Frozen Berries
Year 7 and 8
(Stage Four)

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.

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Year level: 7 and 8
Curriculum focus

This unit aims to help teachers and students explore new and existing methods and technologies involved in the Australian frozen fruit industry to reduce water consumption, recycle waste, develop new varieties, enhance food safety and provide an Australian-grown product in a competitive international market. Students are given an insight into the operation and management of a commercial family farm and will learn tips and tricks to grow, pick and pack strawberries economically while maintaining optimum sweetness and freshness at the same time as achieving maximum productivity and profitability. The teaching materials provide students with an understanding of seasonality, geographic diversity and the importance of a changing climate to ensure a reliable product that is available all year round. They also clearly define the nutritional benefits of eating frozen fruits, the economic and wellbeing rewards of sourcing local and provide a solid platform to discuss food miles and food security within Australia’s frozen fruit industry.

In this unit students will:
• see the ‘from paddock to plate’ journey of frozen fruit on a family-owned and operated strawberry farm;
• listen to the sounds on the farm including the processing facility where the fruit is washed and blast frozen;
• taste, touch and smell a handful of strawberry varieties;
• learn how to cook with and preserve fruits using several different methods; and
• discover how to plant and grow your own strawberry plants at school.

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
Design & Technologies, Years 7 and 8

**Strand:** Design and Technologies Knowledge and Understanding

**PAGE 7 | ACTDEK029** *(Cross-curriculum priorities: Sustainability)*
Examine and prioritise competing factors including social, ethical and sustainability considerations in the development of technologies and designed solutions to meet community needs for preferred futures

**PAGE 13 | ACTDEK030**
Investigate the ways in which products, services and environments evolve locally, regionally and globally through the creativity, innovation and enterprise of individuals and groups

**PAGE 18 | ACTDEK032** *(Cross-curriculum priorities: Sustainability)*
Analyse how food and fibre are produced when designing managed environments and how these can become more sustainable

**PAGE 21 | ACTDEK033**
Analyse how characteristics and properties of food determine preparation techniques and presentation when designing solutions for healthy eating

**PAGE 24 | ACTDEK034**
Analyse ways to produce designed solutions through selecting and combining characteristics and properties of materials, systems, components, tools and equipment

**Strand:** Design and Technologies Processes and Production Skills

**PAGE 7 | ACTDEP035**
Critique needs or opportunities for designing and investigate, analyse and select from a range of materials, components, tools, equipment and processes to develop design ideas

**PAGE 16 | ACTDEP036**
Generate, develop, test and communicate design ideas, plans and processes for various audiences using appropriate technical terms and technologies including graphical representation techniques

**PAGE 7 | ACTDEP037**
Effectively and safely use a broad range of materials, components, tools, equipment and techniques to make designed solutions
PAGE 24 | ACTDEP038 (Cross-curriculum priorities: Sustainability)
Independently develop criteria for success to assess design ideas, processes and solutions and their sustainability

PAGE 16 | ACTDEP039
Use project management processes when working individually and collaboratively to coordinate production of designed solutions

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

Anaphylactic
Aquatic chemistry
Blast frozen
Botanist
Certified organic
Strawberry variety
Cloudberry
Commercially quantities
Contaminate
Cross breeding
Dewberry
Drip irrigation
Elderberry
Fertigation
Fertiliser
Flowering
Food miles
Food safety
From paddock to plate
Geographic diversity
Greenhouse
Hand picked
Harvest
Huckleberry
Import
Integrated Pest Management
Irrigation
Labour costs
Local produce
Loganberry
Microclimate
Mulberry
Perennial
Pollinisers
Predator mite
Processing facility
Pruning
Punnet
Ripe
Seasonality
Shelf life
Sustainable farming
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 frozen fruit 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 frozen fruits.
- 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.

It is now a great time to watch the From Paddock to Plate ‘Frozen Berries’ virtual excursion.

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

ACTDEK029 • ACTDEP035 • ACTDEP037
Social | Ethics | Sustainability | Environment | Innovation |
Design | Culture | Design | Technology | Genetics | Social media |
Careers | Employment | Jobs | Food waste | Water security

INVESTIGATE how ethics, social values, profitability and sustainability considerations impact on design and technologies used to save water.

Text reference:
• ‘The use or abuse of technology can create social differences, disagreements and ethical conflicts, e.g. genetically modified foods, in-vitro fertilisation technology. While designing, developing and using technology is linked to the evolution of our species, our future existence will be influenced greatly by technologies currently being, or yet to be, designed and created. Consequently, responsible and democratic decision-making, taking into account cultural, societal
and environmental factors, is an important aspect of Technology and Design.’ – NT Curriculum Framework

EXAMINE what technologies Ruth and Matt use to recycle and save water on their farm.

