Start here

Biotech sQuizBox

NOT JUST FOR KIDS

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International Service
for the Acquisition of
Agri-biotech Applications
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Biotech sQuizBox

/bahy-oh-tek skweez-boks/

a fun activity booklet on crop biotechnology folded similarly to a squeezebox or accordion. It has two parts: Biotech Bites and Biotech Challenge.

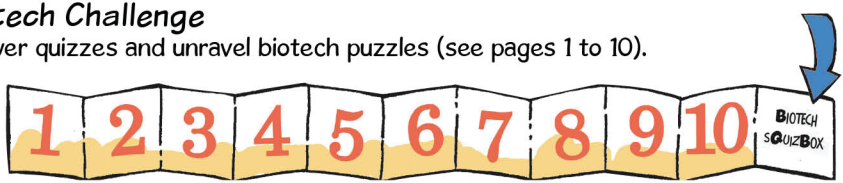
How to use Biotech sQuizBox

Biotech Bites

Read each page and get to know basic information about crop biotechnology (see pages A to I).

Biotech Challenge

Answer quizzes and unravel biotech puzzles (see pages 1 to 10).



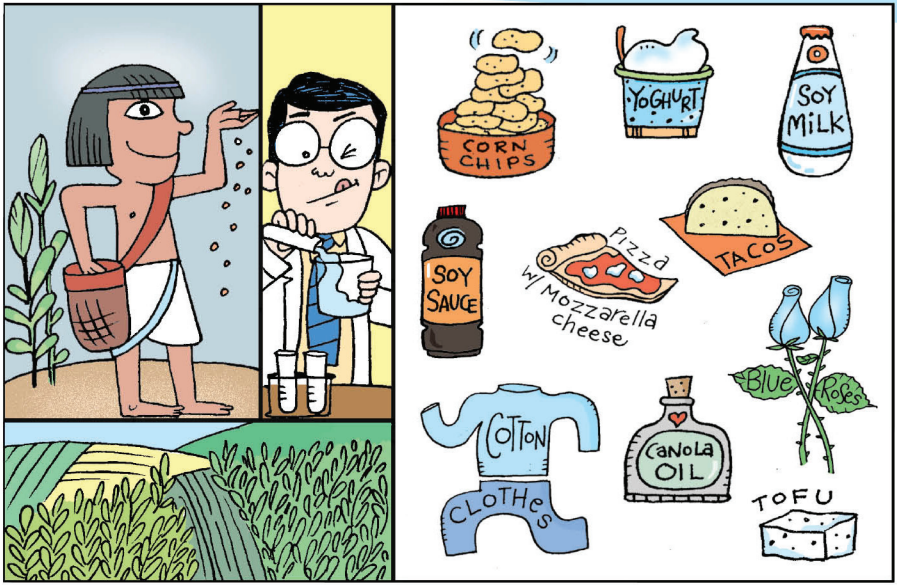
Guide Links

Know more about the topic you are reading by following the suggested links. Jump to the page given beside the icon to

- read a trivia
- get the answers to a question
- take a quiz
- read more online
- scan the code using your smartphone

Biotech Bites

This section will help you know how crops were improved from the days of our ancestors to the present times to meet our basic needs such as food and clothing. You will also discover how biotech crops help farmers all over the world.



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Crops Then and Now

A lot of the things that we eat, use as clothing or fuel come from crops that were initially found in the wild. If these crops were not improved through the years, they would not meet our needs for food, clothing, and energy.

Can you guess what these wild crops are?

Answer: (left to right) tomato, corn, carrot. See how different these wild crops are from the present crops we use?

