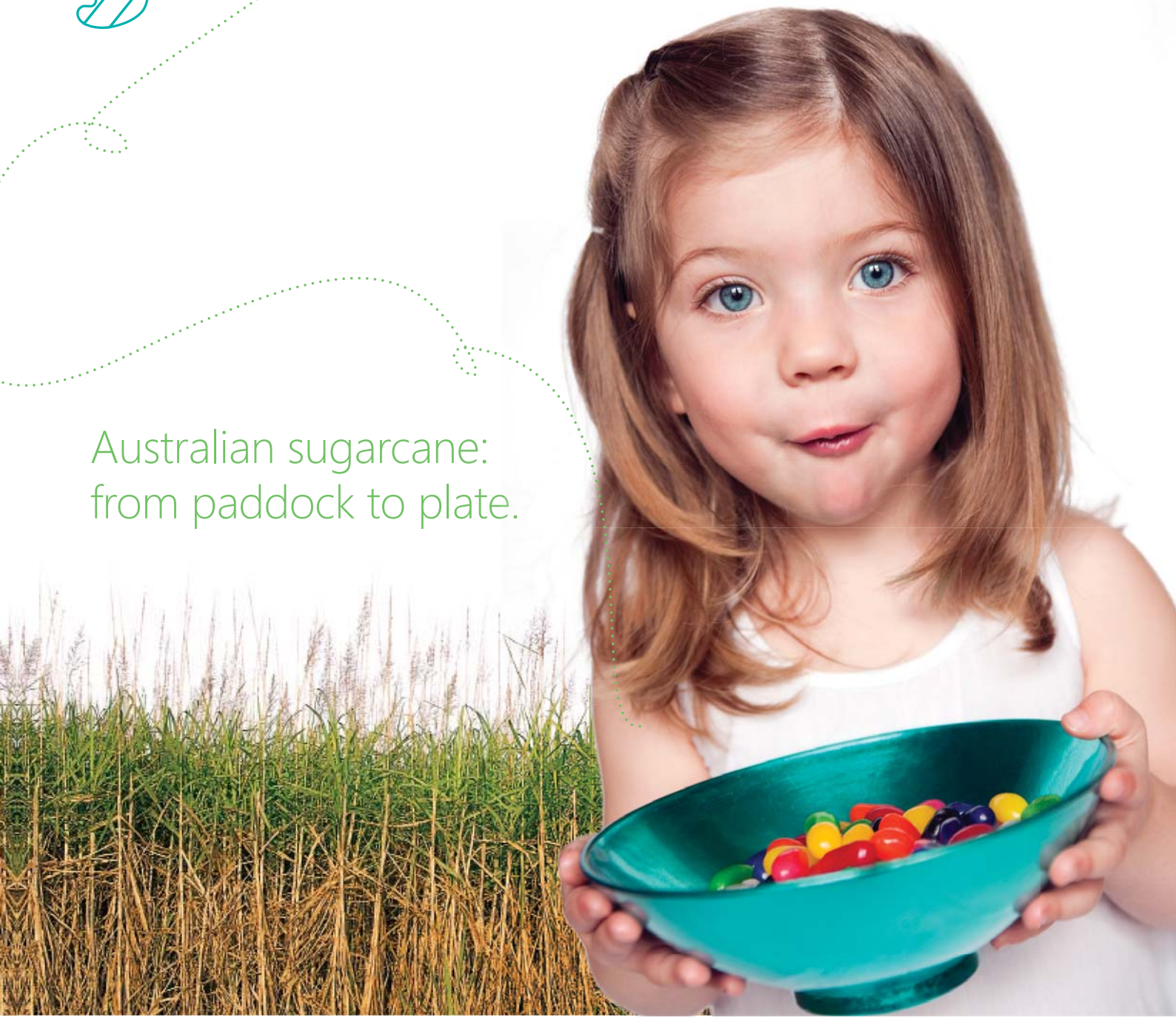
CANEGROWERS

The journey of the jellybean

Australian sugarcane:
from paddock to plate.