For example:

• Subsurface drip irrigation systems to minimise the amount of water lost due to evaporation and runoff by being buried directly beneath the crop and applying water directly to the root zone.
• Surface cover to reduce sediment in runoff and limit soil erosion.
• Using aquatic plants to naturally clean the water so that it can be recycled.

“I studied aquatic chemistry at uni specialising in agricultural water management and sustainability. Australia’s water resources are very finite and very important, so we’ve employed a number of practices to minimise the amount of water and the impact on the environment. Number one is our drip irrigation. Our strawberries are irrigated subsurface, under the ground. The water is delivered directly to the roots so there is no evaporation, very little seepage and so very little water used for strawberries. The water that comes off the fields is diverted into settlement ponds and an array of aquatic plants that naturally clean the water and strip any nutrients from the water. From there, the water is then reused in the irrigation program.” (7:22 – 8:07)

DESIGN a new technology that the Gallace family could use in the strawberry field to increase productivity and/or decrease the level of manual labour involved in growing and harvesting the fruit.

“Strawberries are picked when they are ripe for the highest natural sugar content and the best flavour. Unlike mangoes or bananas that continue to ripen after they have been picked, strawberries have to be picked at their prime. If you pick them when they are unripe, you do get a longer shelf life but they’re not as sweet and they are not as tasty. If they’re picked too ripe, then they’ll be slimy, you might have seen them squashed in the bottom of the punnet and they are no good. That’s why we pick them here at their best.” (4:31 – 4:58)
“With our strawberries for Matilda’s, they’re handpicked and then get transported down to our processing facility. The fruit is hand graded which means that it’s sorted out by size and shape. All that fruit then goes into our washing process. Just like you would with your fresh strawberries at home, you run them under the tap. It goes on a shaking conveyor so the water droplets come off it and then it goes into the freezing tunnel.” (5:27 – 5:50)

EXPERIMENT with traditional and contemporary technologies when developing your design. DISCOVER the advantages and disadvantages of each approach.

INVESTIGATE emerging technologies and their potential impact on design decisions, for example digital technologies.

EXAMINE a variety of suitable materials, components, tools and equipment for your design to DETERMINE their suitability for particular uses related to durability.

PRODUCE annotated concept sketches and drawings, using: technical terms, scale, symbols, pictorial and aerial views.

DOCUMENT and COMMUNICATE the generation and development of your design idea for the school by developing a digital portfolio with images and text, which clearly communicates each step of a design process.

Here are some great inventions for inspiration!

• ‘What could be more blissful than lying back on your picnic blanket while a robot picks perfectly ripe strawberries for you? Yes, we all share this arcadian dream. Sadly, it comes with a $50,000 price tag. That’s roughly how much a new strawberry-picking robot will cost when it goes on sale in Japan early next year, so start saving now. The machine moves on rails in a greenhouse. It has a 3D stereo camera system to image the berries and judge which ones are ripe according to color. When it finds one, a robotic arm reaches out and snips its stem. Into the basket it goes. It can harvest a berry every 8 seconds. “This robot would harvest two-thirds of the strawberries during the night when growers are sleeping.” Shibuya Seiki’s Mitsutaka Kurita told AFP. ”The farmer can then pick the rest of the strawberries that the robot couldn’t get at.” - $50,000 strawberry-picking robot to go on sale in Japan by Tim Hornyak, CNET, 28 September 2013

• ‘In a shed near Toowoomba, researchers at the University of Southern Queensland are developing the tools and techniques they think will dominate farming practice by 2025.
- Mechatronic engineer Dr Cheryl McCarthy is researching the use of drones to automatically detect hot spots in crops, and will soon be one of the few people in Australia licensed to operate unmanned aerial vehicles commercially.

- Agricultural engineer and biosecurity expert Paul Kamel traps moths in a device that allows him to photograph them under a microscope and upload the image, to help spot incursions early.

- Crown rot is a disease caused by fungus, which survives in the stubble of its host plant, limits water movement from the soil and causes browning of the stem. It can be a major headache for the grains industry, causing significant yield losses, particularly in wheat crops. Plant pathologist Dr Cassy Percy is investigating better ways of using phenotyping to learn more about resistance to the disease.

- Food expert Lindsay Brown has been investigating the potential of recycling food waste. He has begun clinical trials to look at how the waste products of foods such as wine can be utilised, and made into functional foods which could improve health. "For example, when we make red wine most of the stuff gets thrown out [and] gets used as compost," Mr Brown said.

