Learn about

COTTON

Educator's Resource

New Zealand Edition

Level 1 - 3

SowtheSeed
AGRICULTURAL & HORTICULTURAL
SCIENCE ADVISORY TEAM

GEORGE the FARMER

Acknowledgments

The curriculum-linked resource is designed to introduce young people to the production of fibres in New Zealand.

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References

New Zealand Ministry of Education. New Zealand Curriculum. Retrieved from https://nzcurriculum.tki.org.nz/The-New-Zealand-Curriculum

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Cotton Australia
Retrieved from https://cottonaustralia.com.au

Backyard Buddies
Retrieved from https://backyardbuddies.org.au

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Introduction

We sleep in it, dry ourselves with it, wrap our bodies in it and we even cook with its oil. This George the Farmer educational resource aims to raise awareness about the incredible products that can be produced from the cotton plant.

NATURAL FIBRES

Natural fibres come from nature and can include plant fibres or animal fibres.

Plant fibres include cotton, hemp and coconut.

Animal fibres include wool and silk.

Fibre can be turned into thread or yarn and used to make many products that we use every day like t-shirts, jeans, socks, bed sheets and even paper!

THE COTTON PLANT

Cotton is both a food and fibre crop and is related to the Hibiscus plant. It is a leafy, green shrub that produces fluffy white cotton bolls after the plant goes through a flowering stage.

Cotton is grown as an annual plant and reaches a height of 1.2 metres.

Squares (flower buds) develop several weeks after the plant starts to grow, with flowers appearing a few weeks later. The flowers then drop, leaving a ripening seed pod that becomes the cotton boll (the fruit) after pollination. The flower of the cotton plant is a self-pollinating type that does not need insects to assist with pollination.

The plant also produces seeds that are contained in small capsules (called locks) surrounded by fibre in the cotton bolls. Each cotton boll usually contains 27 - 45 seeds, and attached to each seed is between 10,000 – 20,000 tiny fibres about 28mm in length.

THE PRODUCTION CYCLE

The cotton production cycle starts with a grower preparing the soil before planting the cotton seeds.

The farmer then cares for the plants over summer before harvesting the cotton in autumn, approximately 150-160 days after planting the seeds.

A big mechanical cotton picker is used to pick the cotton bolls off of the plants and then bale them into round cotton modules.

After harvest, the farmer delivers the cotton modules to the cotton gin (cotton cleaning facility) nearest their property.

At the cotton gin, the cotton lint (fibre) is removed from the seeds and baled to be exported overseas where most Australian cotton is further processed into yarn. Yarn is then bought for manufacturers to make into all sorts of cotton products that we use in our daily lives.

Did you know that one 227-kilogram bale of cotton can produce:

- 2,100 pairs of boxer shorts…
- 3-thousand nappies…
- 215 pairs of jeans…
- 12-hundred t-shirts…
- 4,300 pairs of socks…
- And 250 single bed sheets!

Additionally to fabric, cotton seed is also used to make products like oil for cooking hot chips and moisturisers for skin. The seeds are also fed to livestock. What a versatile plant!

A message from George!

Did you know that there is a plant that is grown for both fibre AND food? We sleep in it, dry ourselves with it, wear it, we cook with its oil...and we even feed the seed to livestock. This amazing plant is called cotton, and you'll find it growing on Australian farms mainly in Queensland and New South Wales.

Cotton begins as a tiny seed that's planted in rows in large paddocks each spring. The cotton plants start to emerge in as little as 10 days…and with the help of sunshine and rain — or water from a big channel or dam — the cotton plants soon grow into bushes.

Not too long after, flowers emerge, and when they drop their petals, they leave seed pods called cotton bolls. As the bolls ripen they begin to crack open revealing soft, fluffy cotton fibres hiding inside.

About 150-160 days after planting the seeds, a big mechanical cotton picker is brought into the paddock to pick the cotton bolls off of the plants. The picker bales them into round cotton modules that fall out the back of the machine.

After harvest, the farmer delivers the cotton modules to the cotton gin (cotton cleaning facility) nearest their property. At the cotton gin, the cotton lint (fibre) is removed from the seeds and baled again. This cotton is then sent overseas where it is turned into yarn or thread, before being manufactured into all sorts of cotton products that we use every day.