Where does sugar come from?

Meet farmer Joe and Jana. They're here to tell you all about the journey of the jellybean. Sugar, which is the main ingredient in jellybeans, is produced in more than 100 countries around the world. In Australia, sugar is made from a tall tropical grass called sugarcane. Farmer Joe grows sugarcane so he knows all about it.

from sugarcane to jellybeans

What is sugarcane?

Sugarcane is a tall tropical plant that is similar to bamboo. To grow successfully, sugarcane needs strong sunlight, fertile soil and lots of water. It needs at least 1.5 m of rainfall each year or access to irrigation.

Sugar is made in the leaves of the sugarcane plant through a natural process called photosynthesis.

Photosynthesis occurs when a plant, using energy from the sun, transforms carbon dioxide (CO_2) and water (H_20) into oxygen (0_2) and glucose (sugar). The plant absorbs water through its roots and O_2 from the air through the pores in its leaves. Sugar is created when this process is combined with the help of a substance called chlorophyll.

Chlorophyll is green and gives plants their colour. It allows plants to absorb the sun's energy more readily.

In the same way that animals store fat, the sugarcane plant stores energy that is doesn't need. This extra energy is sugar and it is stored as sweet juice in the plants' stalks. When ripe, sugarcane stalks are harvested and converted into raw sugar.

Where is sugarcane grown?

In Australia, sugarcane can be seen growing along 2,100 kilometers of coastline between Mossman in far north Queensland and Grafton in northern New South Wales.

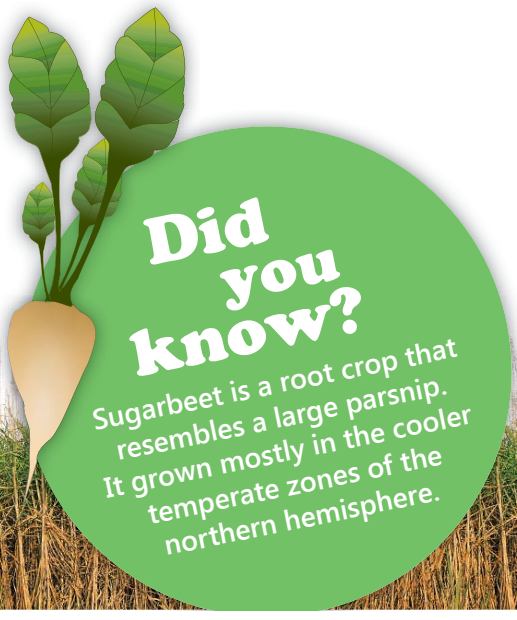
Sugarcane growers manage some unique and spectacular vegetation, animal life and waterways. Many cane growers live close to rainforests and the Great Barrier Reef. Because of their proximity, many cane growing families spend their weekends outdoors swimming and fishing.

Cane growers go out of their way to manage the land so it is still in excellent condition for their children and grandchildren to enjoy for many generations to come.

Why is sugarcane important for Australia?

Sugarcane is one of Australia's most important rural industries, worth around $1.5 - $2.5 billion to the Australian economy. Approximately 70% of the world's sugar is produced from sugarcane; the remaining 30% is made from sugarbeet.

