Careers in Grains
Year 9
(Stage Five)

English
Science
Geography
Design & Technologies
Food Technology

Acknowledgements
Founder of From Paddock to Plate, Louise FitzRoy, has produced this national educational resource to be incorporated into the curriculum programs of schools across Australia.

Louise would like to sincerely thank the Australian Grain Institute (AGI) Capacity Building Project for providing the funding to create the ‘Careers in Grains’ content so that students across Australia can learn about the diverse career opportunities available in the grains industry. Louise would also like to acknowledge all the sponsors and supporters of From Paddock to Plate.

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Year level: 9
Curriculum focus

The unit *Careers in Grains* will show students first-hand the different jobs that are available and the variety of skills required within Australia’s agriculture industry. This manual and associated lesson plans will assist teachers and students to explore technologies and innovative concepts being utilised by the rural workforce and discover the rewarding career opportunities that exist in the industry. *Careers in Grains* will challenge the farmer stereotype and remove the misconception that you need to grow up on a farm or have a farming background to be involved in agriculture. Students are given insights into the varying work environments and are provided with an understanding of the passion and commitment that those who work in agriculture have for the jobs that they do. This topic aims to inspire young people to consider careers in agriculture so that the sector can continue to grow and prosper into the future.

In this unit students will:

- explore the numerous jobs required of farmers and the skills they need to learn to operate a farming enterprise efficiently and productively;
- follow the journey of several people who each have different careers in the agriculture industry;
- meet both employees and employers of all ages who have varying goals and ambitions; and
- discover the enticing career opportunities and tempting lifestyle choices available in rural areas.

*Source: Australian Curriculum, Assessment and Reporting Authority (ACARA), downloaded from the Australian Curriculum website in January 2017.*

Sample of topics covered for discussion and further consideration

- Food security
- Sustainability
- Biodiversity
- Environment
- Waste management
- Water security
- Drought & natural disasters
- Traceability
- Nutrition
- Food waste & recycling
- Innovation & design
- Technology
- Food miles
- Ethics
- Animal welfare
- Animal health
- Soil & pasture management
- Community
- Pests & diseases
- Economics
Geography Year 9

**Strand:** Geographical Knowledge and Understanding: Unit 1: Biomes and food security

**PAGE 9 & 10 | ACHGK060**
The distribution and characteristics of biomes as regions with distinctive climates, soils, vegetation and productivity

**PAGE 13 | ACHGK061 (Cross-curriculum priorities: Sustainability)**
The human alteration of biomes to produce food, industrial materials and fibres, and the environmental effects of these alterations

**PAGE 23 | ACHGK062 (Cross-curriculum priorities: Sustainability)**
The environmental, economic and technological factors that influence crop yields in Australia and across the world

**PAGE 26 | ACHGK063 (Cross-curriculum priorities: Sustainability)**
The challenges to food production, including land and water degradation, shortage of fresh water, competing land uses, and climate change, for Australia and other areas of the world

**PAGE 26 | ACHGK064 (Cross-curriculum priorities: Sustainability)**
The capacity of the world’s environments to sustainably feed the projected future population to achieve food security for Australia and the world

**Strand:** Geographical Knowledge and Understanding: Unit 2: Geographies of interconnections

**PAGE 32 | ACHGK065**
The perceptions people have of place, and how this influences their connections to different places

**PAGE 32 | ACHGK066**
The way transportation and information and communication technologies are used to connect people to services, information and people in other places

**PAGE 32 | ACHGK067**
The ways that places and people are interconnected with other places through trade in goods and services, at all scales
The effects of the production and consumption of goods on places and environments throughout the world and including a country from North-East Asia

The effects of people’s travel, recreational, cultural or leisure choices on places, and the implications for the future of these places

**Strand:** Geographical Inquiry and Skills: Observing, questioning and planning

Develop geographically significant questions and plan an inquiry that identifies and applies appropriate geographical methodologies and concepts

**Strand:** Geographical Inquiry and Skills: Collecting, recording, evaluating and representing

Collect, select, record and organise relevant geographical data and information, using ethical protocols, from a range of appropriate primary and secondary sources

Evaluate sources for their reliability, bias and usefulness, and represent multi-variable data in a range of appropriate forms, for example, scatter plots, tables, field sketches and annotated diagrams, with and without the use of digital and spatial technologies

Represent spatial distribution of geographical phenomena by constructing special purpose maps that conform to cartographic conventions, using spatial technologies as appropriate

**Strand:** Geographical Inquiry and Skills: Interpreting, analysing and concluding

Evaluate multi-variable data and other geographical information using qualitative and quantitative methods, and digital and spatial technologies as appropriate, to make generalisations and inferences, propose explanations for patterns, trends, relationships and anomalies, and predict outcomes
Apply geographical concepts to synthesise information from various sources and draw conclusions based on the analysis of data and information, taking into account alternative points of view.

**Strand:** Geographical Inquiry and Skills: Communicating

Present findings, arguments and explanations in a range of appropriate communication forms, selected for their effectiveness and to suit audience and purpose; using relevant geographical terminology, and digital technologies as appropriate.

**Strand:** Geographical Inquiry and Skills: Reflecting and responding

Reflect on and evaluate the findings of the inquiry to propose individual and collective action in response to a contemporary geographical challenge, taking account of environmental, economic and social considerations; and explain the predicted outcomes and consequences of their proposal.

*Source: Australian Curriculum, Assessment and Reporting Authority (ACARA), downloaded from the Australian Curriculum website in January 2017.*
Facts about the Australian grains industry

- Japan and Korea annually import about 1,700,000 tonnes of wheat [Australian Noodle (ANW) and Australian Premium White (APW) varieties] from Australia for noodle production (about 20 percent of the WA wheat crop).
- Wheat accounts for the majority of Australia’s grain production and is used for the production of breads, noodles and pastas. Australia produces just three per cent of the world’s wheat but accounts for 10-15% of the world’s 100 million tonne annual global wheat trade.
- There are various different types of wheat produced in Australia, including Australian Prime Hard (APH), Australian Hard (AH), Australian Premium White (APW), Australian Noodle Wheat (ANW), Australian Standard White (ASW), Australian Premium Durum (ADR), and Australian Soft (ASFT).

Australian Export Grains Innovation Centre, May 2015

- The total gross value for all grains and oilseeds in Australia in 2009-10 is approximately $9 billion-a-year.


- In Australia, 40,281,000 tonnes of coarse grain were produced in 2010-11 (cereal crops primarily including barley, grain sorghum, maize, oats, triticale and wheat), covering 19,283,000 hectares of land.
- The total amount of wheat produced in Australia in 2010-11 was 27,891,000 tonnes on 13,645,000 hectares.
- The total amount of barley produced in the same time frame equalled 8,145,000 tonnes on 3,740,000 hectares.
- Production of the major winter grains in 2011 is estimated at over 27 million tonnes for wheat, 2.4 million tonnes for barley and 2.4 million tonnes for canola.
- Globally, 1,100 million tonnes of coarse grain were produced in 2010-11, covering over 306 million hectares of land.
- Australia’s annual export volume of coarse grains in 2010-11 was 5,337,000 tonnes, with an export value of $1.493 billion.
- Australia exported 4,625,000 tonnes of barley in 2010-11, worth $1.295 billion.
- Exports of sorghum for the same period were valued at $146 million, and totalled 553,000 tonnes.

ABARES, Australian Commodity Statistics 2011
General facts about the Australian agriculture industry

• There are approximately 134,000 farm businesses in Australia, 99 percent of which are family owned and operated.

• Each Australian farmer produces enough food to feed 600 people, 150 at home and 450 overseas.

• Australian farmers produce almost 93 percent of Australia’s daily domestic food supply.

• As of 2010-11, there are 307,000 people employed in Australian agriculture.

• The complete agricultural supply chain, including the affiliated food and fibre industries, provide over 1.6 million jobs to the Australian economy.

• The agricultural sector, at farm-gate, contributes three percent to Australia’s total gross domestic product (GDP).

• The gross value of Australian farm production in 2010-11 was $48.7 billion.

• Australian farmers export around 60 percent of what they grow and produce.

• Australia’s farm exports earned the country $32.5 billion in 2010-11.

• Australian farmers are environmental stewards, owning, managing and caring for 61 percent of Australia’s land mass.

• Farmers are at the frontline of delivering environmental outcomes on behalf of the Australian community, with 94 percent of Australian farmers actively undertaking natural resource management.