- Precision agriculture expert Troy Jensen has been developing technology which can measure and quantify the spatial capacity of farms in terms of things like fertiliser use. However, to do so requires advanced technology such as auto-steer tractors, which Mr Jensen said already existed. But farm equipment could be even more advanced in the future. "The idea behind fully autonomous, driverless tractors is a possibility," Mr Jensen said.‘ – *Drones as common as tractors? Farm technology in 2025* by Robin McConchie, Craig Zonca and Arlie Felton-Taylor, ABC Rural, 27 October 2015

- ‘The Low Impact Harvester is a mobile, harvesting machine which is structured like a mobile production line and mini packing shed. It allows the vegetable grower to pick, wash and pack the vegetables ready for transportation, in the field where they are grown.’ – The New Inventors, ABC Television

**Teacher resources:**

- [www.abc.net.au/tv/newinventors/txt/s1404842.htm](http://www.abc.net.au/tv/newinventors/txt/s1404842.htm)
Use the Paddock to Plate app to contact farmers around Australia to source ideas for your design.

**CASE STUDY**

RESEARCH and ANALYSE how innovation in Israel has led to the development of some of the world’s most popular new fruits and vegetables.

DISCUSS the meaning of hybridisation, artificial selection, cross-breeding, transgenic plants and genetic modification.

**Text references:**
- ‘The Galia melon, released to the market in 1974 by breeders Zvi Karchi and Anneke Govers, became a multimillion-dollar hit internationally.’ - Top 12 new fruit and vegetables developed in Israel by Abigail Klein Leichman, ISRAEL21c, 28 May 2013
- ‘Orangetti spaghetti squash, now the only spaghetti squash sold in Israel, was the first hybrid Israeli vegetable grown in the United States under its own name. Its intense orange color (as opposed to its pale yellow cousin) makes it better looking, better tasting and richer in beta-carotene and other antioxidants.’ - Top 12 new fruit and vegetables developed in Israel by Abigail Klein Leichman, ISRAEL21c, 28 May 2013
- ‘Ben Dor Fruits & Nurseries’ nectarine-mango is heart-shaped with a smooth peel. The fruit took 10 years to perfect and went on the market in Israel, the UK and South Africa in June 2012. Ben Dor also breeds hybrid stone fruits such as the plume grenade (a pomegranate-colored plum), the lemon-shaped lamoon plum, the pita peach and many others.’ - Top 12 new fruit and vegetables developed in Israel by Abigail Klein Leichman, ISRAEL21c, 28 May 2013
- ‘Angello, the first seedless bell pepper in the world, won the Fruit Logistica Innovation Award in 2012. The development of the mini seedless red pepper began six years ago at the Israeli seed company Zeraim Gedera. For now it’s grown only in Israel and Spain, and as it hits the world market additional varieties in other colors are soon to follow.’ - Top 12 new fruit and vegetables developed in Israel by Abigail Klein Leichman, ISRAEL21c, 28 May 2013
- ‘The Black Galaxy tomato was introduced to international markets in early 2012 but had already won high acclaim in its native Israel. The dark salad staple was developed by Technological Seeds DM using a pigment derived from blueberries.’ - Top 12 new fruit and vegetables developed in Israel by Abigail Klein Leichman, ISRAEL21c, 28 May 2013
- Another Hishtil innovation is the mini basil tree, a novel solution to the problem of the herb’s naturally short shelf life. By grafting two types of basil plants together, Hishtil got a hardy strain that grows a sturdy trunk and leafy aromatic leaves. It can grow outdoors in warmer weather and be brought inside during winter.’ - Top 12 new fruit and vegetables developed in Israel by Abigail Klein Leichman, ISRAEL21c, 28 May 2013
THINK about your favourite fruits. EXPLORE what fruit traits you would use to breed your ideal fruit. EXPLAIN why you have chosen these traits and what technology you would use to produce a fruit with these new traits.

CONSIDER the ideas above.

INVESTIGATE whether breeding popular fruits and vegetables helps to reduce food waste. REFER to page 11 in the ‘Food Waste’ Year 10 Science teacher manual for examples on how genetics may reduce food waste into the future.

Would you like to be a “plant inventor”? DETERMINE how this role can help to reduce food waste in the world.

“Strawberries are picked when they are ripe for the highest natural sugar content and the best flavour. Unlike mangoes or bananas that continue to ripen after they have been picked, strawberries have to be picked at their prime. If you pick them when they are unripe, you do get a longer shelf life but they’re not as sweet and they are not as tasty. If they’re picked too ripe, then they’ll be slimy, you might have seen them squashed in the bottom of the punnet and they are no good. That’s why we pick them here at their best.” (4:31 – 4:58)

“This factory processes about 3 to 4 tonnes of frozen fruit a day. While berry harvest is from October to May in Victoria, harvest in Queensland (where Matt and Ruth also source berries) starts in June and goes through until October. This means that they always have a supply of fruit, emphasising the importance of geographic diversity in a business like this one. This diversity as well as seasonal changes each year influences the flavour of the berries.” (5:03 – 5:24)