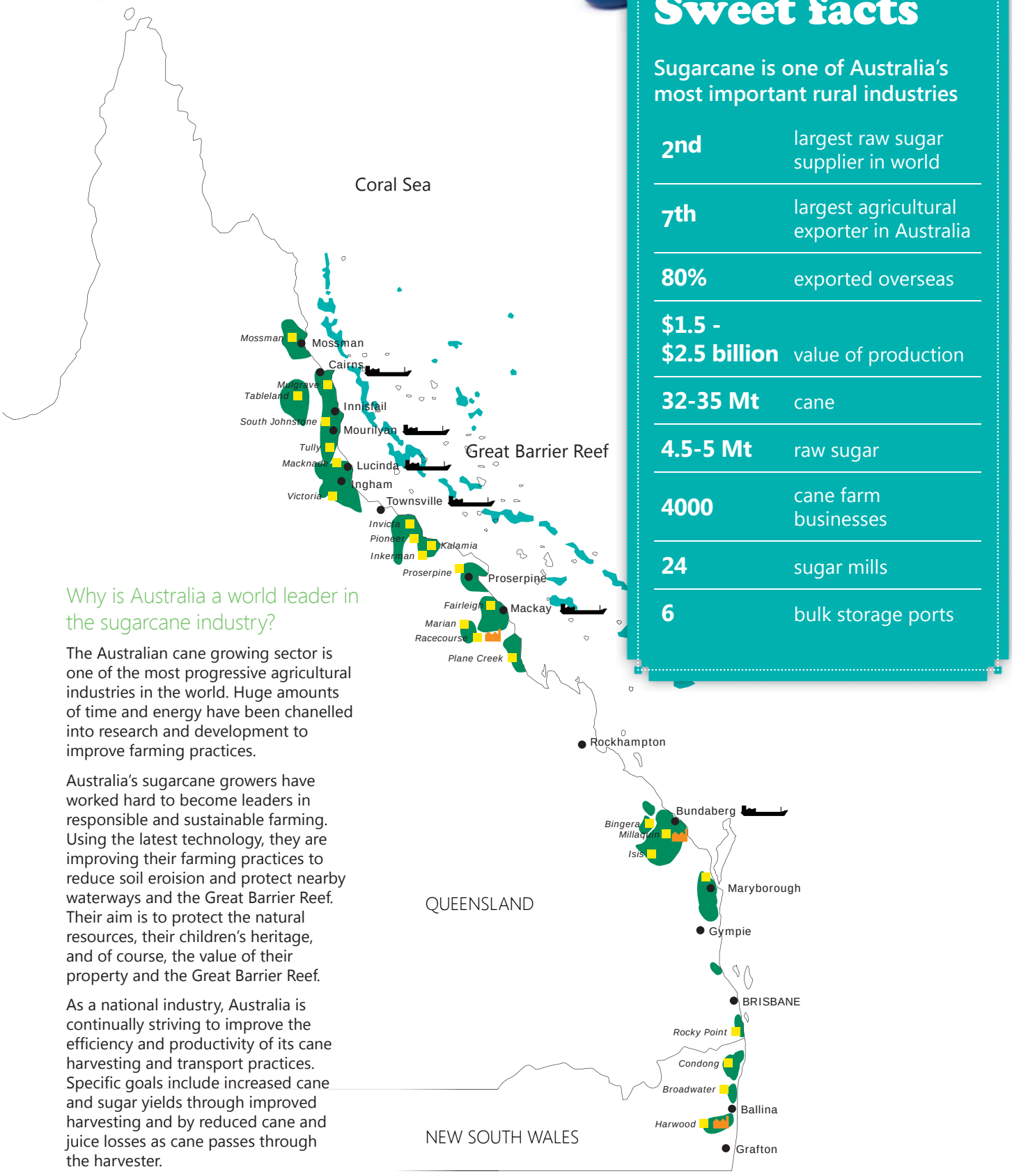
Cane growing and sugar production has been around for over a hundred years in Australia. The sugarcane industry has helped build many coastal towns and is the main source of income for many towns to this day.



Sweet facts

Sugarcane is one of Australia's most important rural industries

2nd	largest raw sugar supplier in world
7th	largest agricultural exporter in Australia
80%	exported overseas
$1.5 - $2.5 billion	value of production
32-35 Mt	cane
4.5-5 Mt	raw sugar
4000	cane farm businesses
24	sugar mills
6	bulk storage ports



Why is Australia a world leader in the sugarcane industry?

The Australian cane growing sector is one of the most progressive agricultural industries in the world. Huge amounts of time and energy have been chanelled into research and development to improve farming practices.