National Farmers’ Federation, June 2016
Useful words and phrases

Australian Grain Institute (AGI)
Barley
Bran
Broadacre
Broker
Brokerage
Canola
Cash market
Coarse grains
Cultivate
Grist
CBH Group
Commodity
Endosperm
Fertiliser
Folic
Forward contract
FOSS machine
Fungicide
Germ
Global Positioning System (GPS)
Grain bank
Grains Research & Development Corporation (GRDC)
Hectolitre
Herbicide
Husk
Kernel
Millet
No-till
Quarantine
Pesticide
Plough
Protein
Ring-bark
Storage bin
Stubble
Thiamin
Trade barriers
Variable levy
Weighbridge
Wheat
Wheat berry
LET’S GET STARTED

Firstly, please read the FP2P Welcome Guide on the FP2P website - www.frompaddocktoplate.com.au/school-programs/

It is important to understand the level of knowledge your students have of grain production in Australia. This will determine the structure of your delivery for this unit.

- ASK the students to describe and list what they know about grains.
- DISCUSS the useful words and phrases.
- BRAINSTORM and gather ideas and information from the class and use this as a platform to begin this unit.
- READ the ‘Canola’ chapter in the From Paddock to Plate book, p35.

It is now a great time to watch the From Paddock to Plate three-part ‘Careers in Grains’ video series.

Ask the students to do the follow-on activities below in succession or as standalone lessons.

ACHKG060 Environment

TALK with students to find out what they know about biomes. IDENTIFY and DESCRIBE the world’s biomes.

Teacher resources:
www.blueplanetbiomes.org/world_biomes.htm
www.worldbiomes.com/biomes_aquatic.htm
www.worldbiomes.com/biomes_desert.htm
www.worldbiomes.com/biomes_forest.htm
www.worldbiomes.com/biomes_grassland.htm
www.worldbiomes.com/biomes_tundra.htm
IDENTIFY and DESCRIBE the major biomes of Australia and INVESTIGATE the biomes that would be most suitable for growing grain.

EXAMINE the influence of climate, soil type and rainfall. DISCOVER where these biomes are located, what animal and plants live in them and the type of climate. CONSIDER what other foods could be grown in these biomes.

Australia’s main grain growing regions
‘Geographically, the grains industry is defined by three broad agroecological regions.

- **The Northern Region**
  Encompassing Queensland and northern New South Wales, has generally high inherent soil fertility, although there is increasing evidence that this has been run down over time. It has relatively high seasonal rainfall and production variability compared with the other two regions. Both summer and winter crops are important for profit. Yield depends, to a significant degree, on conservation of soil moisture from summer-dominant rainfall. The Northern Region has the highest diversity of crop production, including maize, sorghum and tropical pulses as well as wheat, barley, winter-growing pulses and oilseeds. The Northern Region is the largest source of Australia’s premium hard high-protein wheat for export and domestic use. Demand for feed grains from the region’s important livestock industries is a key driver of grain production.

- **The Southern Region**
  Encompasses southeastern Australia, including central and southern New South Wales; Victoria; Tasmania; and south-eastern South Australia. It has a diverse suite of soils of generally low fertility and with many subsoil constraints, such as salinity, sodicity and toxic levels of some elements, although there are also some areas with very productive soils. Yield potential depends on seasonal rainfall, especially in autumn and spring, and there is less dependence on stored soil moisture than in the Northern Region. Crop production systems are varied and include many mixed farming enterprises with significant livestock and cropping activities.
The Western Region
Comprises the cropping areas of Western Australia, where soil fertility is generally low to very low, and yields depend on winter and spring rainfall. In many areas, yields are low by world standards; this is compensated for by the large scale and degree of mechanisation of the enterprises. Long-term variability in seasonal rainfall and production is lower in the coastal areas than in the Northern and Southern regions. Wheat, barley, canola and lupins are the dominant crops, with livestock enterprises in mixed farming systems often of less importance. The Western Region has a relatively small population and feed industry, and consequently exports more than 85 percent of its grain production.’ – Grains Research & Development Corporation

Text references:
- ‘Wheat is the most abundant crop, occupying 22% of the total cultivated area in the world. The most intensive wheat cultivation occurs in the temperate latitudes of both hemispheres. Wheat is most prevalent in the Great Plains of the United States, the Canadian Prairie Provinces, the Indus and the upper Ganges Valleys, along the Kazakhstan and Russian border, and in southern Australia. Wheat is also found throughout Europe, in southern South America, in parts of eastern Africa, and in eastern China.’ - Geographic distribution of major crops across the world by Billie Leff, Navin Ramankutty & Jonathan A. Foley, Global Biogeochemical Cycles Volume 18, Issue 1 March 2004
- ‘This year, Mr Nicoletti planted more than 83,000 hectares at his three locations, in the northern Wheatbelt at Mullewa, in the Central Wheatbelt around Merredin and south at Esperance. That’s a crop roughly 80 square kilometres larger than the Pacific Ocean country of Tonga. His business is deliberately structured to spread seasonal risks of drought and other factors, by growing crops at various geographical locations, which are capable of capturing different rainfall patterns in any given year. Over 33 years, he’s steadily built his business based on these sound risk management principles and the advantages of adopting greater economies of scale. But times are becoming more complicated and challenging due to the compound effects of several recent droughts and ongoing price volatility. Mr Nicoletti endured one of his toughest seasons last year with his 74,000/ha program ravaged by WA’s worst drought in 20 years.’ - The future of wheat growing by Colin Bettles, Farm Weekly, 27 October 2011
- ‘While soil types vary widely across Australia, there are three main types – clay, sand and loam. Clays, particularly when they are wet can become quite sticky, and while some are at risk of holding too much water when it is available and are easily compacted. When they dry out they can form a surface crust that is almost impenetrable to water. Sandy soils on the other hand tend to loose or leach water and
nutrients very easily. Loamy soil that is crumbly and looks good enough to eat is the best type of soil. It has a good balance of sand, clay and organic matter as well as a combination of small and large particles that enables good root development and the circulation of air, water and nutrients. The magic ingredient in any good soil is organic matter.’ – Gardening Australia

- ‘We have fragile soil resources, and increased yields over the last 60 years have benefited from phosphorus and nitrogen fertilisers. The world’s phosphate fertilisers are produced from largely depleted guano and rock phosphate mines. How will agriculture adapt when readily available supplies may be largely exhausted over the next 50 to 100 years?’ – Australia’s farming future: can our wheat keep feeding the world? By Ian Wright, Lecturer in Environmental Science, Western Sydney University, 6 June 2013

**Teacher resources:**
- [www.abc.net.au/gardening/stories/s1235759.htm](http://www.abc.net.au/gardening/stories/s1235759.htm)

**DEFINE** food security. What does food security mean to you? REMEMBER that food security involves more than just the production of sufficient quantities of food.

**UNDERSTAND** the threats to grain production around the world and how they are being addressed.

**For example:**
- Pests and diseases
- Land degradation
- Urban encroachment
- Land availability
- Water
- Weeds
- Chemical and fertiliser use
- Drought
- Natural disasters
- Pollution
- Climate change and variability
- Erosion of agricultural biodiversity
- Population growth and demographic changes
- Food prices
- Farm profitability
- Insecurity of imports
• Lack of infrastructure
• International trade
• Intellectual property rights
• Food waste
• Decline in funding for agricultural research and development
• Politics and conflict
• Food safety

DETERMINE primary actions that you believe are required to secure the food supply?

For example:
• ‘Educate governments, policy makers and the general public on the issue of food security and the potential consequences of inaction.’ – Food security issues for the Australian Horticulture Industry, a report prepared by Growcom for Horticulture Australia Limited (HAL), March 2011
• ‘Establish an Australian Food Security Agency.’ – Food security issues for the Australian Horticulture Industry, a report prepared by Growcom for Horticulture Australia Limited (HAL), March 2011
• ‘Incentives from government and private sector to encourage uptake of formal qualifications in agriculture.’ - Food security issues for the Australian Horticulture Industry, a report prepared by Growcom for Horticulture Australia Limited (HAL), March 2011

Teacher resource:

CREATE a map to show the relationship between biomes and world food production, using a spatial technologies application.

WALK around your school and locate the most suitable place to set up a wheat crop. EXPLAIN why you have chosen this location.

ACHGK061
Sustainability | Water management | Environment | Energy | Greenhouse gas emissions | Climate change | Biodiversity | Recycling | Soil health

BRAINSTORM and ANALYSE the grain industry’s possible environmental effects on biomes in Australia and DISCUSS what the industry is doing to minimise the impact of production.
For example:
- Vegetation clearing
- Chemical and fertiliser use
- Land degradation
- Water use

DEFINE the specific careers required to investigate and create new practices to reduce the industry’s environmental footprint.