“With our strawberries for Matilda’s, they’re handpicked and then get transported down to our processing facility. The fruit is hand graded which means that it’s sorted out by size and shape. All that fruit then goes into our washing process. Just like you would with your fresh strawberries at home, you run them under the tap. It goes on a shaking conveyor so the water droplets come off it and then it goes into the freezing tunnel.” (5:27 – 5:50)
“Sustainable farming and responding to a changing climate have been high on the agenda for Matt and Ruth, which has included developing a new variety of strawberry to cope with the changing environment.” (6:24 – 6:34)

“The process of developing new strawberry varieties is quite interesting, because you’re playing the role of essentially the bees, just like they do in nature. I’ve been lucky enough to go along in the strawberry fields with Matt’s sister who is an agronomist and who leads our breeding program. What she does is she takes a flower from a plant that has characteristics that she likes and she’ll put the pollen from that flower in a petri dish. Then she’ll go to another plant, also with favourable characteristics and using a paint brush simply paints the collected pollen on a flower and that’s how the cross breeding happens and that’s how you start developing a new strawberry variety.” (6:36 – 7:21)

QUOTE
"I can't understand why people are frightened of new ideas. I’m frightened of the old ones.” - Musical innovator John Cage

EXPLORE how the packaging of strawberries and frozen fruit has changed over time and PREDICT what this packaging will be like in 50 years time.

CONSIDER traditional and contemporary design and technologies and DISCUSS how fruit packaging has changed in response to the need for more sustainable patterns of living.

ANALYSE how developments in materials, tools and equipment influence designed solutions.

“After washing the berries they are blast frozen, so they go from four degrees down to minus 40 in 30 seconds. Now what this does, is that it holds the cell structure of the fruit and when you defrost it, it’s almost the same as what you would have before you froze it. From the blast freezer, the fruit goes up into an elevating conveyor into our multi head weigher, which
just ensures that the exact weight goes into the bag. The berries drop down into the bag, is sealed, goes down through the conveyor and the check weigher, into a box, packed onto a pallet and into storage.” (5:52 – 6:23)

SHORT DOCUMENTARY
WATCH this short documentary called ‘Waste Deep’ filmed by the team at Sustainable Table. It ‘shows how food and plastic waste can be avoided, drawing attention to much of the unnecessary packaging that is choking our lives, oceans and animals. It also gives an insight into the environmental and social impacts of our wasteful ways.’ – Sustainable Table, www.sustainabletable.org.au/Hungryforinfo/WasteDeep/tabid/144/Default.aspx

Text references:
• ‘Corn on trays, apples sliced in containers, lettuce wrapped in plastic and sweet potatoes peeled and displayed on polystyrene trays. It’s the modern-day obsession with faster food that is creating a tsunami of waste swamping Sydney. And there is no need for it — fruit and vegies already come in nature’s own packaging that doesn’t clog our household garbage bins. There has been a 170 per cent increase in waste over the past 20 years, with two-thirds of that coming from food packaging. And there is a growing call for supermarkets to stop pandering to our time-poor society and obsessive parents by providing peeled fruit and vegetables in plastic. “Waste has a growth of 7.8 per cent annually and two-thirds of that growth is food packaging,” said Mike Ritchie, from waste consultancy group MRA Consulting.’ - Cost of convenience: Fruit and vegetables packaged in plastic the source of increasing waste in Sydney by Jane Hansen, The Daily Telegraph, 29 May 2016
• ‘An airtight plastic bag is the worst choice for storing vegetables, according to Barry Swanson, professor emeritus of food science at Washington State University. And don’t pack veggies tightly together, either; they need space for air circulation or they’ll spoil faster.’ - Ten fruits and vegetables you’re storing wrong by Candy Sagon, The Washington Post, 21 October 2014
• ‘It’s the supermarket gripe driving us crazy. Where we once were happy to pick up an individual sweet potato or choose a nice looking pair of tomatoes, we are now faced with shrink-wrapped cucumbers, individually packaged heads of lettuce and handfuls of basil leaves encased in their own container with lid. Customers are up in arms about excessive packaging for their fresh produce in our supermarkets and grocers. And a West Australian shopper has decided to do something about it, launching a change.org petition to stop Woolworths and Coles from wrapping small portions of herbs, vegetables and fruits in plastic and Styrofoam. “The world is overloaded with plastic. Consumption of disposable plastic is a major
contributor to plastic pollution,” Pat Lowe, of Broome, says in her online petition. “These items may be used for a day, or just a minute, but remain in the world forever. Plastic does not disintegrate. Wrapping fresh food in plastic is an unnecessary use of non-biodegradable materials, which is leading to the proliferation of harmful waste, much of which is ending up in our oceans.” - Customers up in arms about excessive packaging by James Law, News Limited, 14 March 2015