Defining Biotechnology

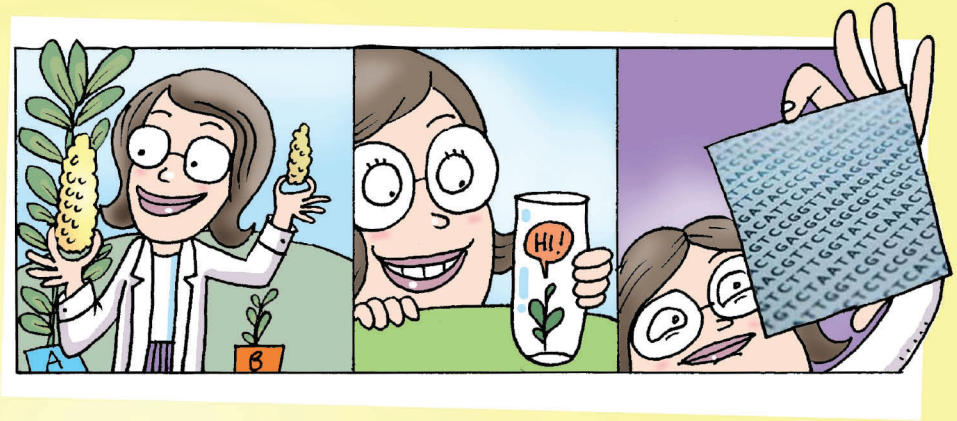
bios + techne + logia
life skill study
=
biotechnology

It is any process that uses living organisms or their parts to make or modify a product, improve plants, trees, animals, or microorganisms for specific purposes. The improvement of crops, making of bread, cheese, beer, and wine, were the earliest forms of biotechnology.

What is agricultural biotechnology?
bit.ly/50BBites

From Traditional to Modern Biotech: The Necessary Shift

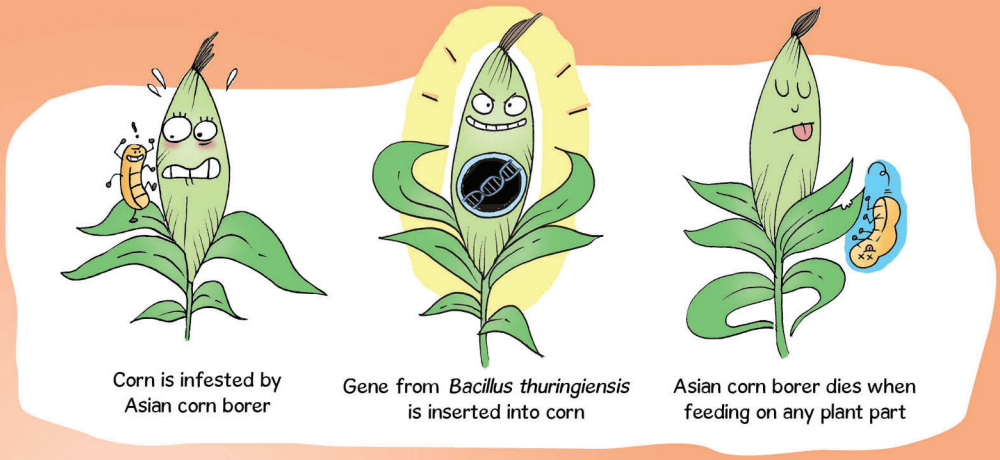
With traditional biotechnologies, plant breeders were able to develop new and improved crops. However, those methods usually take long periods of time before breeders get the desired characteristics. Thus, scientists developed more precise techniques that require shorter time to come up with better products that suit man's needs.



What are traditional biotechnologies?
bit.ly/PocketK13

Working on the Genes

Genes are made up of a substance called DNA 5. Through modern biotech, scientists can choose and isolate the gene for an important trait from a related or unrelated organism. The gene is transferred into another organism that needs the trait. For example, a gene of a soil microorganism can be transferred to corn plants so that it would be resistant to insects.