RESEARCH & DEVELOPMENT
Minimising the environmental impacts of grain cropping at a paddock to neighbourhood catchment scale

- This project has examined the environmental impacts of dryland cropping from a paddock to neighbourhood catchment scale. At the paddock scale, total runoff and soil erosion were highest under down slope farming, but under large rainfall events, the down slope treatment was able to reduce rill development, thereby reducing soil erosion. Regardless of traffic direction, zero tillage has kept erosion rates low. Data from the down slope triple bay have highlighted the increased erosion due to higher sediment concentration, supporting the need for contour banks to continue to be installed at the current standard spacing. Catchment results have shown that catchment condition (ground cover) is an important driver in sediment loads delivered to streams, and cover levels across the entire catchment need to be maintained above 30%. Water quality results at both scales have shown that the total P concentrations in runoff water are strongly correlated to sediment concentration, and total N concentrations at the catchment scale appear to be dominated by discharge and sediment concentration (unlike the paddock scale which is dominated by application). Pesticides (atrazine) are regularly detected at high concentrations post-application. Better management practices therefore need to be implemented to reduce the off-farm impacts of applied nutrients and pesticides, particularly N and atrazine. Due to drought conditions and lack of cropping opportunities, there has been very little change in farm management practices during the term of this project. Despite these conditions, the project team surveyed (by telephone) 99 grain growers across the southern portion of the Central Highlands (33% of all dryland grain growers in the Central Highlands) to record current levels of adoption of management practices (tillage, CTF, contour banks, fertility management, riparian fencing, etc.). These results showed that 75% of properties had installed contour banks, 33% of growers had adopted zero tillage with a further 50% undertaking reduced tillage. CTF, a relatively new technology, was adopted by 36% of growers. These results show good levels of in-paddock adoption, but
even practices beyond the paddock (e.g. riparian fencing) that reduce sediment loads to streams have been adopted by 15% of grain growers.’ – Grains Research & Development Corporation

Teacher resource:

NEWS ARTICLE

- ‘Coastal agricultural industries are meeting their responsibility to farm in a way that protects the Great Barrier Reef. That was the message from the farming winners of this year’s Federal Government Reef Program Awards, announced on Tuesday night, at Reef Range and Red Dust, on Queensland’s Sunshine Coast. There is no denying that agriculture has a significant and detrimental impact on the health of the Great Barrier Reef, and is a big concern for governments, landcare groups, farmers, and the public alike. Many Queensland farmers are trying to change that, and it is those at the forefront of that push that have been recognised in the 2015 Reef Programme Awards. Brian and Mark Pressler from Hill End Farms in Bundaberg, won the award in the sugarcane category, for their use of tractor GPS navigation to reduce the amount of driving they do in their fields, to limit runoff. They are also installing improved irrigation systems and variable rate technology on fertiliser bins. Mark Pressler said the social responsibility to farm sustainably has never been higher, and the cane industry is working to meet that obligation. "We are not environmental vandals and we try as much as we can to minimise our impact on the reef," he said. "We all want to be here for the long term so sustainability is the key, and sustainability is our biggest driver." - Queensland farmers proving agriculture and the Great Barrier Reef can co-exist by Marty McCarthy, ABC Rural, 3 September 2015

Teacher resource:
- www.abc.net.au/news/2015-09-02/reef-program-awards/6743482

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Food origin | Nutrition | Health | Traceability | Food miles | Storage | Retail | Technology | Preservatives

PLAN, REHEARSE and DELIVER a presentation on the ‘from paddock to plate’ journey of grain, from farm and tracing back to point of sale in the supermarket.

CONSIDER the route that grain takes from the source, through production to manufacturing and then onto retail as a product such as bread.
INTRO VIDEO

"Hi my name is Duncan and I’m a mixed farmer. This means that I produce grains like wheat, barley and canola, as well as producing lamb for the likes of Coles and Woolworths. What I find so rewarding about farming, particularly with grains, is seeing the product from the start to the finish. We sow the crop early on in the year, then we spray it and look after it and then at the end, we get to reap the grain at harvest and it’s just a really rewarding feeling seeing that whole process from start to finish.” (1:18 – 1:52)

SARAH

"Here we are today at CBH. It’s the largest cooperative in Australia. We buy the grain from the growers and then we sell it domestically and internationally. Our largest market is the Asia-Pacific region. We also ensure that we return value to our growers and create it at the same time. I’m the Accumulations Product and Payment Coordinator and I ensure that the grower payments are made correctly and that the products are released to the market efficiently so our growers know each season what new products we have on offer.” (2:39 – 3:10)

"This is the Trading and Shipping team. This is where we buy the grain and sell the grain to domestic and international markets.” (4:01 – 4:10)

"In Operations, this is the Logistics team. In the Logistics team, they ensure the grain gets to site on time.” (4:24 – 4:31)

WHAT HAPPENS FROM FLOUR TO BREAD?

‘Once upon a time, bread was made with flour, water, salt and yeast and took between eight and 20 hours to produce. In the early 20th century, bakers experimented with various mechanised techniques to speed up bread-making, but in 1961 the Chorleywood bread process changed everything. Invented by UK scientists, the Chorleywood method allows a loaf to go from flour to sliced and packaged in about three-and-a-half hours using high-speed mixers and the addition of extra yeast and dough-improving chemicals. Now bread that is soft, springy and consistent takes much less time and costs much less to produce. But the question is, in light of how different modern bread-making is from traditional methods, when it
comes to choosing bread for your nearest and dearest (and the rest of the family too), which is the mother-loaf?

**Bread ingredients: what's in your bread?**

Look at the ingredients on a bread label and alongside the more recognisable substances you'll often see a list of mysterious numbers. Some of these additives are what are known as bread and dough "improvers" or "conditioners". They often have more than one function, but generally they're designed to dramatically increase the rate at which the dough rises (helping bread-makers increase production speeds and lower costs), improve bread texture and taste, and extend shelf life. Processing ingredients you'll commonly see are mineral salt 170 (calcium carbonate) and ascorbic acid (food acid 300 or treatment agent 300), otherwise known as vitamin C. Emulsifiers (427e, 481, 471), vegetable gums (412, 461) and amino acid 920 speed up dough handling, help sliced bread retain its shape and extend shelf life by reducing the crystallisation of starch that makes the bread go hard (if you put bread in the fridge, the cold temperature increases the rate of crystallisation and the bread goes hard faster). Only small amounts of these additives are required – usually up to three per cent of the bread – and bakers often buy them in a ready-made premix, to which they add water and yeast. Most breads, whether from a factory or a small baker, are made from similar premixes – differences generally stem from baking techniques. Since 2009, it's been mandatory for breads (except organic ones) to add iodine via iodised salt (for thyroid health), as well as folic acid, a form of the B vitamin folate that helps reduce the rate of neural tube defects in infants.

**Preservatives in bread**

While emulsifiers and other "improvers" are widely accepted as safe, preservatives are more controversial. Introduced in the 1990s as a mould retardant, calcium propionate, or 282, is the best-known preservative of public concern. Although approved by Food Standards Australia and New Zealand (FSANZ) for use at specified levels, a furore erupted when a study by Sue Dengate of 27 children published in the Journal of Paediatrics and Child Health in 2002 showed 282 to be associated with irritability, restlessness, inattention and sleep disturbance. In response to consumer concern, most breadmakers removed 282 from many of their products. Bakers Delight advises it does not use any artificial preservatives, while Brumby’s claims not to use 282 or 223 and to minimise preservatives where it can. Other bread manufacturers, such as Baker’s Life (Aldi), Goodman Fielder and George Weston, advertise on some packaging that they are free of 282, preservatives or artificial preservatives. However, these companies still use 282 in other products such as crumpets, muffins, Turkish bread and pizza bases. It's also widely found in wraps. We found 282 in several of the breads we bought for this investigation in 2013. With 282 a dirty word for
concerned consumers, some bread-makers get around the problem by using its close relative propionic acid (280) instead.