Did you know that one 227-kilogram bale of cotton can produce:
2,100 pairs of boxer shorts…
3-thousand nappies…
215 pairs of jeans…
12-hundred t-shirts…
4,300 pairs of socks…
And 250 single bed sheets!

Cotton really is an amazing natural fabric that's as woven into our lives as the threads in our favourite t-shirt, shirt or jeans! The next time you go to grab a clean t-shirt or towel, remember it all started out from a seed…that grew into a plant….with the help of sunshine, water — and some super dedicated farmers!

Resource Description

The pages in this resource are intended as starting points for a cross-curricular approach to learning, after watching the George the Farmer YouTube video "Learn about Cotton" https://www.youtube.com/watch?v=cyzEjyHBlqc and two George the Farmer activity videos from the series, 'In the Classroom': https://bit.ly/4cOMd8i

The activities seek to complement and extend the enjoyment students will experience from seeing the videos, whilst at the same time meeting some of the requirements of curriculum outcomes.

The activities in this resource can be printed out for students, or alternatively, display the activity page from the PDF on your interactive white board or import an activity page into your online teaching and learning environment such as Google Slides and have the students use their existing workbooks to complete the task.

Curriculum Focus

The guide is divided into a series of Science, Technology, the Arts, and Mathematics activities aimed at students between the ages of 4 and 8 years.

The activities are also suitable for teachers and students in early childhood and care settings such as long day care services, preschools, kindergartens, and outside school hour care services.

New Zealand Curriculum Connections

Level 1

Technology

Technological Practice

Students will:

Planning for practice

- Outline a general plan to support the development of an outcome, identifying appropriate steps and resources.

Brief development

- Describe the outcome they are developing and identify the attributes it should have, taking account of the need or opportunity and the resources availabl.

Outcome development and evaluation

- Investigate a context to communicate potential outcomes. Evaluate these against attributes; select and develop an outcome in keeping with the identified attributes.

Technological Knowledge

Students will:

Technological modelling

- Understand that functional models are used to represent reality and test design concepts and that prototypes are used to test technological outcomes.

Technological products

- Understand that technological products are made from materials that have performance properties.

Technological systems

- Understand that technological systems have inputs, controlled transformations, and outputs.

Nature of Technology

Students will:

Characteristics of technology

- Understand that technology is purposeful intervention through design.

Characteristics of technological outcomes

- Understand that technological outcomes are products or systems developed by people and have a functional nature and a physical nature.

Science

Living World

Students will:

Life processes

- Recognise that all living things have certain requirements so they can stay alive.

Ecology

- Recognise that living things are suited to their particular habitat.

Material World

Students will:

Properties and changes of matter

- Observe, describe and compare physical and chemical propertieis of common materials and changes that occur when materials are mixed, heated, or cooled.

Chemistry and society

- Find out about the uses of common materials and relate these to their observed properties.

Mathematics

In a range of meaningful contexts, students will be engaged in thinking mathematically and statistically. They will solve problems and model situations that require them to:

Statistics

Statistical Investigation

Conduct investigations using the statistical enquiry cycle:

- Posing and answering questions.
- Gathering, sorting and counting, and displaying categroy data.
- Discussing the results.

Statistical Literacy

- Interpret statements made by others from statistical investigations and probability activities.

New Zealand Curriculum Connections

Level 2

Technology

Technological Practice

Students will:

Planning for practice

Develop a plan that identifies the key stages and the Brief development

- Explain the outcome they are developing and describe the attributes it should have, taking account of the need or opportunity and the resources available.

Outcome development and evaluation

- Investigate a context to develop ideas for potential outcomes. Evaluate these against the identified attributes, select, and develop an outcome. Evaluate the outcome in terms of need or opportunity.

Technological Knowledge

Students will:

Technological modelling

- Understand that functional models are used to explore, test, and evaluate design concepts for potential outcomes and that prototyping is used to test a technological outcome for fitness of purpose.

Technological products

- Understand that there is a relationship between a material used and its performance properties in a technological product.

Technological systems

- Understand that there are relationships between the inputs, controlled transformations, and outputs occurring within simple technological systems.

Nature of Technology

Students will:

Characteristics of technology

- Understand that technology both reflects and changes society and the environment and increases people's capability.

