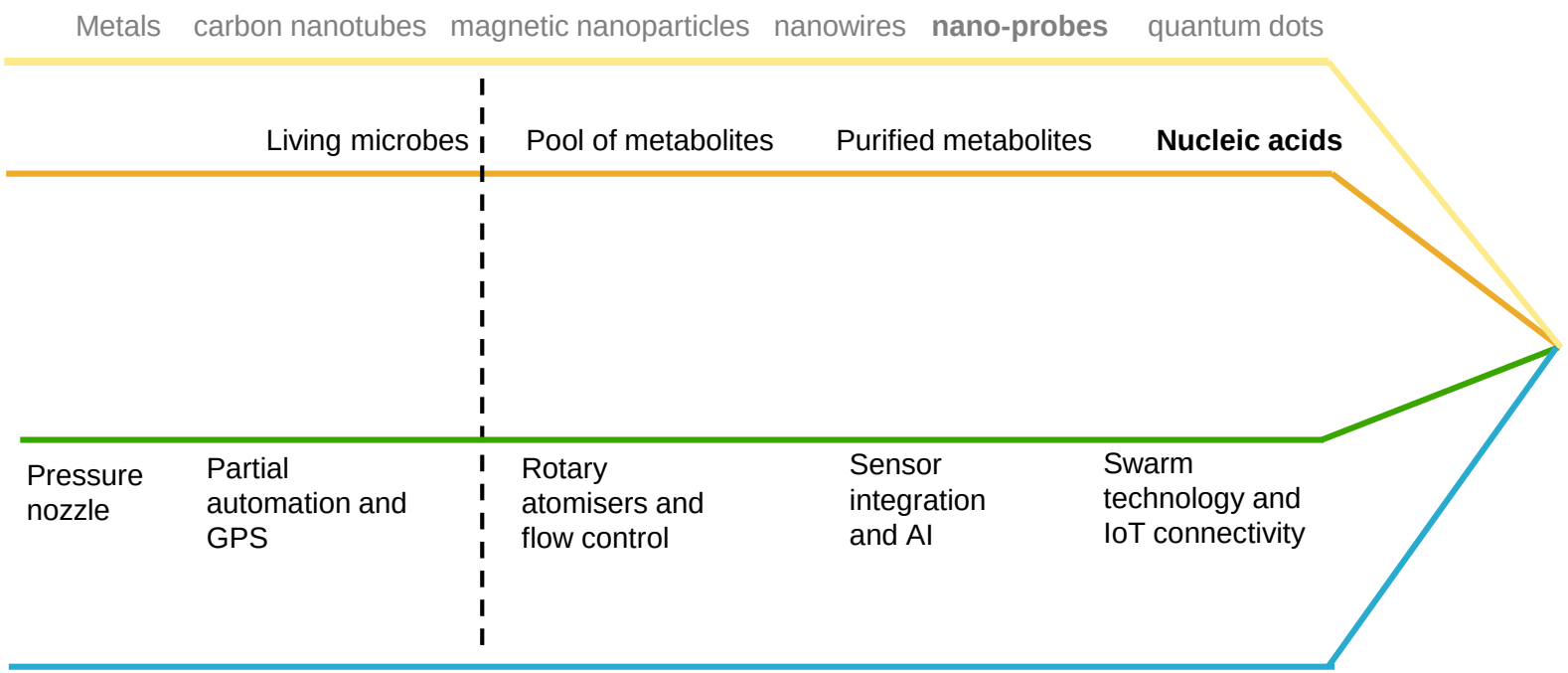
Enablers

- Delivery systems for nucleic acids
- Integration with nanoprobes and quantum dots

Trends on drones

Enablers

- Hardware Evolution
- Sensor integration
- Software and intelligence
- Connectivity



Drone compatible adjuvants

ATPLUS™ DRT-EPS technology

Smart adjuvants

Integration with metabolites and biosensors and responsiveness to environmental signals

Bio-intelligent adjuvants

Part of data-driven system, adjusting spray parameters dynamically

Nucleic acid sequences and nano biosensors

- Real time communication with soil, climate and plant sensors
- High precision, efficiency and sustainability in applications

Key integration drivers

- Sensor feedback loops between drone and crop
- Regulatory harmonization to for biologicals, adjuvants and drone use
- Formulation science convergence: chemistry + biology + engineering + data

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Thank you

Get in touch!

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Takeaways

- Drone-compatible adjuvants are essential to ensure biological efficacy and microbial viability under challenging spray conditions
- Regulatory harmonization and innovation in formulation science are key to unlocking the full potential of drone applications in agriculture
- **ATPLUS™ DRT-EPS** enable precision, sustainability, and performance, supporting the future of biologicals in modern farming

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