- ‘We are mindful of the need to minimise our waste and over the past five years we’ve been making good progress to improve our recycling rate which has increased to 70% this year. We expect this trend to continue as we continue to work with the waste industry on new technology that can recycle more of our waste as well as consumer waste. We are also helping our customers with their waste by providing recycling solutions. Hopefully, you’ve heard about our soft plastics recycling program with RED Group that’s now available in 480 Coles stores across Australia where customers can bring back their soft plastics – including bread bags, biscuit packs, plastic bags and polypropylene shopping bags - to be recycled and turned into useful things like outdoor furniture for schools and, most recently, trolley bays at one of our new stores. Approximately 280 tonnes of plastic was returned to our supermarkets by customers for recycling via this program in the past year. We understand some consumers would prefer not to have organic produce packaged in plastic. It’s something we’ll continue to review but we don’t have an easy solution for this right now.’ – Coles’ response to Pat Lowe’s petition to reduce food packaging

- ‘Shopping at the supermarket inevitably results in a trash bin overflowing with plastic refuse. Whether it’s juice, meat, fruit, or other food items, it’s all packaged in plastic. The quantities are enormous -- Germany alone produces roughly 5.7 million tons of it each year. Although the majority of people conscientiously put these packaging into their yellow recycling bins, only about 42 percent of the waste gets "reincarnated" as diapers, fleece pullovers, stuffed animals, and the like. The rest is sent to waste incineration plants, where it is converted into energy. Black plastics in particular suffer this fate because it has thus far been impossible to sort them by material type. Conventional sorting systems operate specifically within the near-infrared range, which in general allows them to categorize plastics. But what works especially well for most plastics fails for black ones: the soot that gives them their dark color absorbs most of the signal, so the optical system cannot see these substances. At the same time, the need to recycle these dark plastics has become more urgent, because any efforts to meet the EU thresholds for car recycling programs will have to include black plastics.’ - Sorting black plastics according to type, Fraunhofer-Gesellschaft, Science Daily, 1 June 2016
Teacher resources:
- www.washingtonpost.com/lifestyle/food/ten-fruits-and-vegetables-youre-storing-wrong/2014/10/21/a7d8adb6-4b44-11e4-891d-713f052086a0_story.html
- www.sciencedaily.com/releases/2016/06/160601083922.htm

DID YOU KNOW?
‘There has been a 170 per cent increase in waste over the past 20 years, with two-thirds of that coming from food packaging.’ - Cost of convenience: Fruit and vegetables packaged in plastic the source of increasing waste in Sydney by Jane Hansen, The Daily Telegraph, 29 May 2016

ACTDEP036 • ACTDEP039
EXCURSION

VISIT your local supermarket to DISCUSS different types of fruit packaging.

EXAMINE all packaging for usability, convenience and aesthetics.

DESIGN your own packaging for fresh strawberries using a variety of CRITICAL and CREATIVE thinking strategies such as brainstorming, sketching, 3-D modelling and experimenting to generate innovative design ideas.

DEVELOP models, prototypes or samples using a range of materials, tools and equipment to test the functionality of your idea.

IDENTIFY factors that may hinder or enhance project development.

PRESENT your prototype to the class.

FOOD FOR THOUGHT
There’s nothing wrong with a bit of mould, right?
‘It’s a wonder the human race managed to survive before the advent of a date sticker telling us when we should be eating certain foods by, but survive we did. Mostly we sniffed our food and decided whether to eat it or not. These days, around half of us go by the date label printed on the packaging, and will often throw away food that is safe to eat. According to the Waste Resources Action Programme (Wrap), an organisation that promotes sustainability, we throw away 4.2m tonnes of food every year in the UK, which, aside from the financial costs, has a huge impact on the environment. We buy too much, or we cook too much, or we forget to store leftovers properly. But the biggest reason for throwing food away is because we don’t use it in time, and, in many cases, we simply look at the date on the packet rather than the contents – and that date might be OK to ignore. In February, a supermarket opened in Denmark that only sells food past its sell-by date. In the UK, online retailer Approved Food sells “short-dated” goods – defined as approaching or past their best-before date.’ - ‘There’s nothing wrong with a bit of mould’: chefs on food waste and using leftovers by Emine Saner, Angela Hartnett, Tamal Ray, Ruby Tandoh & Thomasina Miers, The Guardian, 21 March 2016

Here’s what those in the “foodie world” think…

**Angela Hartnett, Chef and restaurateur**

“At work, people are paying money so you’re going to use the best and if something is substandard, you’re not going to serve it. But at home I’m not going to throw odd bits of lettuce in the bin. I had a bit of pancetta at home, and it had a bit of mould on it. There’s nothing wrong with that because it’s a smoked, cured meat. If I think something is off, I throw it away, but if I think it’s fine, I eat it. I wouldn’t throw something out just because of the sell-by date. If there is veg that feels a bit wilted, I would cook it, not throw it away. I admit there is some confusion. I’m never sure about eggs – whether to keep them in the fridge or at room temperature – but eggs never really stay around for long enough in my house for me to worry about whether they’re fresh or not.”