282: Evidence of harm?
The internet is awash with warnings of the dangers of 282 and other food additives, pointing to a cumulative cocktail in the body which can lead to a host of symptoms from migraine and tiredness to rashes, gastro-intestinal upsets and depression. Propionates (280-283) are on the list of food additives that can be associated with food intolerance in the Royal Prince Alfred Hospital Elimination Diet. On her Food Intolerance Network website, Dengate argues that children’s behaviour and learning is more affected than authorities will admit, citing stories from parents who noticed a behavioural improvement when 282 was removed from their child’s diet. But Dr Rob Loblay, director of the allergy unit at Sydney’s RPA Hospital, argues that about five per cent of the general population is sensitive to one or more food additives, whether artificial or natural, and considers the push to ban additives "overblown". "The issue is very complicated," says Vijay Jayasena, professor of food science and technology at Western Australia’s Curtin University. "The first thing people should know is that not all preservatives are artificial or may cause harm, and many are useful for food safety." Jayasena says most people won't be affected by 282, while for others it's about dosage. "It’s hard to say at what level 282 may cause a reaction in each individual, because people can have reactions to so many things and at different levels. However, if you're worried about them you should avoid them." Anti-additive campaigners argue that until additives are proved safe, FSANZ should use the precautionary principle where suspect additives are substituted with others that don’t raise health concerns. If you’re worried about preservatives, Jayasena says breads baked daily in-store generally have few, if any, preservatives, because any bread not sold is usually thrown out at the end of the day. Check the ingredient labels, or ask the baker what preservatives they use.

Labelling and health concerns
Questions have been raised about a loophole in labelling laws that allow manufacturers to avoid listing unpopular ingredients such as 282 or 223. In the Food Standards Code, food processing aids don’t have to be listed as ingredients. According to FSANZ, it’s very unusual for there to be anything other than minimal residues of these processing aids in foods. As a sulphite, 223 is not permitted for use as a preservative in bread. It is, however, permitted for use as a processing agent – and so it can be used and not listed. If 282 is used as a preservative, it must be listed, but if the manufacturer deems it a processing aid, it does not. So it’s essentially up to manufacturers to "apply good manufacturing practice". Enzymes such as alpha-amylase are also classed as processing aids and so don’t have to be listed. Used in most breads in a dried, powdered form, they artificially help speed up the fermenting process that would normally occur when
traditional dough is left to rise. Concerns have been raised that enzymes are still allergenic, even after baking. Studies have found workers exposed to airborne particles of alpha-amylase can become susceptible to "baker's asthma". But FSANZ argues most of the allergenic effect of alpha-amylase is destroyed during cooking, pointing to a World Health Organization/UN Food and Agriculture Organization expert committee which found no adverse effect from seven grams of the enzyme per kilogram of body weight per day.

Is your bread baked fresh?
In 2012, a ruckus erupted when it was revealed that Coles "freshly baked in-store" bread was actually par-baked bread made in Ireland. Par-baking is when bread is baked to around 80–90% completion, snap frozen and transported to the store, where it is baked for the final 10%. Often there is no difference in ingredients, but par-baked bread's freshness starts to decline after about six hours. Larger supermarkets with in-store bakeries make most simple products like bread rolls and loaves from scratch on-site daily - and these often have labels showing the date and time baked - while trickier specialty breads tend to be made off-site and par-baked. In June 2013, the Australian Competition and Consumer Commission (ACCC) instituted proceedings in the Federal Court against Coles, accusing the supermarket of misleading consumers about its par-baked products. In June 2014, Coles was found guilty of misleading and deceptive conduct, with the Australian Federal Court ruling it breached the Australian Consumer Law (ACL) by labelling its par-baked bread "fresh".

Who owns your bread?
The bread industry (like our supermarkets) is dominated by a duopoly. You may see many brands, but at least two-thirds of all our bread comes from two big corporations – George Weston Foods and Goodman Fielder.

George Weston Foods products
Tip Top
Abbott's Village Bakery
Burgen
Golden
Bagel House
Bazaar
Top Taste Cakes
Speedibake
AGB (Australian Garlic Breads)

Goodman Fielder products
Country Life
Flinders Bread
Freya's Continental Style Bread
CHOICE verdict
Look for bread in which wholemeal flour is the chief ingredient but there is also a high percentage of whole or kibbled grains and visible seeds. Also, it should have less than 400mg of sodium per 100g of bread.

Special claims and bread

Wholegrain
Pre-2005, wholegrain food was defined by FSANZ as "unmilled products of a single cereal or mixture of cereals". However, as a result of petitioning from the cereal processing industry, the definition was changed to a food that uses every part of the grain. This means grains can be processed and separated into three constituent parts (bran, germ and endosperm) but a food can still be classified as wholegrain as long as the three parts are added back into the food in the same proportions as the original unmilled grain.

Multigrain breads
Usually made from white flour with added whole grains, which slow digestion and lower the GI, resulting in a lower GI than for wholemeal loaves. Sourdough is traditionally made using a "starter", where wheat and water ferment to create a culture that gives the sour taste. This requires specific temperatures to survive so commercial bakeries often replace it with dried powdered yeast, which adds colour and smell as well as the sour taste but is not considered authentic by connoisseurs. There is no regulation defining sourdough, so the only way to know if it is authentic is to ask the baker.

High-fibre
Should contain at least three grams of fibre per serve. As a general rule of thumb, bread with at least 4g of dietary fibre per serve is a good source of fibre, and with at least 7g of dietary fibre per serve is an excellent source (Food standard 1.2.7). White bread labelled "high fibre" often contains Hi-maize, a corn-based, resistant starch that passes undigested into the small intestine, where it can encourage the growth of beneficial bacteria.
**Omega-3s**
There are two types of omega-3 fats – those from plants (mainly ALA) and those from fish (mainly EPA and DHA). There's now very good evidence that omega-3 fats from fish reduce your risk of heart disease and probably provide many other health benefits as well. But you don’t get the same benefits from ALA from plant sources, such as linseed. This fat may also help prevent heart disease, but you’d need more of it to get some benefit – more than you’d get from a serving of multigrain bread containing linseed.

**Phytoestrogens**
Phytoestrogens in some plants, such as soy and linseed, mimic the hormone oestrogen. They supposedly relieve menopause symptoms and protect against heart disease and some cancers, including breast cancer. In reality, there’s no consistent evidence that soy products reduce hot flushes, and no evidence at all that linseed relieves menopausal symptoms. High consumption of soy foods may lower the risk of breast and prostate cancers, but only by a little. For the small amount you’d get from a serving of multigrain bread there’s little point in buying soy and linseed over other grainy breads unless you prefer the taste.

**Glycaemic index (GI)**
GI is a measure of how carbohydrates affect your blood glucose levels. If there’s a rush of glucose into the bloodstream followed by a quick fall, the food is higher in the GI scale. If it gives a slower, gentler rise and fall in blood glucose, the GI is lower. Diabetics should consider GI, but for other people research hasn’t yet shown significant benefits – although low-GI foods may aid weight control. Some manufacturers make a GI claim on the label, but most multigrain breads already have a lower GI than either wholemeal or white breads.

**Shelf life**
Packaged sliced bread can be 24 hours old by the time it arrives at the shops because it’s baked the day before and then transported. Consumers will have no idea how old the bread is, because the best-before tag indicates when it should be eaten by, rather than when it was baked. Bakers we spoke to agree the lifespan of a fresh loaf should be about two or three days. But we found packaged breads last much longer than fresh-baked breads. So how do packaged bread companies make their bread last mould-free so long without artificial preservatives? Manufacturers claim advances in processing methods help, as does packaging that limits the flow of moisture, oxygen and carbon dioxide. Artificial preservatives may also be replaced with natural ones. As an example, mould can be kept at bay by citric acid (330), lactic acid (270) and fumaric acid (297). Other preservatives are vegetable gums, vinegar (acetic acid 260) and sodium.
Shelf life experiment
We stored 10 slices of white bread that didn’t contain artificial preservatives in airtight containers to see how long they took to go mouldy. The slices from the independent baker and Bakers Delight went mouldy first, on day four, followed on day five by the in-store brand of bread from Coles, Woolies and the artisan loaf. Wonder White and Aldi’s Country Bakery brand lasted until day eight and Tip Top finally gave up the ghost on day 10.’ – Let them eat bread by Miranda Herron, CHOICE, 5 August 2014

Teacher resource:

CREATE a visual presentation of this process.

EVALUATE the best ‘from paddock to plate’ method for everyone concerned (farmer, grower, manufacturer, retailer and consumer).

Use the From Paddock to Plate app to locate farmers in your area. The app will show you the distance the growers are to your school and map the route to get to their farms. The websites and contact details of these farmers are also on the app to assist with your research task.

