Maintaining the Pulse in Agricultural Resilience

- Sydney Institute of Agriculture

Presented by
Associate Professor Brent N. Kaiser
Director - Legumes for Sustainable Agriculture

Faculty of Science
School or Life and Environmental Science
What is a Pulse?

Legumes

Soybeans
Peanuts
Fresh Peas
Fresh Beans

Pulses

Dry Bean
Chickpea
Field Pea
Cow Pea
Lentil
Pigeon Pea
Lupin
Vetch
Bambara Bean

Fresh Beans

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Pulses are good for you!

High in iron and calcium
High in dietary fibre
Vitamins (Folate)
Source of antioxidants
Low glycaemic index

The Protein Power of Pulses
Pulses are good for Agriculture

- Rotational crops
  - Break disease cycles
  - Disrupt weed populations
  - Provide soil nutrition

Field Pea
Canola
Lupin
Wheat

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Pulses Fix Nitrogen (N₂) – Nitrogen self-sufficiency

- N to grow and set seed
- Soil N for other crops
  - Wheat, Canola, Maize
  - Soil microbes

Diagram:
- Nodules
- SHOOT
- ROOT
- N₂
- NH₃
- AA
- Bacteria
- Carbon
- NO₃⁻
Population Growth – Ensuring Food Security

- World population is increasing
- How to feed ~9 billion people by 2030?

Source: Grid Arendal
Australian Pulses are in Demand!

India: Pulse Demand - 2030
- Will require ~40 million tonnes (MT)
- 2015 Indian production ~15 MT
- India will require ~1.5 MT of extra pulses per annum!
Australian Pulse Production

2017 Forecast: ~ 3 Million MT combined harvest

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<thead>
<tr>
<th>Chickpea</th>
<th>Lentil</th>
<th>Faba bean</th>
<th>Field Pea</th>
<th>Lupin</th>
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<tbody>
<tr>
<td>1.5 MT</td>
<td>370 KT</td>
<td>300 KT</td>
<td>280 KT</td>
<td>500 KT</td>
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Chickpea Harvest
Australian pulse production is not secure

- Pulse production (yield and quality) subject to unpredictable and challenging environments
  - Drought, heat, flood, frost, degraded soils
Challenges facing Australian pulse production

- Climate variability
  - Drought
  - Heat
  - Flooding
  - Salinity

- Disease

- Reliability
  - Profitability
Genetic resilience – key to sustainability

- Genetic improvement will mitigate the impact of climate change and disease – pathway to enhanced quality and yield

1) **Basic Research** to identify resilient traits (genes and proteins)
2) **Translatable Research** to introduce traits
3) **Plant Breeding** to deliver the physical outcomes to growers

4) **Societal** support that enables genetic improvement
   - Valuing agriculture and its role to meet global food demands
   - Prioritization of research funding to ensure long-term outcomes occur
- ARC Industrial Transformation Research Hub
  - Basic and Transformational Research for Legume Resilience
LSA Research Aims

- Develop pulses for increased resilience to abiotic stress

- Optimise plant resource partitioning to enhance yield under stress.

- Enhance $N_2$-fixation of pulses for annual and rotational crop production
Summary

- Pulses are important to Australia’s agricultural sector and its long-term sustainability

- **Legumes for Sustainable Agriculture** has been developed to deliver pulse research and development to Australia

- **Legumes for Sustainable Agriculture** and the **Sydney Institute of Agriculture** will spearhead new investment and research activity focused on pulse improvement and their role in meeting global food challenges