Our pulses & the world

Concluding Jeanie Clark's environmental education series in the International Year of Pulses (IYP) 2016

It's spring at last! With heaps of rain everywhere! Across Australia's grain-growing belt, pulses are growing well this year – unless they've had too much rain and sadly been flooded. The plants are reaching the end of their life cycles, harvest time is coming. This article will focus on harvested seeds for geography, history, science and maths.

From seeds planted to seeds harvested

What is happening to the pulses in the photo above?

Pulse seeds, full of nutrition to grow a new plant, await a moisture trigger (1). After soaking (see *Otherways* issue 148, p29-30), the life cycle starts. The embryo grows and eats the food stored in the seed (2) to make first a white root (3) sending it down to the soil. Then it sends a green shoot upwards (4), breaking through the soil (5). Leaves follow (6) and a seedling grows (7).

During mid-spring, the seedling will grow greatly and form flowers and seed pods. Later in spring, they dry off and this plant dies. It's time to harvest a crop of their pulse seeds! What happens to the harvested pulse seeds – eaten, or saved to plant next year? Don't forget the roots – on them tiny balls (nitrogen nodules) have formed. When the roots rot, this nitrogen will fertilise the soil.

From where do Australian Pulses originate?

None of the pulses grown in Australia are indigenous. Most originate in the Mediterranean, Middle East or Southern Asia. Like all food plants brought here, they have gone through long processes of seed/plant breeding to adapt them to Australia's soils and climates, and pests and diseases! Plant breeding science is amazing!

Lupins are a more recent arrival in the 1960s. They were introduced to West Australia's grain lands for their suitability to its sandy soils. Table 1 shows the basic Lupin history as plants were bred from those that survived each problem.

Table 1 –Key stages in Australian Lupin Breeding

Farmed from	Lupin variety	Lupin breeding problem solved in next variety
1967	Uniwhite	Wilted, died, seeds shattered in WA's heat and winds
1973	Unicrop	died from local plant diseases
1988	Yorrel	eaten by pests e.g. aphids
2004	Mandelup	

Derived from WA Dept of Ag and Food, *Lupin Breeding In Western Australia*, www.ioa.uwa.edu.au/__data/assets/pdf.../Lupin-improvement-in-WA.pdf

Mandelup has been bred for our conditions over 40 years! It grows well in sandy soils, survives hot winds, and our pests and diseases. Such scientific work of seed breeding has been improving varieties of plants available to farmers for centuries. It is a branch of science that will continue to be vital for the future and needs scientists working on future problems.

How could children appreciate and be inspired by the science in seed breeding? Turn the history above into an imaginative story? Draw pictures for its timeline? Delve deeper? Grow seeds?

Where are pulses grown in Australia?

In the 19th and 20th centuries, Australia had a 'wheat–sheep belt' – an inland arc running along eastern and southern Australia. Here wheat and sheep enterprises dominated farm landscapes.

From the 1960s, the soil benefits of pulses and the needs of pulses as food for stock and for food exports became increasingly known. In the 21st century, this belt has become a 'grain–stock belt'. This reflects the diversity of grains (cereals, pulses and oil seeds) and of stock (sheep, cattle, poultry mainly) grown on these productive lands. If you drive through this belt in early spring, you may only notice the bright yellow of the canola oil seed flowering, while the soft pastels of the pulses are less noticeable in green fields.

Crop choice depends on soil and climate at the region and farm level, and forecast sale prices. This belt has five climate-soil sub-regions (see http://www.pulseaus.com.au/storage/app/media/using_pulses/AGN_Pulse-Note-LR.pdf map p2).

So regional differences exist. For example, Table 2 shows northwest Victorian production this year:

Derived from Pulses Australia July 2016 Crop forecast http://http//pulseaus.com.au/storage/app/media/markets/20160721_Australian-Pulse-Crop-Forecast.pdf

Table 2 Areas under pulse production July 2016

Pulse	Mallee (ha)	Wimmera (ha)
Chick peas	1, 600	11,500
Faba beans	4, 000	50,000
Field peas	32,000	13,000
Lentils	33,000	71,000
Lupins	19,000	3, 500

Tables are a starting point for understanding. Converting tables to diagrams is a valuable maths skill. Try an area scale of 1sq cm:1000 ha, and paper in two colours (one for each region) for this

data. Draw the areas as rectangles. Label these with region, pulse and area. Rank them by size. What is noticed? Similarities? Differences?

The photo above shows pulse area rectangles, ranked by size, on a Wimmera-Mallee map. Notice more pulses grown in the Wimmera and different ranks. Why? Find a state map to identify where these two regions are, and their typical soils and climate. This geographic information, matched with scientific information about the needs of different pulses for best growth, helps explain such differences. The Mallee has sandier soils and is a little hotter and drier than the Wimmera. Lupins prefer this, Faba Beans do not.

Such climate and soil differences don't just affect crop growing patterns, but the native vegetation itself. Typical Mallee trees are different to those of the Wimmera. They live with less rainfall, slightly higher temperatures and sandier soils than those of the Wimmera. Tree species alter moving north.

Where do Australian pulses go?

The export of Australian pulses is big business, providing revenue to Australia's farmers and 'feeding the world'. Where? The photo below shows this by using 10 seeds for each pulse crop and mapping where 10% goes with each seed.

Source: data adapted from Pulse Australia report on exports 2010-2014 .

What explains the pattern on the map above?

Consider: the size of populations; amount of farm land; staple foods (eaten daily); and pulse origins.

Our pulses especially help feed the Indian sub-continent and Egypt. Work out how the four factors above explain this. And Arabia, especially Dubai? Consider the origins of their workers. What about our lupins sold to the Netherlands and South Korea? Both are very small, fish-eating countries. They farm fish (aquaculture), using our lupins in their fish food mix.

What do we do with pulses sold here in Australia? Recall the grain-stock belt? A lot of pulses feed stock, for example chickens, beef, sheep, which feed people. Some is packaged, or split and ground into products for packaging for foods for people.

What pulse foods can you buy locally?

The photo below shows some bought in the Wimmera and, on the right, in a market in Adelaide.

Take an excursion to your local supermarket and health store and look for pulses on sale there.

Food Science is another Agricultural. Science branch that is, and will be, important and creative in the future. Pulses are gluten-free. Do you eat lupin flour? Not sure? Food scientists have found how to make lupin flour, to use in gluten-free bread, biscuits and cakes.

"*Nutritious seeds for a sustainable future*"

The first aim of the IYP is to raise the profile of pulses: as a healthy food for soil, people and animals; and as sustainable staples, integral to future global food security.

From one seed, we harvest heaps of *nutritious* edible seeds full of all the goodness needed to produce many new plants and/or to healthily feed people. Underground, on the roots, nitrogen is a food for the soil, freely helping the next crop grow well, naturally improving soil - '*sustainable*'. In the future, more pulses will be needed to feed the world's growing population and renew its soils.

Australia is an important supplier of pulses globally, with many Agricultural Science branches involved in this. Our pulses are also very valuable economically, from farm to national level.

So our pulses are incredible plants, aren't they?◆

See more at http://enviroed4all.com.au/sustainability-in-farming/pulses/