DID YOU KNOW?
- ‘The industrialisation of our food supply means that our current production is extremely oil intensive. It has been calculated that, on average, it takes ten calories of fossil fuels to produce one calorie of food in our current setup. Some food has an even more ridiculous ratio – like corn-fed feedlot beef which consumes about 55 fossil fuel calories to one calorie of meat. We are effectively eating oil.’ – 2010 Food Crisis for Dummies
- ‘Conventional food and farming today rely on the use of nitrogen fertiliser. Today, one third of the energy consumed in agriculture goes for nitrogen fertilizer. The manufacture of one tonne of fertiliser produces seven tonnes of nitrous oxide, a greenhouse gas with a global warming potential 296 times greater than carbon dioxide.’ – Organic Agriculture Centre of Canada (OACC)
- ‘….tomatoes are often picked green to make them easier to transport. Then, before sale, they’re placed in ripening rooms where they are exposed to ethylene gas. This imitates some of the changes that occur during ripening but, because the sugars and flavour compounds that make tomatoes taste good come only from the vine, they don’t develop their full flavour’. – CHOICE
- ‘(The NSW Farmers Association) research revealed that farmers were being paid about 40¢ a kilogram for grey pumpkins, which were then being sold on supermarket shelves for as much as $2.78 a
kilogram. It was a similar story for tomatoes and carrots.’ – Growers underpaid for produce, say farmer by Alexandra Smith, The Sydney Morning Herald, 28 September 2011

- ‘At the supplier end of the grocery cycle, the National Farmers’ Federation estimates that Australian farmers get as little as five percent of the retail price of fruit and vegetables. Meanwhile Australia’s grocery prices have risen over 40 percent in a decade – well above the OECD average for developed nations.’ – FairChoice

- ‘About 75% of Australian tomatoes are produced in Queensland, where they grow year round. In summer they’re also produced in NSW and Victoria. Western Australia is self-sufficient, relying on winter tomatoes from Geraldton and Carnarvon and summer ones from the Perth area. So, depending on where you live, tomatoes can be well-travelled by the time you eat them.’ – CHOICE

- ‘The CERES report on food miles in Australia estimates that the average distance travelled for a tomato = 1,618.37km. This estimate assumes that Melbourne’s tomato sources vary seasonally. During summer most tomatoes come from within Victoria, but during winter as far as Queensland or WA, or we import hydroponically grown tomatoes from New Zealand. (To ensure a conservative figure, the estimate disregarded the tomatoes imported from New Zealand).’ – Food Miles in Australia

ACHGK062

Geographic diversity | Sustainability | Land management | Environment | Water management | Weed and pest management

Describe how environmental factors, for example, climate, soil, landform and water, can support higher crop yields and investigate the environmental constraints on agricultural production in Australia, for example, soil moisture, water resources and soils.

Discuss, in groups, provide reasons to justify the location of specific grain farms in Australia, considering seasonality, water availability, temperature and pests and diseases.

Text references:
- ‘About 22 million hectares are planted annually to commercial grain crops across Australia. Climate and weather patterns as well as soil type effectively split Australia into two major grain cropping regions – northern and southern – and two crop growing periods – winter and summer. Most regions are only able to produce one crop per year however some areas are capable of producing both a summer and winter crop each year due to particular soil types and climate.'
Northern cropping region
The northern region takes in central and southern Queensland through to northern New South Wales down as far as the Dubbo region. Most rainfall in this northern region tends to be over the summer months, allowing for dryland summer crop production. But with the high moisture-storing capacity of the clay-based soils of this region, supplemented by some winter rainfall, crops that grow during the winter are also successfully produced. Winter crops in the northern region are planted across a wide time period starting during March in the Queensland Central zone, through to July in the New South Wales Central zone. Consequently, harvest of the northern region’s winter crops can stretch from September through to December. Similarly, the north’s summer crops are planted from September through to February with harvest spanning the February to May period.

Southern cropping region
The southern region stretches from central New South Wales (south of Dubbo) through to Victoria, Tasmania and South Australia and the southwest corner of Western Australia. The rainfall pattern ranges from uniform in central New South Wales through to winter-dominant in Victoria, Tasmania, South Australia and Western Australia. This is a vast region of the country with a typically Mediterranean climate of dry summers and comparatively reliable winter rainfall lending itself to winter crop production. Summer crop production requires irrigation and the major field crop irrigated in this region is medium grain rice in southern New South Wales. Planting of the winter crop depends on ‘opening rains’ and usually begins in May and can continue through until late July. The winter crop harvest can begin in late October and continue through until January in the higher rainfall areas.’ - Australian Export Grains Innovation Centre

- ‘Australian grain growers are up to twice as water efficient as they were 30 years ago, according to a national study. Data from the Australian Export Grains Innovation Centre (AEGIC) has shown wheat farmers are producing more with less around the country. A comprehensive data map shows that between 1982 and 2012, many wheat growing regions have improved water use efficiency by between 50 and 100 per cent. AEGIC agro-meteorologist David Stephens said there had been a major shift in farming systems. Dr Stephens said a key change to farming was that grain growers were planting much earlier in the year. But he said there was no single reason why growers had made such dramatic improvements. "We’ve seen farmers plant better varieties with more nitrogen," he said. "They’ve been able to use knockdown herbicides once the weeds come up in the crops. They’re really taking out factors that were reducing crop yields." Dr Stephens said farmers were also improving
input management, using precision agriculture and applying additives to soils, such as lime. High rainfall areas of Western Australia, southern Victoria, Tasmania, New South Wales and northern and south-west Queensland had the most improvements with efficiency increases of up to 100 per cent.’ - National data shows wheat farmers have improved water use efficiency by up to 100 per cent over three decades by Bridget Fitzgerald, ABC Rural, 12 May 2015

Teacher resources:

Refer to page 9 and the biomes that would be most suitable for growing grain.

DISPLAY the geographical concepts (location, place, distribution, spatial interaction, spatial change, movement and regions) in the classroom so that students can refer to these terms during the unit.

TALK with the class about geographer’s use of geographical concepts and terminology. Geographers often organise information using concepts such as:

- **Location** using coordinates of latitude and longitude or grid references. For example, Dandaragan WA (where Jono’s family farm is located) latitude 30.6533° S, longitude 115.6997° E; 170 kilometres north of Perth and 2770 kilometres west of Adelaide.
- **Places** describing physical (environmental) or human (cultural) characteristics. For example: The name of Dandaragan was first recorded in 1850 as the name of a nearby gulley and spring or watering hole known as Dandaraga spring. The word is Indigenous Australian in origin and is thought to mean good kangaroo country. The Dandaragan plateau is the underlying geological feature of the area the town is located. Dandaragan has a population of 401 (2011 census).

ASK students to PRESENT their response, supported by visual aids including maps, to communicate a reasoned argument about the importance of geographical locations in the location of jobs and sustaining food production.

*Use the Paddock to Plate app as a useful tool to find where commercial grain farms and fresh produce businesses are located throughout Australia.*
EXPLORE the effects of anticipated future population growth on global food production and security, and its implications for jobs, agriculture and agricultural innovation.

CONSTRUCT a graph to show the relationship between growth in world population and world food production.

- DISCUSS the various impacts of global warming on the grains industry when considering the implications of a growing population on global food production.

- CONSIDER how technology and innovation will assist global food production for a growing population.

**GEORGIA**

“This is the MyCrop Barley app. The app helps growers to make the best variety choices for their farms based on the environment. What I mean by environment? The soil type and rainfall. This app also helps growers to select varieties that provide them with the best yield and also helps them choose varieties that will give them certain disease resistances.” (3:53 – 4:16)

**SARAH**

“In Operations, this is the Logistics team. In the Logistics team, they ensure the grain gets to site on time.” (4:24 – 4:31)

- With a growing population comes a greater demand for jobs. CONSIDER the jobs and skills involved in being a grain farmer. Would you like to work alongside Jono in the paddock?