Australia's sugarcane growers have worked hard to become leaders in responsible and sustainable farming. Using the latest technology, they are improving their farming practices to reduce soil eroision and protect nearby waterways and the Great Barrier Reef. Their aim is to protect the natural resources, their children's heritage, and of course, the value of their property and the Great Barrier Reef.

As a national industry, Australia is continually striving to improve the efficiency and productivity of its cane harvesting and transport practices. Specific goals include increased cane and sugar yields through improved harvesting and by reduced cane and juice losses as cane passes through the harvester.

The sugarcane process:

1

1. Planting

Sugarcane is grown by replanting part of a mature cane stalk. Farmers cut some of the fully grown cane stalks into 40 cm lengths called 'setts'.

These setts are planted by special machines, which drop them into furrows, add fertiliser and cover them with soil.

2

2. Growing

To grow successfully, sugarcane needs strong sunlight; fertile soil; and lots of water (at least 1.5 metres of rain each year or access to irrigation).

New shoots grow from buds on the joints of the setts. These shoots break through the soil surface between two and four weeks after planting. Each sett can shoot up to 12 stalks, forming what is known as the stool of sugarcane.

In warm and sunny Queensland, it takes nine to 16 months to grow a cane crop. Growth is slower in cooler climates like NSW, where it takes 18 to 24 months to grow a cane crop.

Typically, a cropping cycle comprises one plant crop and 3 to 4 ratoon (regrowth) crops. When ripe, the cane is usually about 2 to 4 metres tall.

3

3. Harvesting

Heavy-duty machines called cane harvesters cut the cane stalks off the plant at its base. As they move down each row, the cane is collected and cut into shorter 30 cm length pieces known as 'billets'.

A second machine called a cane haulout drives alongside the harvester to collect the billets.

In Australia, sugarcane is harvested annually during the drier months of June through to November. As harvesting cannot be done in the rain, farmers are very dependant on fine weather.

4

4. Getting cane to the mill

To minimise sugarcane deterioration and juice evaporation, sugarcane must be transported to a sugar mill within 16 hours of being harvested.

Once full, the cane haulout then drives across the paddock to the road, where it unloads its contents either into a semi truck (for road transport) or mill bins at local sidings on the nearest railway track (for train transport).

The sugarcane industry maintains a network of nearly 4000 km of narrow-gauge rail lines to get cane from the paddock to the mill quickly and cost effectively.

from paddock to plate

5

5. Milling

Sugar mills crush cane to extract and separate the sucrose (sugar) from the water, impurities and plant fibre contained in the billets. Using a computerised scheduling system, the sugarcane is monitored as it moves through a four step milling process.

1. Weigh & Record

Sugarcane is weighed and processed at automatic cane-receiving stations as soon as it arrives at the mill.

2. Chop & Shred

The billets are then tipped into a cane carrier and transported to the shredder where they are chopped and shredded into fibrous material. This process ruptures the juice cells.

3. Crush

The cane material is then crushed as it is fed through a series of mills. Three large rollers arranged in a triangle formation, separate the juice from the fibrous material. This process separates the juice from the baggasse, which is fibrous material used as fuel to run the mill's boiler furnaces.

4. Heat & Cool

The juice is pumped away for processing into raw sugar. It is cleaned to remove impurities and thickened into a syrup by boiling off excess water. It is then seeded with tiny sugar crystals in a vacuum pan and boiled until sugar crystals have formed and grown. These crystals are separated from the molasses around them in centrifuges that are like giant spin dryers. The crystals are then tumble-dried and stored in large bins until they are to ports.