Corn is infested by Asian corn borer

Gene from *Bacillus thuringiensis* is inserted into corn

Asian corn borer dies when feeding on any plant part

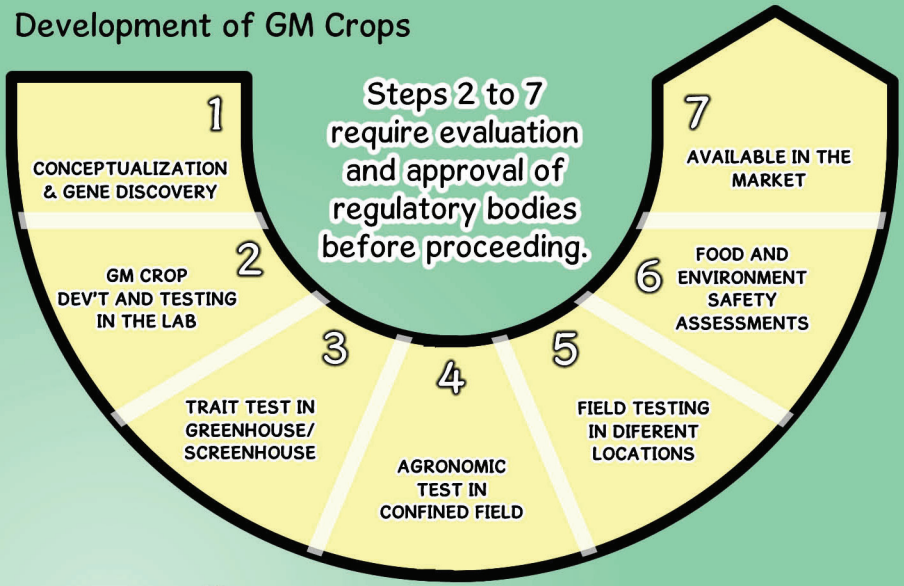
Scientists can also turn on or turn off a plant gene to improve its own characteristics without inserting a gene from other organisms.

What does DNA look like? 5 6

Ensuring Safety of Biotech Crops

A genetically modified (GM) crop (also called transgenic crop or biotech crop) produced in the lab does not go instantly to the market. It must undergo a long rigorous process of tests and consultations to make sure that the GM crop is safe for humans, animals, and the environment. This process usually takes several years to finish.

Development of GM Crops



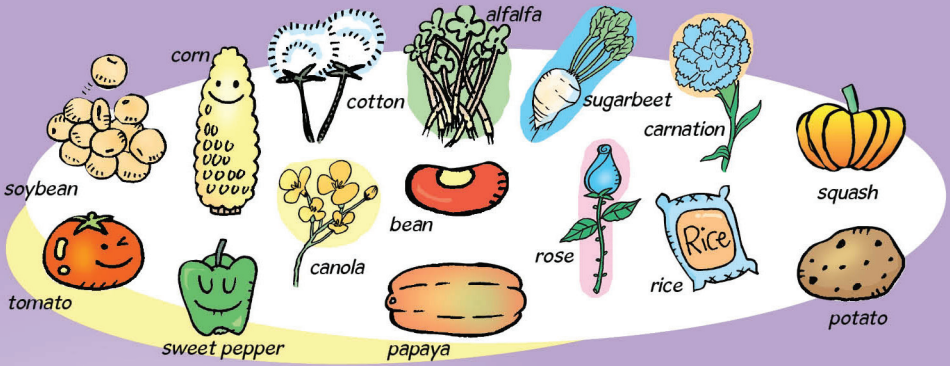
Help biotech corn Betty reach the Farmer's Field 8

Genetic Engineering and GM Crops
bit.ly/PocketK17

F

Biotech Crops All Over the World

Biotech crops have been planted in different countries since 1996. In 2016, the most planted biotech crops are soybean, corn, cotton, and canola.



Aside from these biotech crops, there are still others that are being developed in the lab or tested in the field.

Biotech Crops in 2017
bit.ly/ISAAAbeyond

Benefits of Biotech Crops

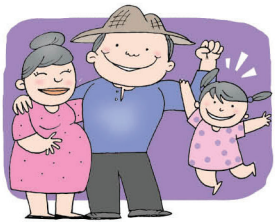
The benefits of biotech crops are well-documented. Among these are:

Increase in farm yield

Increase in farm income

Less use of pesticides

Use of environment-friendly farming practices



Better health to farmers and their families

Peace of mind for farmers

Spot the difference between a conventional and a biotech farm 4

Documented Benefits of Biotech Crops
bit.ly/PocketK5

H

Farmers and Biotech Crops

In 2017, 17 million farmers in 24 countries planted biotech crops on 189.8 million hectares of land.

Pakistan BRAZIL Paraguay INDIA USA SOUTH AFRICA Canada China ARGENTINA Bolivia

Top 10 biotech crop producing countries

Solve the biotech country puzzle 10

Global status of biotech crops
bit.ly/Brief53Info

Biotech Challenge

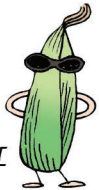
This section contains activities that will help you know more about biotech crops and their importance. Here is the first challenge: Spot 15 biotech crops in this picture!