**Ruby Tandoh, Food writer and cook**

“A strong survival instinct runs in my family. We don’t take unnecessary risks. My dad has waged a lifelong campaign against licking batter from the mixing bowl: he sees sorrow, salmonella and certain death in every drop of uncooked egg. My sister gave us her Christmas chocolates because their best-before date was in a month’s time and one of the Maltesers was shaped like a peanut. I’ve inherited this sell-by date cautiousness, which is a really uncool thing to say in the food world. If you’re into food, you’re meant to be into all of the food, including the soggy, smelly and seemingly unsavoury bits. When eggs are even a day past their best-before date, I agonise: I hold them to my ear and whisper to them and float or sink them in...
If all looks OK, I will then, just to be careful, cook them until they’re rubber-hard. I want to be better at eating resourcefully and sustainably, though. I want to learn just to scrape off the mouldy bits, go dumpster diving and eat nose-to-tail.”

Tamal Ray, Baker, G2 columnist and junior doctor
“T’ve got a pretty liberal attitude to best-before dates but even I have my limits. Once, I was on a placement at uni with a girl who made a giant pot of beef bolognese. She forgot to put it in the fridge. It lay in the corner of our sweltering kitchen for three days, incubating by the window until it had grown a thick layer of mould. She came in while I was making a cup of tea and realised she’d left it out. Right in front of me, she skimmed off the mould and tucked in. Misreading my look of horror, she offered the pan to me. “Fancy a bit?” “Uh no, I’m good thanks,” I replied, scuttling off to retch. The only time I ever really pay attention to best-before dates now is when I’m buying food. Once it’s home, I just rely on my senses. If it looks, smells and feels all right, then it’ll be fine to eat.”

Thomasina Miers, Chef and Guardian columnist
“I smell it and look at it, and if something smells or looks off then it’s off. I find yoghurt normally lasts at least a week past its date. I don’t leave raw meat lying around for long but I will happily leave leftover spag bol in the fridge for four or five days. I’ve had onions that have lasted for weeks in the fridge. In my parents’ house, we’ve found a ketchup bottle that was 10 years old that was fine to use. I’m very careful with some things. The easiest thing with which to give yourself food poisoning is raw chicken. Cooked rice is never in our fridge for longer than a day or so, because it can harbour bacteria— but, equally, stir-fried rice is one of the staple leftovers meal we have.”

THINK and WRITE a list of all the innovations and inventions in the kitchen designed to increase the shelf life of foods, reduce food waste and enhance food safety.

ACTDEK032

Sustainability | Environment | Water security | Natural heritage |
History | Design | Technology | Farming systems | Food miles |
Chemicals | Organic

COMPARE water-efficient irrigation methods in contemporary Australian food and fibre production with traditional Aboriginal systems and countries of Africa.
DISCUSS a variety of irrigation technologies and techniques as a group. 
Refer to page 8 of this teacher manual.

CASE STUDY
RESEARCH and EXAMINE water management and water use in hill furrow/surface irrigation in the Kilimanjaro region of Tanzania and in the Tohoku region in northern Honshu, Japan. DETERMINE how effective and efficient this irrigation system is.

COMPARE this irrigation system with traditional Aboriginal systems.

Text references:
- ‘The study underlines the following facts:
  - hill furrow irrigation systems are operated by groups of farmers who continue to use and develop long-standing traditions;
  - their practices and technology are of relevance to debates about indigenous intensive agricultural systems in Africa, concerning their emergence, sustainability and prospects for development;
  - as a result, groups of self-organised irrigators and their practices were targeted by several development initiatives;
  - in water management, initiatives have been seeking to control their water use; and in irrigation redevelopment, they have been trying to replace existing technology and organisation;
  - in this sense, a series of initiatives in water management for the Pangani river basin came in the wake of a hydropower redevelopment project led by Norwegian Agency for Development Cooperation (NORAD).’ - Studies of the waterscape of Kilimanjaro, Tanzania: water management in hill furrow irrigation by Mattias Tagseth, Norwegian University of Science and Technology