6

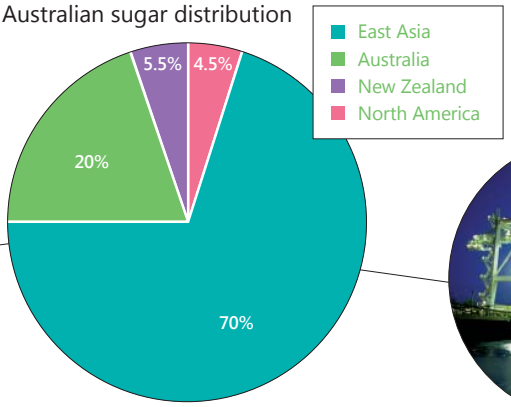
6. Refining: from 'raw' to ready-to-eat

Australian mills produce 'raw' sugar, a product not to be confused with the raw sugar that we use to sweeten hot drinks. 'Raw' sugar from the mill is refined until it is suitable for human consumption and for use as an ingredient in the manufacture of food and drinks.

At the refinery, the 'raw' sugar crystals are washed and dissolved in hot water. Carbon dioxide and lime are added to the melted 'raw' sugar to remove impurities. Any remaining colours and impurities are removed as the sugar is filtered through cloth. The now pure sugar is boiled in a vacuum pan and seeded with fine sugar crystals.

When the crystals are large enough, they are tumble dried to remove moisture. The dried sugar is then graded into sizes and packaged for for delivery to customers.

Australian sugar distribution



80% exported overseas

Approximately 80% of Australia's sugar production is exported overseas as 'raw' sugar. Australia is the world's second largest exporter of 'raw' sugar after Brazil.

In Australia, all 'raw' sugar has been handled in bulk since 1964. 'Raw' sugar is stored in bulk sugar terminals before it is sent to refineries in Australia or overseas.

Large containers of bulk sugar are transported from the mills to the terminals by road and rail. On arrival, the sugar is carried by conveyer into storage sheds. When ready for collection, conveyers quickly move the sugar onto ships.

Queensland's bulk sugar terminals can store more than 2 million tonnes of raw sugar, allowing year-round deliveries to refineries in Australia and overseas. Queensland bulk sugar terminals are located at Cairns, Mourilyan, Lucinda, Townsville, Mackay, and Bundaberg.

20% processed in Australia

Australian refineries process approximately 20% of Australia's 'raw' sugar into white (refined) sugar; liquid sugar products; and other specialty products such as Golden Syrup, treacle, coffee sugar and cube sugar.

Sugarcane innovations

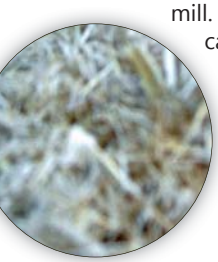
In Australia, farmers grow sugarcane to extract the sugar. However, sugarcane can be used for numerous purposes including ethanol fuel, paper, plastics, clothing and pharmaceuticals.

What other products can be made with sugarcane?

Although 'raw' sugar is the main product Australian grown sugarcane, there are a host of other uses for the plant. Here we cover just some of these.

Every single part of the sugarcane plant is used. At the sugar mill, the sugar is taken out of the stalk through a crushing process. The left over fibre from the stalk is called bagasse.

Bagasse is used to power the sugarcane mill. That means that the sugarcane can make electricity as well as sugar. Sugarcane provides its own processing energy, which means it does not rely on fossil fuel to power the mill. Sugarcane is the only crop in the world that can do this.



Other by-products include residue which can be used as a fertiliser on cane farms and gardens, and specialised inputs which can be made into plastics, clothing and pharmaceuticals.

Molasses is a dark syrup separated from raw sugar crystals during the milling process. It is used as a raw material for ethanol and rum. It can also be used for animal feed.

Sugarcane

- **Filter cake**
- **Flue gases**
- **Bagasse**
  - **Fuels**
    - Cogeneration
    - Charcoal
    - Synthesis gas
  - **Fibrous products**
    - Bleached pulp
    - Corragulating medium
    - Writing paper
    - Fiber board
    - Particle board
    - Newsprint
  - **Miscellaneous**
    - Furfural and derivatives
    - á-Cellulose
    - Xylitol
    - Plastics
    - Poultry litter
    - Animal feed
    - Bagasse concrete
    - Activated carbon
    - Soils amendment
- **Molasses**
  - **Direct Utilisation**
    - Export
    - Fertiliser
    - Animal feed
  - **Distillery Industry**
    - Carbon dioxide
    - Rum
    - Industrial alcohol
    - Rectified spirits
    - Anhydruos alcohol
    - Glycerol
    - Alcohol derivatives
  - **Miscellaneous**
    - Butanol-acetone
    - Citric acid
    - Lactic acid
    - Single cell protein
    - Baker's yeast
    - Feed yeast
    - Monosodium glutamate
    - Lysine
  - **Miscellaneous**
    - Antioxidants
    - Aconitic acid
    - Itaconic acid
- **Sugar**
- **Boiler ash**
- **Cane tops and leaves**