**INTRO VIDEO**

“Hi I’m Jono and I’m a sheep and grains farmer. I guess you could describe a farmer as a ‘jack of all trades’ and a master of none and it’s that variability that I love about my job. We’re about half an hour to our closest town,
which means that if a job needs fixing, often we’ve got to do it ourselves. In one day I could go from being a vet to an agronomist, to a mechanic, to a soil scientist, to a machinery operator and it’s this variability in tasks that keeps you on your toes and makes the job exciting. That’s what I really love about being a farmer.” (0:22 – 0:58)

“Hi my name is Duncan and I’m a mixed farmer. This means that I produce grains like wheat, barley and canola, as well as producing lamb for the likes of Coles and Woolworths. What I find so rewarding about farming, particularly with grains, is seeing the product from the start to the finish. We sow the crop early on in the year, then we spray it and look after it and then at the end, we get to reap the grain at harvest and it’s just a really rewarding feeling seeing that whole process from start to finish.” (1:18 – 1:52)

“Hi, my name’s Angus. I work on a mixed farm of sheep and cropping. We’ve got barley, wheat, canola and lupins. I spray all through the year and then at the end, I get to jump on the header and see what we’ve grown. It’s a lot of fun.” (1:55 – 2:08)

“Hi, my name’s Kaitlin and this is Schnitzel Vonkrum. I’m a farmer’s wife. I work four days a week as a school psychologist and on my days off and weekends, I help out on the farm with sheep work and moving machinery at harvest time. The thing that I love most about living on a farm is that there’s plenty of room to have lots of animals.” (2:09 – 2:28)

“Hello I’m John and I’m the boss. I get to tell everyone what to do. I make sure everyone gets out to work on time and does the job properly and safely.” (2:28 – 2:38)

➢ DETERMINE how genetically modified grain crops will or will not assist with demands placed on global food production.

Text references:
• ‘Monsanto, which already sells GM varieties of corn and soybeans, could become the first company to market genetically modified wheat. Professor Rick Roush, of Melbourne University, says while there's demand for herbicide resistant wheat from US farmers, he
predicts Australian farmers will be less interested because of differences in the way they plant their crops. "Most of southern Australia that gets planted into wheat would get an application of a herbicide like paraquat or glyphosate anyhow, before planting and then farmers will go out and direct drill their seed into the stubble after that, so there’s key herbicides already being used in an efficient way for growing the crop. There’s less interest in seeing Roundup-ready wheat than there are other kinds of advances in wheat." Trials of genetically modified wheat in Australia are focusing on improving crop yields and the digestibility of protein in wheat, as well as developing crops that will tolerate drought and frost, and are still years away from commercial development. Groups opposed to GM crops claim there is no market for genetically modified wheat. Scott Kinnear, director of the not-for-profit Safe Food Foundation, says research conducted by his group, in collaboration with others opposed to GM crops, found Australia’s key grain markets don’t want genetically modified crops. "Our group and other groups last year collaborated and extensively examined and approached, and got in writing responses from every single one of Australia’s major export wheat markets and every single one of those markets said we are not interested in buying GM wheat." But Professor Rick Roush believes there will be a market for GM wheat in the future. "This has been a long-standing argument about whether countries will buy GM crops or not, but the facts remain that virtually all, probably 96 per cent plus, of Canada’s canola crop is genetically modified and they are having no trouble selling it," Professor Roush said. "In fact, they sell more of their GM canola to Japan and China, then we sell non-GM canola to either country. I suspect that in the fullness of time there probably will be quite large markets for Roundup-ready wheat and other sorts of genetically modified wheat." Scott Kinnear, of the Safe Food Foundation, is also concerned genetically modified crops resistant to herbicides will lead to greater herbicide resistance in weeds. "In North America, weed resistance is at endemic proportions now and the real issue is the spiny, thorny types of weeds that will grow six or eight feet high, and the only way to get them out is with hordes of labourers working manually with axes and shovels to dig these things out." Professor Roush says herbicide resistance needs to be carefully managed. "What’s happened with the development of Roundup-ready crops around the world is there’s been a significant increase in the use of the herbicide Roundup, which has significantly increased selection in some areas for resistance in the weed as a consequence," Prof Roush says.’ - World's first GM wheat getting closer by Catherine McAloon, ABC Rural, 25 March 2014

• ‘Dr Sanjaya Rajaram, the winner of the World Food Prize 2014, says genetic modification technology is needed to feed the world into the future. A wheat scientist in India and Mexico, he has bred 480 wheat
varieties so far. He said global what production has to increase from 700 million metric tonnes, to one billion tonnes, to feed the world’s population by 2050 and conventional or hybrid breeding will not be enough. "There are some reports coming in where they say perhaps GM will not be needed, I’m not sure about that," said Dr Rajaram. "I think the world community, including the governments, scientific centres and the scientists, farmers, [have] got to prepare [for] how to meet that target. I also don’t see traditional plant breeding doing that job.” The largest exporter of wheat is the United States, with 16 per cent of the global exports. Dr Rajaram said the US is now allowing trials of GM wheat.  

• ‘Few issues are as polarising as -genetically modified food. To some, it’s the saviour of a global population that has outgrown the farm. To others, it’s an irreversible monstrosity and unacceptable health risk. But it could become a moot -argument as GM annexes new crops, countries and companies. In February, the makers of the Lilydale free-range chicken brand sparked social media -outrage and a consumer boycott when it emerged they were feeding their poultry genetically modified grains and legumes. In March, McDonald’s UK revealed it had ended its ban on burger meat sourced from cattle fattened with GM crops. It lifted similar bans on eggs and chickens a few years ago. David Hughes, a professor of food marketing at Imperial College London, says the issue is academic. “If you look at soy and corn, the two principal raw ingredients of the food industry globally, something like 80 per cent of them are GM,” he told The Times. “We just find it convenient not to make a big noise about that.” Increasingly, the question is not whether one should eat GM food, but whether it is still possible to avoid it. “Most people are eating it all the time and really have no idea what or how much they’re eating,” says Fran Murrell, co-founder of anti-GM group MADGE.’  

• ‘A major field trial of GM wheat that is designed to repel aphids has found the crop is no better protected against the pests than conventional wheat. The results come from two years of trials that compared aphid attacks on standard wheat plants with those suffered by a GM version modified to release a natural aphid repellant.’  

Teacher resources:
LISTEN to this ABC Radio report about a meeting of hundreds of the world’s most eminent experts on grain crops. The meeting ‘has heard arguments for the likely necessity of genetically modified crops. The consensus among the scientists is that current crop yields are not enough to keep up with global population growth and climate change.’ – www.abc.net.au/pm/content/2015/s4315659.htm

DID YOU KNOW?
‘Global wheat production is 700 million tonnes, but researchers say that needs to reach a billion tonnes to feed the world’s population by 2050.’ – ABC Radio, PM


FOOD FOR THOUGHT
UNDERSTAND how gene technology works and give some examples of its current application in food production.

DEVELOP an awareness and understanding of the positive and negative impact of genetically modified foods.

ASK critical questions about the interests served by those promoting GM food products and/or food production practices.

DEBATE the importance of labelling GM foods.

APPRECIATE the historical and social impact of food technology.

RECOGNISE the impact food decisions have in the domestic, community, commercial, industrial and global settings.

EVALUATE the impact of food technology on people and the environment.

EXPLORE the ongoing problem of food wastage and how this is hindering food security efforts.

○ www.theguardian.com/environment/2015/jun/25/gm-wheat-no-more-pest-resistant-than-ordinary-crops-trial-shows

Text references:

• ‘From an ethical standpoint, it’s pretty simple. When you consider that 15 per cent of U.S. homes are food insecure, throwing away food is morally callous. And no, the food you leave on your plate isn’t going to feed anyone (here or in a developing nation). But that doesn’t mean you couldn’t donate excess food instead of preparing too much. Or buy less food—to reduce the amount you’ll discard—and pass the savings along to your local food bank.’ – Wasted Food, 29 March 2011

• ‘Eliminating the millions of tonnes of food thrown away annually in the US and UK could lift more than a billion people out of hunger worldwide, experts claim. Government officials, food experts and representatives of the retail trade brought together by the Food Ethics Council argue that excessive consumption of food in rich countries inflates food prices in the developing world. Buying food, which is then often wasted, reduces overall supply and pushes up the price of food, making grain less affordable for poor and undernourished people in other parts of the world. Food waste also costs UK consumers £10.2bn a year and when production, transportation and storage are factored in, it is responsible for 5% of the UK’s greenhouse gas emissions.’ - Elimination of food waste could lift 1bn out of hunger, say campaigners by Adam Vaughan, The Guardian, 9 September 2009

• ‘No More Forgotten Veggies in the Fridge: When you can just head to the garden to grab your veggies you’ll likely have far less food waste from limp forgotten veggies in your fridge crisper. Let’s face it, most of us buy a lot of produce intending to eat it all before it goes bad but sometimes things come up and you forget about them. Growing your own food means full access to the freshest vegetables and fruits at all times!’ – Isis Loran, food blogger and author, Little Mountain Haven

• ‘Every year Australians waste about $10 billion worth of food. It starts on the farm, where fruit and vegetables are rejected for cosmetic reasons, and continues right through to the household, where leftover or unwanted food is thrown out. In France, supermarket giant Intermarche has introduced a successful campaign called Inglorious Fruits and Vegetables. The supermarket purchased produce usually discarded for purely cosmetic reasons and displayed it in special aisles, sold them at a 30 per cent discount. When it was launched, the program was an immediate success; within a month, it reached over 13 million people and stirred a national conversation about food waste and just what makes a piece of fruit, or a vegetable acceptable to the consumer. The campaign only faced one problem: the produce quickly sold out. Now the ugly fruit and vegetables are available in soup and fruit juice form. Intermarche calls it ‘a glorious fight against food waste’. In Australia, between 20 and 40 per cent of fruit and vegetables grown are rejected
before they reach the shops because they don’t meet supermarkets’ high cosmetic standards and specifications.’ - Campaign for ugly fruits aims to end food waste, Bush Telegraph, Radio National, 14 July 2014

Teacher resources:
- www.littlemountainhaven.com/reasons-to-grow-your-own-food/
- www.abc.net.au/radionational/programs/bushtelegraph/irregular-food/5595302

➢ CONSIDER the benefits and disadvantages of knowing where the food you eat comes from. Why is this important when it comes to food security? What pressures will an increasing world population have on food security?