Be updated on the latest news on crop biotechnology!
Subscribe to the Crop Biotech Update at
www.isaaa.org/subscribe

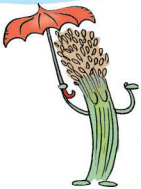
Will we have enough food in 2050?

As of 2018, the world population is 7.63 billion. Feeding 7.63 billion mouths every single day is a huge task for our farmers. By 2050, the world population is expected to be 9.2 billion. Experts say that agriculture must double its food production to feed the world. Unscramble the jumbled words to find out the important characters that can help us have more food in the future.

TSITNESCI
SCIENTIST



HTUGROD
_____
TOELNRAT
_____
ROCN
____



DOOFL
_____
LTOERNAT
_____
CERI
____

REMARF
_____

YOU (Draw yourself here)

EICDBIREH
_____
RANTOTLE
_____
NTOTOC
_____

SEDIASE
_____
RSEISTANT
_____
TEAWH
_____

EDFIBIOORFTI
_____
BESOYAN
_____

NICTSE
_____
SIARNTSET
_____
ANGPLGET
_____

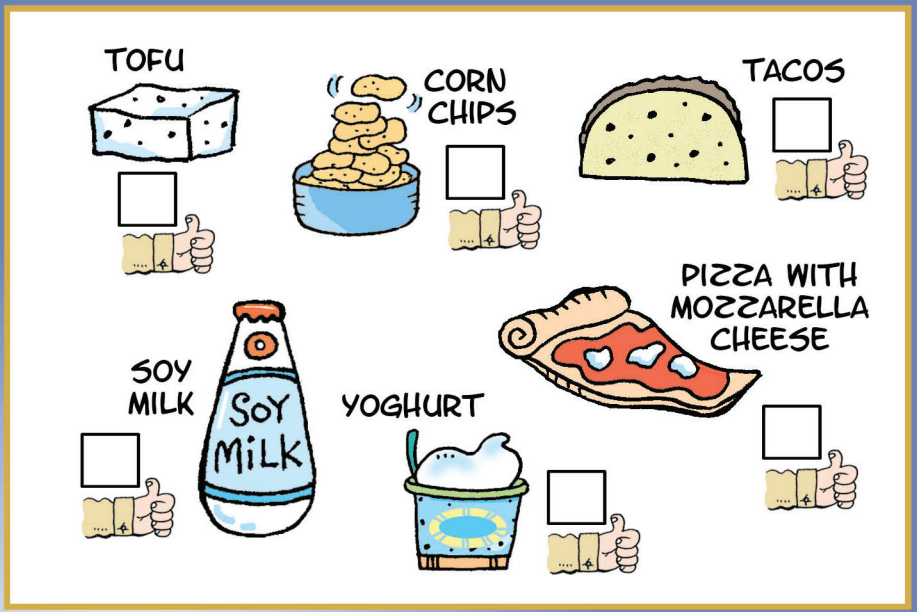
All of these characters including YOU must take part in ensuring that we have food in the future.

Answer: flood tolerant rice, scientist, drought tolerant corn, herbicide tolerant cotton, disease resistant wheat, biofortified soybean, farmer, insect resistant eggplant.

How does biotech help fight hunger and malnutrition?
bit.ly/PocketK30

What is inside the Biotech foodbook?

Put a check on the like button if you eat any of the following:

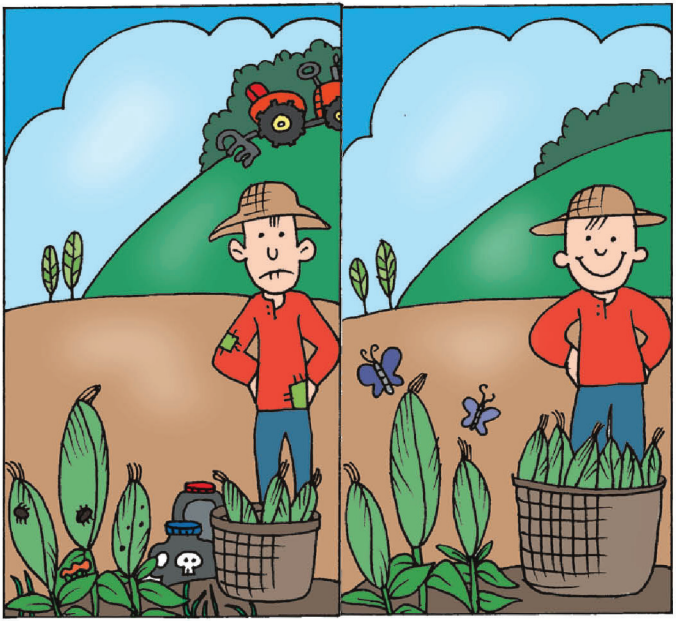


Which of these may contain GM products? A

Labeling GM Foods
bit.ly/Pocketk7

What is the difference between a conventional and a biotech farm?

Spot at least 6 differences between the two farms.



conventional farm

biotech farm

What is DNA?

Plants and animals have a chemical recipe in their cells that dictates the appearance and the role of each cell and thus, the organism as a whole. This recipe is called DNA, short for deoxyribonucleic acid. Biotechnology is like changing one of the ingredients in this recipe to make the dish better.

DNA contains two strands wrapped around each other in a helix, and these strands are connected by molecules called nucleotides. The nucleotides determine the amino acids and type of protein the organism produces.

Do you want to see how DNA looks like? You can do this simple exercise at home.

Prepare the following materials and proceed to page 6.

- ☐ 1 pc banana (cold)
- ☐ ½ cup cold water
- ☐ pinch of salt
- ☐ 1 tbsp liquid detergent
- ☐ ½ tsp pineapple juice
- ☐ cold ethyl alcohol (70-95%)
- ☐ 3 pcs clear plastic cups
- ☐ toothpick
- ☐ blender
- ☐ coffee filter
- ☐ rubber band
- ☐ fork
- ☐ saucer

Know what scientists do with the DNA to improve crops.
bit.ly/PocketK19

What does DNA look like?

1. Peel a piece of banana and then mash.

2. Mix mashed banana, water, and salt in a blender for 15 seconds at high speed.

3. Cover one plastic cup with a coffee filter. Secure with a rubber band. Pour the banana mixture on the filter.

4. Remove the coffee filter and add the liquid detergent. Mix gently to avoid forming bubbles. Leave it for 10 minutes.

5. Slowly pour 1/3 of the mixture on another cup. Add the pineapple juice. Slightly tilt the cup then pour 1/8 cup of ethyl alcohol through the side of the cup.

6. Wait for 5 minutes or until a cloudy substance appears. That substance is the DNA of banana! Scoop it using a toothpick.

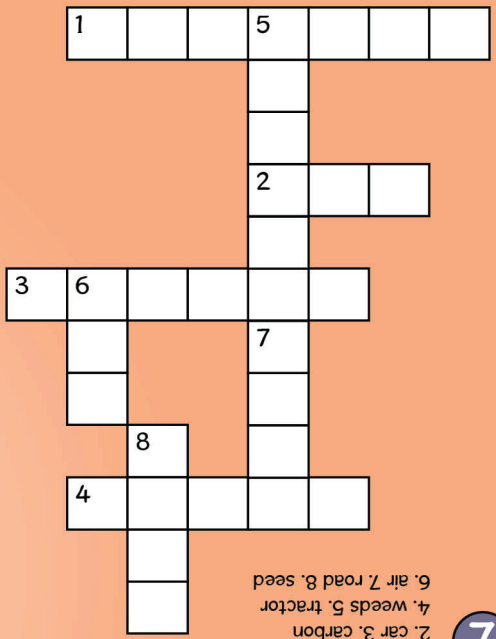
Are biotech crops safe for the environment?

Planting biotech crops with herbicide resistance trait does not need tractors to pull out the weeds from the field. Because farmers planted biotech crops in 2016, carbon dioxide emissions were reduced by 27.1 billion kg, which is equivalent to taking 16.7 million cars off the road for one year according to PG Economics.

Solve this crossword puzzle.