Characteristics of technological outcomes

- Understand that technological outcomes are developed through technological practice and have related physical and functional natures.

Mathematics

In a range of meaningful contexts, students will be engaged in thinking mathematically and statistically. They will solve problems and model situations that require them to:

Number and Algebra

Number strategies

- Use simple additive strategies with whole numbers and fractions.

Number knowledge

- Know the forward and backward counting sequences with whole numbers to at least 1000.
- Know the basic addition and subtraction facts.

Patterns and relationships

- Generalise that whole numbers can be partioned in many ways.

Statistics

Conduct investigations using the statistical enquiry cycle:

- Posing and answering questions.
- Gathering, sorting, and displaying category and whole number data.
- Communicating findings based on data.

ACTIVITY 1

Design and make a cotton journal

Watch the George the Farmer Cotton video and think about what you might record in your journal.

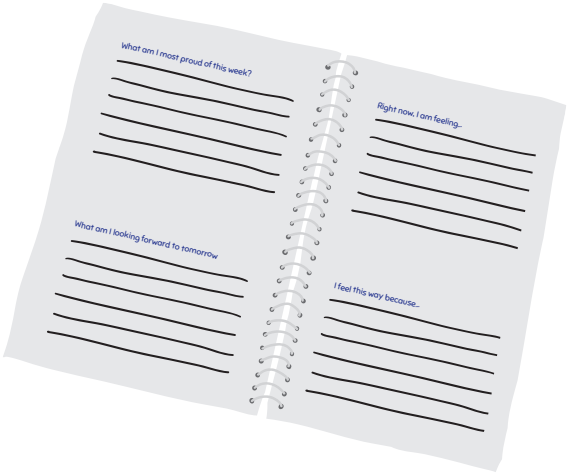
Think about what you saw, what you discovered about the incredible cotton plant, how the plant is grown and who produces them.

Then, tell the story of where cotton comes from and the products that are produced from the fluffy fibre.

You can draw pictures, write information, document data and you can decorate your journal in any way you wish. Make a colourful, exciting cover.

Create a journal by folding 6 pieces of A4 paper together and stapling at the spine to create a book for journaling.

If you have an arts supplies store nearby, you could also look at making a journal out of cotton 'rag' paper.



Write a journal entry in your cotton journal to retell what you know about cotton farming.

ACTIVITY 2

Sprout a seed

Cotton is grown by passionate farmers.

Cotton has a long and interesting history in the world and is one of the oldest known fibres. Archaeologists found cotton fabric 5,000 years old at Mohenjo Daro, an ancient town in West Pakistan. Similarly aged examples have also been found in Egypt and Mexico. Cotton has a relatively long history in Australia – native varieties have grown here for many thousands of years with other cotton varieties being introduced to Australia with the First Fleet in 1788. Opportunistic rain-fed crops appeared from the 1850's, however, it was not until the 1960's that the modern cotton industry started large scale commercial crops with better mechanical pickers and irrigation.

Cotton bushes have beautiful green leaves, white flowers that turn a pinky purple shade, bolls that contain cotton – each of which contain cotton seeds. Believe it or not, these seeds are fairly easy to germinate. Cotton seeds are not grown in New Zealand, so to carry out this activity, use radishes to investigate the germination process.

Plant the seeds in containers with potting mix and soil. Keep the pots in a warm location above 15 degrees.

Did you know that these seeds are the 'embryo' which grows into a new plant?

Plants need soil, sunshine, and water to grow.

Remember: Keep the seeds in a warm place for germination above 15 degrees.

What you need to do – record your findings in your journal:

Set up a workstation with recycled containers, soil, paper towel, radish seeds, water, and gardening tools.

1. With a partner, plan the steps involved in growing 3 radish seeds.
2. Then create a visual representation to plot the steps involved in your journal.
3. Brainstorm what else is needed to help seeds grow. Record in your journal.
4. Talk with your partner about where the pots containing the seeds might best be placed for them to receive what they need (sunlight and regular watering). Then construct a procedural text: 'How to grow your own seeds….'
5. Now, estimate and measure your seedlings regularly Make tables with headings such as time, date, size and note observations over several weeks.
6. The seedlings will need to be placed outside or planted in the school garden when they are approximately 10cm in height (within 2-5 weeks), in a position where they are protected from damaging weather conditions. Be careful not to damage the roots when they are transplanted.