- ‘Indigenous irrigation systems have been a central feature of Asian agriculture since prehistoric times, and reflect technical knowledge with a proven record of sustainability. Modern agricultural development efforts often ignore this indigenous knowledge, replacing traditional infrastructure with new construction, and replacing indigenous management arrangements with state bureaucracies. For reasons of environmental conservation as well as institutional stability, indigenous irrigation systems should be intelligently assisted, rather than mindlessly replaced.’ - Building on tradition: Indigenous irrigation knowledge and sustainable development in Asia by David Groenfeldt

- ‘Many of these indigenous systems illustrate locally derived solutions to recurring problems in modern systems. This paper discusses three organisational themes that derive from analysis of local systems: accountable leadership; mini-unit organisation and canal-based

[Image]
‘In their food quest, Aboriginals developed an intimate understanding of local weather patterns and their relationships to plants, animals, and land. This knowledge is being used by meteorologists today. There was no incentive for farming, since hunting and gathering was successful and the climate changes that fostered the transition to farming elsewhere had less impact on Australia.’ - Societies, Networks, and Transitions: Volume I: A Global History, by Craig Lockard

**Describe** and **List** water-efficient irrigation methods being used today in agriculture in Australia.

**Examples of how on-farm irrigation efficiency can be improved include:**
- adopting technology that better matches irrigation water application to plant water requirements;
- reconfiguring irrigation layouts;
- installing infrastructure, such as recycling systems and piping, to improve on-farm storages and delivery systems; and
- installing new infrastructure, such as drip or spray systems, to improve in-field applications systems.

**Text reference:**
- ‘Modernising irrigation systems may involve automating and upgrading channels, rationalising and decommissioning redundant channels, constructing pipelines, upgrading the accuracy of metered outlets to farms and lining and remodelling channels.’ – Victorian Department of Environment, Land, Water and Planning

**Recognise** the need to increase food production using cost efficient, ethical and sustainable production techniques.

**Teacher resources:**

**Research Assignment**
Investigate the management of plant and animal growth through natural means and with the use of chemical products like herbicides and medicines when producing food and fibre products.
DEFINE the technique of ‘fertigation’ as described in the *From Paddock to Plate ‘Cherry’* virtual excursion. *The reference is below.*

“A flower turns into a piece of fruit by pollination. Lots of bees, lots of sunshine and good healthy weather. A bit of help from us with some fertilisers and it will set and each flower could produce six, seven or eight pieces of fruit.” (2:31 – 2:50)

“We fertilise our trees through fertigation, which we put through the water. We have found this the best way of giving the tree food. Once the tree starts flowering, we do that once every two weeks.” (3:54 – 4:07)

ACTDEK033

Food safety | Food security | Nutrition | Health | Packaging |
Processed foods | Food preparation | Technology | Preservation |
Food waste

EXAMINE the relationship between cooking and processing foods and the impact on nutrient value and aesthetics.

For example:
- Boiling
- Frying
- Steaming
- Sautéing
- Roasting
- Canning
- Pickling

VISIT our *From Paddock to Plate* recipe section. INVESTIGATE how a recipe can be modified to enhance health benefits. JUSTIFY decisions.

Would you prefer to eat strawberries fresh, stewed or frozen? Which method provides greater nutritional value?

“Strawberries are picked when they are ripe for the highest natural sugar content and the best flavour. Unlike mangoes or bananas that continue to
ripen after they have been picked, strawberries have to be picked at their prime. If you pick them when they are unripe, you do get a longer shelf life but they’re not as sweet and they are not as tasty. If they’re picked too ripe, then they’ll be slimy, you might have seen them squashed in the bottom of the punnet and they are no good. That’s why we pick them here at their best.” (4:31 – 4:58)

“After washing the berries they are blast frozen, so they go from four degrees down to minus 40 in 30 seconds. Now what this does, is that it holds the cell structure of the fruit and when you defrost it, it’s almost the same as what you would have before you froze it. From the blast freezer, the fruit goes up into an elevating conveyor into our multi head weigher, which just ensures that the exact weight goes into the bag. The berries drop down into the bag, is sealed, goes down through he conveyor and the check weigher, into a box, packed onto a pallet and into storage.” (5:52 – 6:23)

EXPLORE how the principles of food safety, preservation, preparation, presentation and sensory perceptions influence the creation of strawberry products for healthy eating.

EXPERIMENT with food preservation methods such as pickling, bottling, drying and freezing strawberries to determine changes to food structure and how these impact on designing healthy food solutions.

