

## ▼ Case Study

### Is new agronomy needed for paludi-crops?

#### Overview

Paludiculture is a farming system on wet or rewetted peatlands which maintains high water tables to protect carbon stocks and ecosystem services. Conventional agronomy - designed for dry soils and machinery access - cannot be directly applied to these wet landscapes.

Two complementary Paludiculture Exploration Fund (PEF) projects explored this challenge: Drone RePeat, which tested autonomous aerial systems for crop

establishment and management, and Unlocking Typha, which optimised Typha seedhead production for fibre and other high-value products. Together, they illustrate that new agronomy must be systems-oriented, integrating biology, technology, and operational management.

This case study examines whether new, systems-level agronomy is needed for wet peat farming and, if so, what that new agronomy looks like in practice.

#### The challenge

High water tables restrict machinery access and precision, making sowing and early crop establishment difficult. Key questions include:

- How can seeds be effectively sown on wet peat for optimal crop establishment?
- How can crops be managed to maximise productive seedheads?

*As Dr Marcus Bellett-Travers (Drone RePeat) observes:*

“Typha seed is like dust – the slightest wind, and it is gone.”

This highlighted the need to rethink both delivery systems and crop management practices.



## Key insights:

Seed delivery innovation: Hydrogel suspensions and clay pellets were tailored to water depth and seed biology.

*“The light-bulb moment was using the drone’s ability to spray a thick liquid via its peristaltic pump, suspending the seed in a gel.” - Dr Marcus Bellett-Travers*

Operational scale: Coverage of up to 5 hectares per hour; up to 40kg of seed per flight.

Timing matters: Optimal sowing window for Typha identified as May-June, feeding into AI-driven decision support.

*“It became evident there was an optimum time to sow Typha seed using a drone.” - Dr Marcus Bellett-Travers*

Regulatory breakthrough: Secured the UK’s first CAA BVLOS Operational Authorisation in an Atypical Air Environment, enabling repeatable and insurable operations.

Systems-level learning: Success required integrating hydrology, seed biology, drone engineering, and regulatory compliance, not technology alone.



## Innovations in crop productivity: Unlocking Typha



The Unlocking Typha project, conducted by ADAS, focused on improving yield and quality of Typha seedheads through controlled trials on planting density, rhizome maturity, and pest management.

### Key findings:

Establishment and maturation: Year 1 builds rhizome reserves; flowering occurs in Year 2.

*“Typha doesn’t just respond to light and warmth; it also needs healthy, mature rhizomes with enough stored energy to trigger flowering.” - Islam Abdel-Aziz, RSK ADAS*

Density effects: Lower-density planting (30 rhizomes/m<sup>2</sup>) produced larger seedheads than higher density (100 rhizomes/m<sup>2</sup>), even when counts were similar.

Pest management: Early intervention is essential to prevent malformations and loss of quality.

*“Damage to the plants in the trials ranged from fibre protrusion and longitudinal splitting of seed heads to the abortion of heads.” - Islam Abdel-Aziz, RSK ADAS*

Hydrology matters: Water depth and irrigation influence establishment success and yield quality.

## Integrated insights: Why new agronomy is needed

Both projects highlight that paludiculture requires systems-level agronomy:

Technology as an enabler: Drones and AI extend capability but must align with seed biology and hydrology.

Hydrology-sensitive management: Water table depth is central to establishment and yield.

Data-driven decision-making: AI and monitoring enable precision at scale.



XAG P100 Pro agricultural drone used to apply *Typha* seed in a gel suspension



## Conclusion

Paludiculture requires new, systems-level agronomy that integrates seed biology, wetland hydrology, delivery mechanisms, aviation safety, regulation, and data intelligence. Drones and robotics are not simply tools; they are enablers of entirely new farming systems, making it possible to farm with water, rather than against it.

## Project Links

<https://www.paludiculture.org.uk/boggybulrushes>

<https://www.paludiculture.org.uk/drone-repeat>

<https://www.paludiculture.org.uk/fwagsw>

<https://www.paludiculture.org.uk/textileproduction>