TIME	DATE	SIZE	OBSERVATIONS

Remember to observe your planted seeds regularly and keep a diary of observations in your cotton journal (See Activity 1).

Good bugs. Bad bugs.

Not all bugs are pests. Good bugs pollinate plants through flowers, break down dead flora and fauna, aerate the soil and can be yummy food for wildlife.

Recall in the video how cotton farmer Daniel mentioned the good bugs and other animals that are often found in cotton fields that help the cotton plant to grow sustainably by eating pests.

In a garden setting, there are other ways to encourage good bugs and helpful animals. These include planting beneficial plants nearby, providing a water source and hollows or places for bugs and animals to hide. Can you see any of these items nearby where you have placed your cotton or apple seedlings?

Your final task is to investigate what good bugs can be found on or around your seedling. With a partner, sit quietly near your seedling for 20 minutes. You may need a magnifying glass! Record in the space below, drawings of any bugs that you find. Try and name them. After returning to the classroom, refer to the Backyard Buddies website to identify your bugs: https://backyardbuddies.org.au/explore/bugs-and-insects/

Draw the bugs that you see on or around your seedlings.

Replicate your finished drawings in your journal.

Good bugs. Bad bugs.

The main insects that affect cotton production (bad bugs), requiring control measures in most regions in most seasons include: heliothis caterpillar, green mirid, two spotted mite, cotton aphid, whitefly and mealy bugs.

The control of bad bugs relies on some of these good bugs: ants, earwig, lady beetle, lacewing and spiders.

Research what each insect that you found in the garden feeds on to survive. Is it a good bug or a bad bug?

Replicate your answers in your journal.

ACTIVITY 3

Where do our clothes come from?

Clothing is made from natural fibres or synthetic fibres.

The clothing that we wear every day is made from a variety of materials, but the fibres in those items are either natural or synthetic (made in a laboratory).

Natural fibres come from a variety of sources including wool from a sheep, silk from silkworms, mohair from goats, hemp from hemp plants or cotton from cotton plants. Cotton is highly breathable, absorbent and soft to touch which makes it a very comfortable fabric to wear.

Cotton is an amazing plant that can be used for both food and fibre. As the cotton plant grows, pods appear and when they ripen, they pop open revealing these fluffy cotton fibres. Up to 160 days after planting, the cotton is ready to harvest. It's picked by machine, and then rolled into round bales… once it's cleaned, the cotton is sent to overseas factories where it's spun into yarn. This yarn then becomes t-shirts, socks, jocks, jeans, towels, bed sheets – all sorts of items that you use every day.

Your challenge with a partner is to locate 8 items of clothing, bedding or even tea towels and find out where they come from and what they're made of. How many pieces do you think are made of cotton? How many pieces are made in New Zealand? Watch the 'In the Classroom – Where do your clothes come from?' video on YouTube before further investigation: https://rb.gy/3xd1k2

What you need to do – record your findings in your journal:

1. With a partner, locate the tags on each item and create a chart in your journal with three columns and headings – item, material, from.
2. Record on the chart the name (eg. shirt, pants, sheets), what material the item is made from (wool, cotton, a synthetic fibre like polyester or rayon) and the country that the item was made in. Did you have any items that were made in New Zealand?
3. If you would prefer, print and use clip art images to show what type of item you are researching – or cut out pictures from magazines.
4. Now that you have your 8 items recorded, it's time to tally how many of your items are made from wool, cotton or synthetic fibres. Create another chart with three columns and headings – wool, cotton, synthetic.
5. Review your completed chart and mark a I under each relevant column.
6. How many items do you have that have been made from natural fibres? How many from cotton? Isn't it

ITEM	MATERIAL	FROM

Remember when creating a tally to mark I for every 1. Once you have 4 marks, place a line through all 4 marks to indicate 5.

Design a t-shirt.

Cotton is a one of the most popular fibre choices for companies that create fashion items. Cotton is strong, breathable, natural, and renewable. Cotton keeps the body cool in summer and warm in winter because of its good heat conducting properties. Cotton's strength and ability to absorb moisture makes it ideal to make clothes from including army uniforms, and even astronauts' uniforms for inside space shuttles!