Text reference:
• ‘The natural course of things is decay. Our olfactory and visual senses will tell us when something is past its natural deadline. But rotting food is economically unviable in today’s commercially driven marketplace, and food scientists are always looking for more cost-effective ways of prolonging shelf life. In theory, it’s a win-win situation: the food industry maximises profits and we the consumers don’t have to constantly shop for fresh food. Of course, food preservation is not a new science. Before the days of refrigeration, meat and fish would either be slaughtered and cooked immediately, or preserved by salting. Preservation was essential to the peasant family when food was scarce over the winter months: meat and fish were salted and wild plants, peas and beans were dried. Rightly or wrongly, with the help of preservation techniques you can now buy seasonally produced food all year round. But don’t expect your food to taste the same, and preserved food is never as good as the fresh original. Whereas refrigeration slows the process of spoilage, deep freezing at –18°C virtually halts all spoilage by rendering the water in
food unavailable to micro-organisms to grow. They do, however, remain alive and resume activity once defrosted. Nutrient loss is generally small. The quality of frozen food depends largely on how soon it is frozen after harvesting. Frozen fruit and vegetables may actually contain more vitamins than their “fresh” counterparts which have been left to languish for days on end on shop shelves. Frozen vegetables such as peas are ideal stand-bys for when you have run out of fresh produce. However, some produce, such as strawberries, cannot retain their shape well when frozen, and frozen fruit and vegetables rarely taste as good as the fresh variety. ’ - Frozen, tinned and dried food – even the most health-conscious of us keep a supply to fall back on, by Maria Davies, Institution for Optimum Nutrition, 2006

EXPLAIN how the food preparation techniques above affect the sensory properties (flavour, appearance, texture, aroma) of strawberries.

CONDUCT sensory assessment testing of a range of foods to determine how characteristics might be used to enhance food solutions.

For example:
- Eating a fresh strawberry and then a dried strawberry
- Taste testing a variety of milks
- Comparing freshly squeezed juice to juices with artificial flavours and preservatives
- Eating nuts straight from the shell alongside nuts shelled prior to packaging

DETERMINE how the causes of food spoilage can be addressed when preparing, cooking, presenting and storing food items.

For example:
- Developing a comprehensive checklist of considerations for safe and hygienic food storage and preparation including danger zone temperatures for a food service
- Storing vegetables in the fridge rather than leaving out on the bench at room temperature to spoil
PROJECT

In groups, DESIGN, PRODUCE and CREATE a healthy snack using frozen berries for the canteen. Include a range of techniques to ensure optimum nutrient content, flavour, texture and visual appeal. Don’t be afraid to MODIFY your idea to generate the most optimum outcome.

DEVELOP criteria to assess the success of your recipe in terms of appearance, nutrition and flavour.

EXPLORE various marketing strategies to promote the item at your canteen as if it were in a healthy eating campaign. THINK about using food photography and digital technologies to assist your promotional strategy.

SURVEY the students at the school to determine the popularity of your healthy frozen berry snack through your marketing campaign.

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

Use the Paddock to Plate app to locate berry growers to source produce 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 grow.

DRAW a storyboard and PRODUCE a safety information video for employees who work at Matilda’s.

DETAIL risk management practices for using the equipment and machinery that you can see in the video.

LOOK at the employers working in the packing and processing factory. Take note of the clothing that they are wearing.
“With our strawberries for Matilda’s, they’re handpicked and then get transported down to our processing facility. The fruit is hand graded which means that it’s sorted out by size and shape. All that fruit then goes into our washing process. Just like you would with your fresh strawberries at home, you run them under the tap. It goes on a shaking conveyor so the water droplets come off it and then it goes into the freezing tunnel.” (5:27 – 5:50)

“After washing the berries they are blast frozen, so they go from four degrees down to minus 40 in 30 seconds. Now what this does, is that it holds the cell structure of the fruit and when you defrost it, it’s almost the same as what you would have before you froze it. From the blast freezer, the fruit goes up into an elevating conveyor into our multi head weigher, which just ensures that the exact weight goes into the bag. The berries drop down into the bag, is sealed, goes down through the conveyor and the check weigher, into a box, packed onto a pallet and into storage.” (5:52 – 6:23)

DID YOU KNOW?
Rubbing lemon juice on your hands will help to remove strawberry stains.

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

USE the Paddock to Plate app to FIND and VISIT a local farmer’s property to INVESTIGATE technologies being used on this farm to assist productivity and environmental sustainability.

Use the Paddock to Plate app and From Paddock to Plate book to locate farmers who will be able to provide excursion recommendations.

If this is not possible, make observations from the From Paddock to Plate virtual excursions.

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 | Media

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.

SUMMARISE data, from students’ own findings from investigations and secondary sources and use scientific understanding to identify relationships and draw conclusions and evaluate claims based on evidence.

What conclusion can you draw?

Reflect

What have the students learnt from this unit?

• What is something new that you have learnt about frozen fruit production in Australia?
• Describe what you know about sustainable farming practices.
• How might you help others know more about how Australian farmers grow strawberries?
• What have you learnt about food security and food safety?
• What questions do you have about the ‘from paddock to plate’ journey of frozen fruit and Australian strawberry 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.