Across
1. crops with improved traits such as herbicide resistance
2. type of vehicle
3. _____ dioxide
4. plants that need to be removed from the field

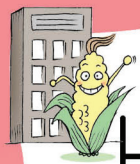
Down
5. vehicle used to remove weeds
6. mixture of gases that make up the atmosphere
7. a long, hard surface built for vehicles to travel along
8. sown on the field



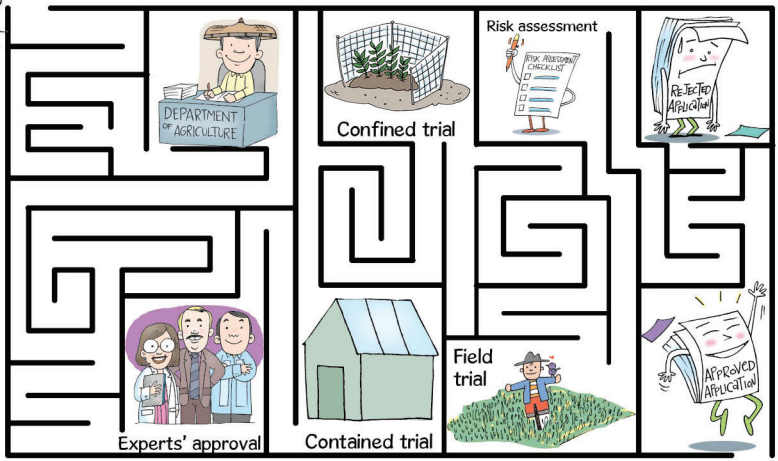
Answers 1. biotech 2. car 3. carbon 4. weeds 5. tractor 6. air 7. road 8. seed

Are biotech crops safe to eat?

Biotech crops (G) are considered as the most studied food products because of the long process (F) they take before they become available in the market. To understand this process that they go through, let's help biotech corn Betty pass through the maze and reach the farmer's field.



Biotech corn Betty developed in the lab with biosafety approval



Farmer's field

Are GM foods safe to eat?
bit.ly/PocketK3

How much land is used for biotech crops?

One of the benefits of biotech crops is that less area of land is needed by farmers to produce the same yield as conventional crops.

Farmer Jun owns 1.6 hectares (ha) of farm. By planting biotech corn, he can harvest as much as 7 tons per hectare. How much biotech corn can he harvest if he would plant his entire farm with biotech corn seeds?

By planting conventional non-biotech corn on the entire farm, he can only harvest 5 tons. What is the difference of the harvest between biotech corn and conventional corn?

Answer: If Jun will plant his entire farm with biotech corn seeds, he'll produce 11.2 tons of corn after harvest. That is 7.2 tons more than the harvest after planting conventional corn seeds on his field.

Which countries are producing biotech crops?

There were 28 countries planting biotech crops in 2015. The top ten countries with the largest land area planted with biotech crops are: **USA, Brazil, Argentina, Canada, India, Paraguay, Pakistan, China, South Africa,** and **Uruguay.** Find and encircle those countries in this puzzle.

X	C	E	O	R	B	O	L	I	V	I	A	F	V	P
I	B	D	B	Z	G	X	N	B	M	A	X	A	V	W
I	N	M	Q	H	W	D	N	M	O	K	P	R	Y	G
S	T	D	D	D	E	R	C	S	U	S	A	G	J	M
V	E	M	I	D	R	C	K	A	I	C	K	E	X	Z
M	W	F	W	A	D	W	I	E	I	T	I	N	G	T
U	Q	C	I	T	B	I	C	R	Y	E	S	T	Z	W
X	Y	G	S	X	P	V	F	A	C	A	T	I	S	Y
K	K	C	H	I	N	A	U	M	A	Z	A	N	Q	O
Y	E	Q	I	B	H	G	R	S	N	F	N	A	D	B
I	O	O	T	T	A	L	U	U	A	B	G	N	Z	B
U	L	O	U	R	C	Y	G	G	D	Q	S	R	U	U
M	V	O	A	E	M	S	U	I	A	X	E	Y	F	R
V	S	P	E	B	B	R	A	Z	I	L	V	S	Y	D
R	P	F	H	A	F	E	Y	X	I	I	X	T	Y	K

Biotech Country Facts and Trends
bit.ly/B53PPT

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