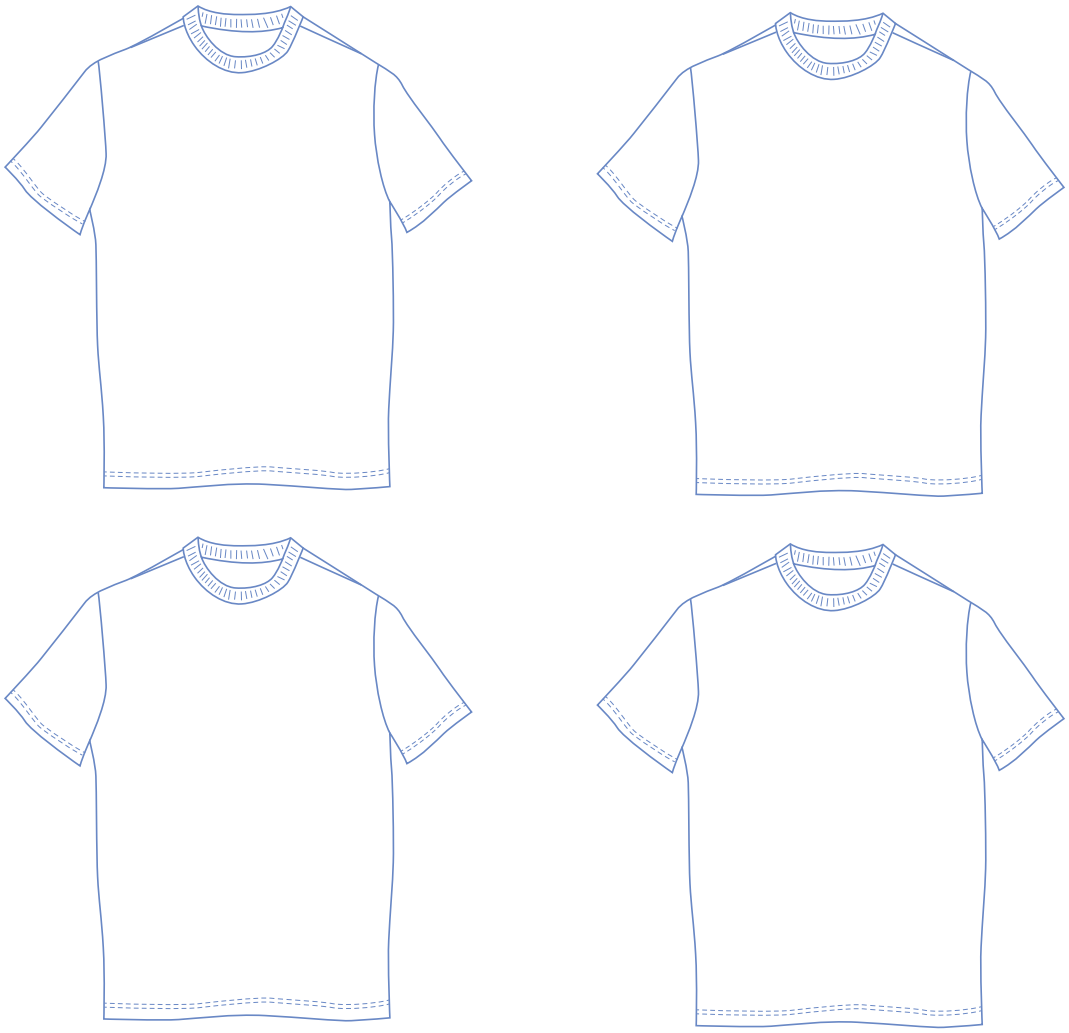
In a school environment, cotton is used for many school shirts, shorts, dresses and socks.

Plus, due to its natural whiteness and high rate of absorbency, cotton is one of the best fabrics to dye or to print designs on to, which enables one t-shirt, for example, to look very different to another t-shirt.

Your job is to come up with an exciting t-shirt design for kids that focuses on the cotton plant, sustainability or farming. Be creative! You can draw your design by hand, use colour, text or use the free online image and graphics program, Photo Pea.

Sketch multiple ideas for your t-shirt design below.

Replicate your chosen drawing in your journal before replicating it at A4 size.