Energy in, energy out

Jelly beans, like any sweet treats, are made with sugar. People, especially children, love the taste of sugar. People also like the instant energy that sugar provides. But as with anything, moderation is the key. We need to balance our energy inputs (what we eat) with our outputs (the energy we use) while recognising the importance of taste (treats we like) and nutrition (what's good for us).

Why do we eat sugar?

People like sugar for both its taste energy giving properties. Sugar plays an important role in providing the energy necessary for our bodies to function properly.

Sugar is a type of carbohydrate. Other carbohydrate-rich food includes breads, cereals, fruit, rice, potatoes, legumes and pastas. Carbohydrates are the body's preferred energy source.

During digestion, all sugars (and other carbohydrates) are broken down into simple sugar, glucose, which then travels through the blood stream to body cells. There it provides energy or is stored as glycogen in our muscles or in our liver for future use.

The key is to balance energy inputs (what we eat) with outputs (the energy we use) while recognising the importance of taste (treats we like) and nutrition (what's good for us).

Since sugar has half the calories of fat (1 teaspoon of sugar contains only 20 calories where as 1 teaspoon of fat contains 45 calories), gram for gram sugar is less fattening.

Sugarcane Energy Muffins

Ingredients

1/2 cup Low GI Cane sugar

2 cups plain flour

2 tsp baking powder

2 tsp cinnamon

2 cups grated carrot (approximately 3 lg carrots)

1 cup grated apple (approximately 1 lg green apple)

1/3 cup desicated coconut

1 cup raisins

3/4 cup plain yoghurt

1/4 vegetable oil

3 eggs

1 tsp vanilla extract

(Makes 18 muffins)

Method

1. Preheat oven to 180˚C. Use paper cases to line muffin pans.
2. Sift flour into a large bowl. Add sugar, cinnamon and baking powder.
3. Add the carrot, apple, coconut and raisins.
4. In a separate bowl, beat the eggs, oil, yoghurt and vanilla together.
5. Add the wet mixture to the large bowl and fold through the dry ingredients until combined but not smooth. Do not overmix.
6. Spoon into muffin cases and bake for 25 minutes or until golden on top.
7. Enjoy.

Are you a Sugarcane Whiz?

1. Sugarcane is grown in which two states?
   b. Victoria
   c. Tasmania
   d. Queensland
   e. South Australia
   f. New South Wales

2. What is bagasse?
   a. the roots of the sugarcane plant
   b. preparing the land for a sugarcane crop
   c. the fibre left over after the 'raw' sugar is extracted from the sugarcane

3. Farmers harvest the cane by doing which of the following:
   a. cutting the cane into billets
   b. crushing the cane to extract the juice
   c. fertilising the cane

4. By which two methods is the sugarcane transported to the mill?
   a. helicopter
   b. train
   c. truck
   d. ship
   e. camel

5. To prevent juice loss, sugarcane must be transported to the mill within how many hours?
   a. 6
   b. 22
   c. 34
   d. 16
   e. 18

This brochure has been produced by CANEGROWERS, the voice of the Australian cane growing industry.

Queensland Cane Growers Organisation Ltd ABN 94 089 992 969

T: 07 3864 6444 | F: 07 3864 6429 | enquiry@canegrowers.com.au | www.canegrowers.com.au

Answers

1. d & f 2. c 3. a 4. b & c 5. d