RESTORATION-ENGINEERING
A BLENDED SCIENCE-ENGINEERING MODEL

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The challenge

- 230,000ha or 2300km²
- 1100t of seed (i.e. 10 Olympic pools)
- Collection rate: 6t p.a. (i.e. ~200 years to collect)
- Seeding rate: ~6ha/day (i.e. ~120 years to seed)
- Dissemination costs: ~$1500/ha (i.e. ~$350M)
So what’s the solution?

Use seeds more efficiently at scale

1 - 5% typical

So what’s the solution?

Use seeds more efficiently at scale

1 - 5% typical

The challenge

- Get tangled
- Are bulky
- Difficult to process
Flash flaming of native seeds to improve land restoration
The innovation

flash flaming
The innovation improves bulk density, flowability & germination.
The innovation improves

Without innovation

With innovation

coatability
Multidisciplinary expertise

5 year collaboration

• **UWA - Engineering**
  – Agricultural Engineering
  – Manufacturing capacity in-house
  – Research Development & Innovation office (UWA RDI)

• **BGPA - Science**
  – 30 years experience in restoration
Multidisciplinary team

UWA Engineering

Dr Andrew Guzzomi
Agricultural Engineer
Lead Engineer

Monte Masarei
Mechanical Engineer
PhD Candidate

Elvan Ling
Mechanical Engineer
Masters student

Kings Park & UWA Science

Dr Todd Erickson
Research Scientist
Project Manager Global Innovation Linkages Project

Dr David Merritt
Senior Research Scientist
Seed Science

US Team

Dr Matthew Madsen
Seed technology

Dr Jeremy James
Plant Biologist

Dr Scott Abella
Applied Ecologist
So what?
So what?
The impact

- Can’t change area
- Reduce t/ha ~8 fold (5% ➔ 40%)
- Reduce collection to decades
- Increase seeding rate: ~5 fold (= 20 years)
- Reduce dissemination costs: ~100fold = $10/ha (i.e. ~$3.5M)
Seed flamer

1. What’s the problem
2. What’s the solution
3. What’s it enable
4. Who’s the consumer
5. Who’s the beneficiary

Restoration Ecology – Trillion Dollar Industry
- Exploration
- Approvals
- Closure
- “Mining”
- “Desert lands”
- “Farming lands”
- “Wild Fires”
- Middle East

Restoration – End Users – Billion Dollar Industry

Regulatory drivers

Mechanisation
- Bulk density
- Flowability
- Improved geometry

Enablement technologies

SEED SUPPLIERS

NATIVE SEED
- tangle
- bulky
- difficult to process

FLASH FLAMING

THE UNIVERSITY OF WESTERN AUSTRALIA
BOTANIC GARDENS & PARKS AUTHORITY

- Mechanical drivers
- Improved technology
- End users

Innovator of the Year 2016
Emerging Innovation Category Winner
Precision metering of *Santalum spicatum* (Australian Sandalwood) seeds

Dylan St Jack, Dianne C. Hesterman, Andrew L. Guzzoni

The development of a seed metering device to mechanise the seed-sowing process for sandalwood is reported. Amongst the mass flow and precision type seed meters considered, the ‘vacuum disc’ type precision meter was deemed most suitable. A vSets vacuum disc seed meter was modified to accommodate seeds whose diameter ranged from 13.5 to 23.5 mm. Nine custom made discs were tested over three vacuum levels. The discs were analysed for their ability to achieve a seed spacing of 200 mm at a ground speed of 4 km h⁻¹. Accuracy was measured using the performance indices from ISO 7256/1-1984(E) as well as a modified coefficient of precision (CP3) index. Tests of twenty seven unique configurations were conducted with a sample of three hundred seeds. It was found that more than half of the configurations could singulate the seeds to a singulation level of 94%. Discs with seven 10 mm or 12 mm diameter holes, run at 17 kPa were found to be the most accurate configurations for the conditions considered and demonstrate that mechanisation of sandalwood seed sowing is possible.
Engineering techniques to improve performance
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