ACTIVITY

Cotton artwork

Clothing is made from natural fibres or synthetic fibres.

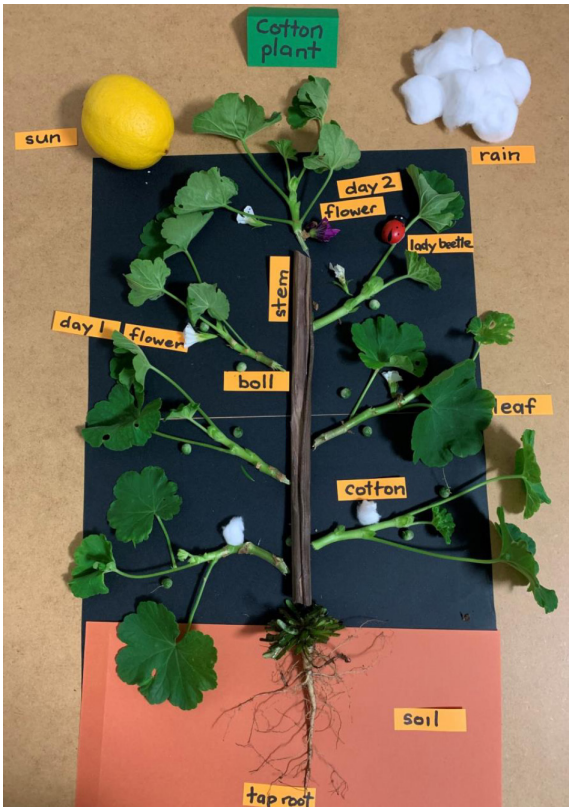
The cotton plant is grown commercially as an annual shrub that reaches about 1.2 metres in height. Its leaves are broad and heart-shaped with coarse veins and three to five lobes. The plant has many branches, with one main central stem. The cotton plant's taproot reaches a depth of 1.5 metres.

Squares (flower buds) develop several weeks after the plant starts to grow, with flowers appearing a few weeks later. The flowers then drop, leaving a ripening seed pod that becomes the cotton boll (the fruit) after pollination. The plant also produces seeds that are contained in small capsules surrounded by fibre in the cotton bolls. Almost all parts of the cotton plant are used in some way, including the lint, cottonseed, linters, stalks and seed hulls.

Your job is to locate items in the garden, from home or in the classroom to make your own 'scientific model' of a cotton plant. Watch the 'In the Classroom – Cotton Artwork' video on YouTube for further instructions: https://youtu.be/mwgvFDuLg4M

Hints and Tips:

1. **In this activity, no glue has been used as a photo is enough to tell the story.**
2. Note that each cotton boll has a leaf opposite it and this leaf provides the energy and nutrients such as the leaf catching the energy from the sun and drawing up nutrients from the soil.
3. Label your model showing where the stem, leaves, roots, flowers and cotton bolls are on the plant. To demonstrate the needs of the plant, add in the sun, a rain cloud and the soil, and remember to also label these.
4. Once completed, create other models to show the different life stages of the cotton plant. From a small seedling with only two small leaves and short tap root, to an immature cotton plant about two months old, just as the first flowers start to appear.
5. The assessment of your artwork will show how well you have understood that cotton plants are living things,