SOURCE and ANALYSE news articles and DEVELOP your own argument using basic language structures that suggest conclusions or conditionals. PRESENT the argument to the class as an individual or in groups.

GEORGIA

“It’s really important that you find out about jobs in agricultural industry because what you eat was produced by a farmer in Australia for you. So my job is really important in the supply chain because I help growers to make the best decisions about their grain varieties on their farms so that they can produce the best grain for you to eat on your plate.” (2:09 – 2:31)

SARAH

“There’s so much I want to achieve in the Australian ag industry and I know I can do that with the family and friends I have around me. My goal is to unite the Australian agricultural industry brand and most importantly, educate our next generation on the career opportunities that exist so that they can develop this industry into the future.” (5:15 – 5:36)

► EXPLORE the latest technologies and structures being developed in the grains industry.
Text references:

- “The grains industry will receive a boost this grain season from the installation of 11 additional automatic weather stations across the Wheatbelt. Agriculture and Food Minister Dean Nalder said the additions to the State’s 145-strong weather station network would provide grain growers with valuable localised information to understand their crop’s potential. Soil moisture probes will be installed in coming months to complement the weather stations, as part of the $10 million eConnected Grainbelt project led by the Department of Agriculture and Food (DAFWA) and funded by the Royalties for Regions program. Mr Nalder said the installations were located on eDemonstration sites hosted by grower groups, which would provide feedback to the project on how weather data could be better applied to help growers to grow more productive and profitable crops. "Grain growers have told us it’s all very well to have this information, what is important is how to interpret the information and integrate it into easy-to-use, decision-making tools," he said. "This is a unique opportunity for growers to have a say in the development of new, cutting-edge digital technology that best meets their needs and adds value to their cropping operations.” - Weather stations grow Wheatbelt network, Farm Weekly, 5 May 2016

- “Australian taxpayers should be toasting the launch of a new beer in Germany made from a unique Australian variety of gluten-free barley. The gluten-free Pionier beer, the world’s first commercial gluten-free beer brewed from traditional malting barley rather than substituted rice, soybeans or sorghum, owes its origins to trailblazing breeding work by plant scientists from Australia’s CSIRO. Every bottle sold of the new “Glutenfrei” beer — developed to suit the 1-2 per cent of the population who suffer from gluten intolerance, bowel digestion problems or have coeliac disease — will return royalties to CSIRO to fund future research efforts.” - CSIRO technology behind gluten-free German beer by Sue Neales, The Australian, 21 April 2016

- “US grain companies plan to reject Monsanto’s new genetically modified soybeans due to concerns they could disrupt international trade without regulatory approval from the EU. Trade groups representing Cargill, Archer Daniels Midland, Bunge and other grain companies blasted the company’s decision to sell the seeds before first securing an approval required to ship the crops to the EU, according to a letter reviewed by The Wall Street Journal. They want Monsanto to say how it plans to keep the soybeans from entering export channels. The grain companies’ stance is a potential blow to a product that Monsanto has touted as a blockbuster for US farm fields.” - Grain companies plan to reject Monsanto’s GM soybeans by Jacob Bunethe, Wall Street Journal, 4 May 2016
Teacher resources:

EXPLORE the differences and/or similarities of wheat production overseas compared to Australia. COMPARE perceptions people have of a grain farming in Australia and how these interpretations influence connections to grain farming internationally.

TALK about how they all use resources from and within biomes and about how their different systems and approaches to production might impact on the physical conditions of the land and water environments within biomes.

INVESTIGATE some of the products and/or services that businesses in your town, city or rural region sell to other places.

ACHGK068
Food security | Sustainability

REFER back to page 12 and DISCUSS the meaning of food security.

BRAINSTORM words and phrases to gauge students’ understanding.

TALK about World Food Day and RESEARCH as a class how to achieve the goal of feeding an expected global population of 9.6 billion people by 2050.

THINK about the capacity of the world’s environments to sustainably feed this projected future population.

EVALUATE the effects of international demand for food products on biodiversity throughout the world, in the places of their production.

PLAN an inquiry into what systems grains farmer Jono Glasfurd has put in place and can put in place, to meet both local and regional demands as well as national and international demands.
Use the Paddock to Plate app to speak to farmers both locally and nationally to find out the importance of food security to them and how they think we might achieve the goal of feeding so many people worldwide.

Teacher resources:

ACHGS064 • ACHGS065
Excursion | Environment | Sustainability | Jobs | Skills |
Economics | Water security | Food safety | Profitability |
Biosecurity | Waste management | Food origin

DEVELOP a table to show the types of challenges to food production in Australia compared to other areas of the world.

USE the Paddock to Plate app to FIND and VISIT a local farmer’s property to GATHER relevant data from a range of primary sources, for example, from observation and annotated field sketches, conducting surveys and interviews and experiments, or taking photographs.

If this is not possible, make observations from the From Paddock to Plate ‘Wheat’ virtual excursion.

ACHGK069
Food Security | Reflect | Tourism

IN SUMMARY, develop a table to show the types of challenges to food production in Australia compared to other areas of the world.

CONSTRUCT a graph to show the relationship between growth in world population and world food production.

INVESTIGATE the global growth of tourism and its likely effects on the future of places including employment.
REFLECT on all the information and knowledge gathered in the above tasks.

ACHGS070
Food origin | Nutrition | Health | Traceability | Food miles |
Global warming | Climate change | Environment | Biodiversity |
Geographic location | Food security

DISCUSS the relevance of food's nutritional content in relation to sustainably feeding the projected future population to achieve food security for Australia and the world.

Text reference:
- ‘Jodie Goldsworthy is the director of Beechworth Honey in NSW and says there are research papers which suggest pollination can increase crop yield by 25 per cent. That, if you think about it, is an astonishing figure.’ – BlueNotes, 11 December 2015

GEORGIA

“Plus barley is really good for you. It’s high in fibre, full of vitamins, minerals, plus it’s natural and healthy.” (3:01 – 3:07)

TOUCH, SMELL and TASTE a selection of grains including rice, barley, quinoa, rye, rolled oats, wheat, barley, amaranth, sorghum and triticale.

DISCUSS the difference between each grain and foods made out of grains.

CREATE a recipe using grist.

The quotes below have been taken from the ‘Wheat’ virtual excursion.

“Grist is a blend of different wheats that we make a flour out of it, hence the saying ‘grist of the mill’. So it becomes a blend of wheat, we then mill it as a baker’s flour or a biscuit flour. So they are all different protein levels.” (12:12 – 12:24)
IDENTIFY the health differences between raw, boiled, fried and steamed grains.

EXPLORE the differences between grains and legumes.

EXPLAIN to the class what your favourite grain is and why this is your favourite grain. USE descriptive words and clear reasoning to JUSTIFY your decision.

FIND OUT more about the protein called gluten and its presence in a variety of grains including wheat. What is gluten intolerance and celiac disease? Refer to page 21 in the Wheat Year 8 English teacher manual to learn more about a new breed of barley grain that contains lower levels of gluten.