ACTIVITY 5

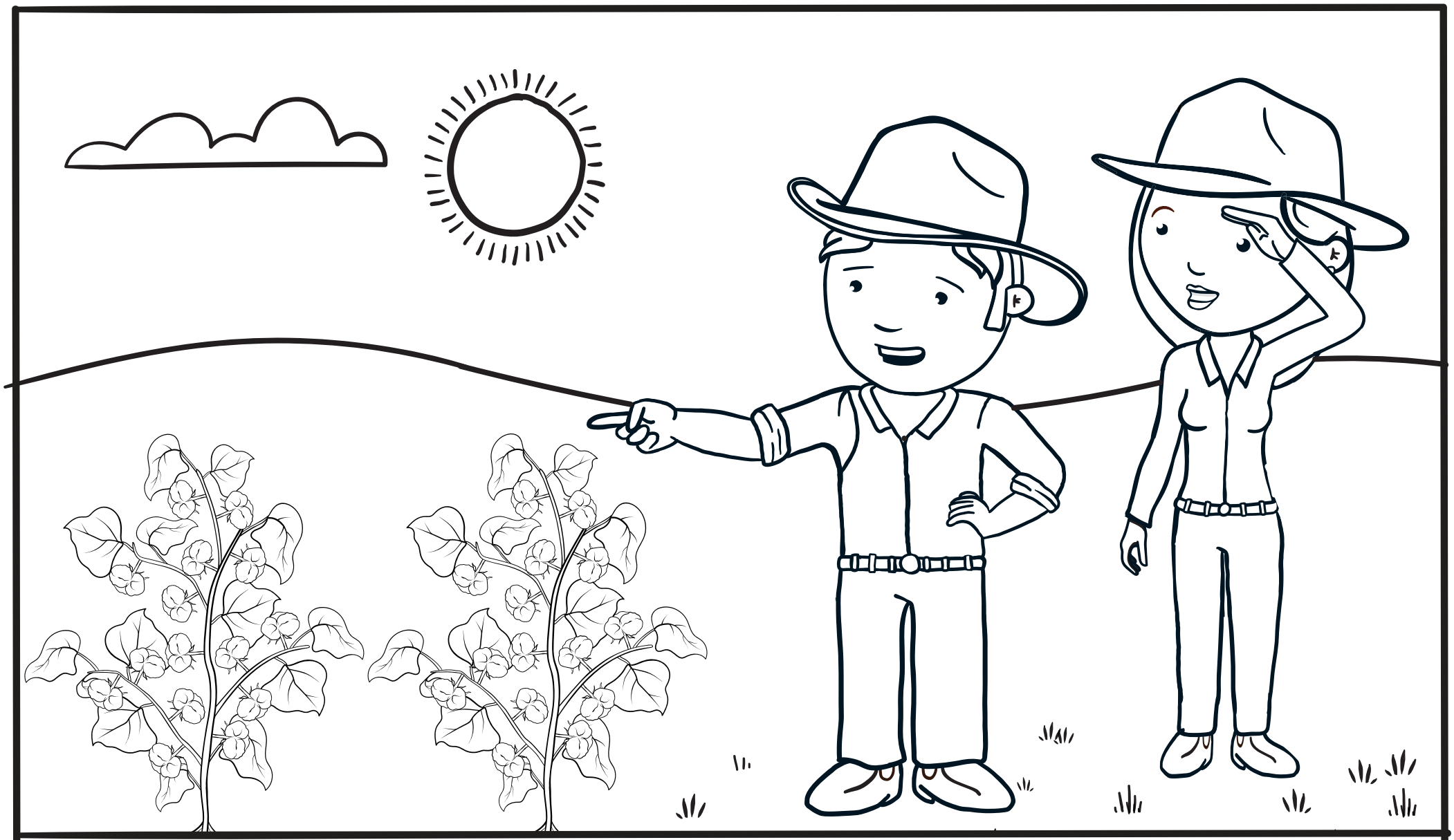
Comprehension questions

Watch the George the Farmer video on YouTube titled, 'Learn about Cotton'

Your task is to answer all of the following questions in your journal.

1. Where does cotton come from?
2. Name 5 items that cotton can be used to make
3. How long has the Kahl family grown cotton for?
4. What valley in western New South Wales does George the Farmer visit?
5. What happens to cotton once we've finished using it?
6. What season does soil preparation for the cotton crop begin?
7. What season does Farmer Daniel plant the cotton crop?
8. What month does picking begin?
9. What is the location called where the cotton is taken to after the farm?
10. What can the cotton seed be used for?
11. How long does it approximately take from the time the seed is planted until cotton picking?
12. What happens to the cotton when it first arrives at the Cotton Gin?
13. How many kilograms can the Cotton Gin bale in one day?

Answers: 1. A plant; 2. Shirts, jeans, socks, jocks, sheets, t-shirt, bedding, towels, oil; 3. 60 years; 4. Namoi Valley; 5. It's biodegradable and can return back to the earth; 6. Winter; 7. Spring; 8. April; 9. Cotton Gin; 10. oil or feed for livestock; 11. 150 days; 12. The cotton is cleaned; 13. 230,000kg.



GEORGE THE FARMER

COTTON AUSTRALIA

THE COTTON HOUSE

How many things can you find in the Cotton House? List and colour