Text references:
- ‘Cereal grains are the world’s single biggest source of food energy. The three most commonly consumed types are wheat, rice and corn. Despite widespread consumption, the health effects of grains are quite controversial. Some think they are an essential component of a healthy diet, while others think they cause harm. In the US, the health authorities recommend that women eat 5-6 servings of grains per day, and men eat 6-8. However, some health experts believe that we should be avoiding grains as much as possible. A whole grain contains the bran and germ of the grain, which provide fiber and all sorts of important nutrients. Refined grains have had these nutritious parts removed, leaving only the high-carb endosperm. Refined grains are nutrient poor, but some whole grains (like oats and wheat) are loaded with many important nutrients. Refined grains are high in carbs that get digested and absorbed very quickly, leading to rapid spikes in blood sugar and subsequent hunger and cravings. They are linked to obesity and many metabolic diseases. Whole foods are always preferable to processed foods. Grains are no exception. Whole grains tend to be high in fiber and various important nutrients, and they do NOT have the same metabolic effects as refined grains. The truth is, hundreds of studies link whole grain consumption to all sorts of beneficial effects on health:
  - **Longevity:** Studies from Harvard showed that people who ate the most whole grains were 9% less likely to die over the study periods, with a 15% reduction in death from heart disease.
  - **Obesity:** Those who eat more whole grains have a lower risk of becoming obese, and tend to have less belly fat.
  - **Type 2 diabetes:** People who eat more whole grains have a lower risk of becoming diabetic.
  - **Heart disease:** People who eat more whole grains have up to a 30% lower risk of heart disease, the world’s biggest killer.
Colon cancer: In one study, 3 servings of whole grains per day were linked to a 17% lower risk of colorectal cancer. Many other studies have found similar results (29, 30, 31). Looks impressive, but keep in mind that most of these studies are observational in nature. They can not prove that whole grains caused the reduced risk of disease, only that people who ate whole grains were less likely to get them. That being said, there are also controlled trials (real science) showing that whole grains can increase satiety and improve many health markers, including markers of inflammation and heart disease risk.’ - Grains: Are They Good For You, or Bad? By Kris Gunnars, a nutrition researcher with a Bachelor’s degree in medicine, December 2015

- ‘You lot ask us daily whether we recommend cutting grains when quitting sugar. Our take? If you tolerate them okay, then properly prepared grains (soaked and sprouted) can be a part of a healthy diet. For more of a detailed answer, we’ve reeled in our fructose-free friend David Gillespie, who has just released his latest book Eat Real Food to shed a little more light on the topic. Over to you, David:

Societies with a diet of processed food eat less (and fewer) grains than societies that don’t. They also eat less grains than their ancestors did before the advent of processed food. That’s right, I said they eat less grains. According to the Reserve Bank of Australia’s analysis of United Nations data, as a society becomes wealthier, it eats more sugar, more meat and less grains. And that makes sense. Grains are cheap food. Rich people would rather buy a steak than eat bread (again). Because per capita grain consumption decreased during the same time frame that modern chronic diseases increased, it seems highly unlikely that grain-based carbohydrates could be responsible for the rise in those chronic diseases. That’s not to say they’re completely exonerated. It’s clearly the case that fructose damages our ability to metabolise carbohydrates properly. Insulin is an important appetite-control signal generated in response to eating any carbohydrate (except fructose). Fructose affects the sensitivity of cells to that signal and degrades our ability to use carbohydrates for energy. The result is that those carbohydrates (whether they be from grains or vegetables) accumulate as fat and leave us with permanently raised blood sugar levels. So yes, carbs make us fat (and give us type 2 diabetes), but only because fructose has damaged the system that’s supposed to stop that happening. Cutting out carbs but continuing to eat fructose will not result in permanent weight loss or reversal of type 2 diabetes. So, for example, a ‘Paleo’ diet that avoids breads and other grains but still allows you to make desserts from dates (34 per cent fructose), honey (40 per cent fructose) or agave syrup (90 per
cent fructose) is not really solving any problem. Cutting out fructose will, though, whether you eat carbs or not. If you want the weight loss or disease reversal to go faster in the beginning (we’re all in a hurry), then cutting out carbs will certainly help while your appetite-control system is repairing itself. But non-fructose carbs are not likely to be the cause of modern disease. They’re not the murderer, they’re just the bloke who happened to find the body and was found (in)conveniently next to it when the police turned up. Equally, there’s nothing wrong with choosing to live without grains. Our species has certainly managed that for longer than any of us is likely to live. We just need to be sure we don’t leap out of the dietary frying pan and into the fire. Replacing wheat flour with almond (or any nut) flour is not a good idea if you care how much omega-6 you consume (and you should). It’s the dietary equivalent of replacing butter with margarine. Replacing cheese with ‘cashew cheese’ (it’s a real thing – suggested for ‘cheese’-cake) is even worse. And replacing cow’s milk with almond milk is also not a good idea for exactly the same reason. Be sure that if you plan to eat like pre-agricultural man, the things you’re eating are likely to be things you could pick off a bush, dig out of the ground or kill on the hunt. Believe me, cashew-cheesecakes, agave syrup non-wheat brownies and almond milk were thin on the ground in the Palaeolithic period, so be careful.’ – *Are grains making us fat and sick?* By Meg Yonson, *I Quit Sugar with Sarah Wilson*, 29 April 2015

**Teacher resources:**
- [https://authoritynutrition.com/grains-good-or-bad/](https://authoritynutrition.com/grains-good-or-bad/)
- [https://iquitsugar.com/are-grains-making-us-fat-and-sick/](https://iquitsugar.com/are-grains-making-us-fat-and-sick/)

**DETERMINE** and **APPLY** criteria for evaluating the credibility of the websites where information is sourced.

**CASE STUDY**
RESEARCH and PRESENT a report on the current status of the noodle wheat industry in Western Australia.

**Text reference:**
- ‘Japan and Korea annually import about 1,700,000 tonnes of wheat [Australian Noodle (ANW) and Australian Premium White (APW) varieties] from Australia for noodle production (about 20 percent of the WA wheat crop). The ANW component of the blend changes year-to-year depending on supply; however on average, ANW makes up about half of the Australian Standard White (ASW) blend. Japan
imports wheat via a weekly tender held by the Ministry of Agriculture Forestry and Fisheries (MAFF); whereas Korea imports privately, with mills often forming blocks to buy directly from traders. In addition to providing a valuable, stable market for WA wheat, the noodle wheat trade with Japan and Korea creates a range of knock-on effects for growers, such as the potential freight economies of scale it provides to other crops being exported to these countries.’ – Western Australia’s Noodle Wheat Industry: Current Status and Future Challenges, The GIWA Wheat Council

Teacher resources:
- www.giwa.org.au/wheat-council

Use the Paddock to Plate app to locate grain growers to source grain for this unit of work. Also use the app and From Paddock to Plate book to see how farmers express their viewpoints on the nutritional content of the food that they produce.

DID YOU KNOW?
- ‘Around 80% of the world’s production is consumed by the wealthiest 20%.’ - Shah, A, 2008, 'Global Food Crisis 2008' Global Issues, viewed 9 November 2010
- ‘We grow 50% more grain than we need to feed the entire population but much of this is fed to livestock.’ - Vegetarian Network Victoria, 2010, Eating up the World: the Environmental Consequences of Human Food Choices, 3rd Reprint September 2010

Excursion / Food miles

VISIT a local grain trader, grains office or storage and handling facility to DISCUSS the different jobs required and career opportunities available in the grains industry.

INTERVIEW the employer or an employee to find out what they like about their job, the challenges and why they decided to pursue this career path.

Use the Paddock to Plate app and From Paddock to Plate book to locate local grain growers who will be able to provide excursion recommendations.
DID YOU KNOW?
‘By buying locally grown food you’ll be strengthening your community by investing your food dollar close to home. Only 18 cents of every dollar, when buying at a large supermarket, go to the grower. 82 cents go to various unnecessary middlemen. Cut them out of the picture and buy your food directly from your local farmer.’ – Local Harvest, www.localharvest.org.au/why-is-local-important/

Local community

PRESENT an argument about how farming and agriculture is represented and portrayed in society through the media, by your friends, your parents and other role models. You must PRESENT a point of view and justify your position in order to persuade other about this issue. Include texts that integrate visual, print and audio features.

CONSIDER all attitudes, opinions, values and beliefs.

What conclusion can you draw?

Reflect

What have the students learnt from this unit?

• What is something new that you have learnt about careers in the Australian grains industry?
• Brainstorm all the potential job opportunities in the agriculture industry.
• How might you help others learn more about Australian farmers and food production?
• What have you learnt about food security?
• What questions do you have about the ‘from paddock to plate’ journey of grains and Australian grains production?
• What piece of work are you most satisfied with?

Websites (viewed January 2017) - As content of the websites suggested for research purposes in this unit is updated or moved, hyperlinks may not always function.