Harper Adams University

Crops Matter

A degree that matters

CROPS MATTER

How to use this pack

What is included?

This pack includes:

- 3 x research stories about projects that are taking or have taken place at Harper Adams University
- 7 x activities to be completed

This pack has something for everyone; from those with green fingers to geography and history lovers (did you know young boys could be employed as bird scarers in the Medieval Britain?)

Some sections of this pack will require you to have access to the internet for online games, audio and videos. You will also need to print out some worksheets. We would recommend parental supervision when using the internet to support with the activities.

To complete this pack, you will need some paper, writing pen or pencil and colouring pencils. If you wish to complete all of the scarecrow activities and the plant diary, you'll require additional materials.

CREST Awards

The activities in this pack have been designed so they can be counted towards a CREST SuperStar award. The awards are fun and easy to complete and you will get a certificate and badge from the British Science Association, which is something wonderful to show off to your teachers and school friends when you go back to school. To get the full award students need to complete 8 x 1-hour challenges. We will provide more than eight fun activities for you to choose from across our packs. Once completed, just send evidence of your completed work to Harper Adams University (schoolsliasion@harper-adams.ac.uk) for verification. Harper will then submit and fund the award to CREST for certification.

Curriculum Links:

The following pack has been put together with the national curriculum in mind. The following activities and elements of this pack are linked to core national subjects such as reading and literacy skills, mathematics, and science.

Some links around science increase scientific knowledge and conceptual understanding, nature and processes.

An introduction to crops

What are crops?

A crop is a plant grown and harvested on a large scale for profit or food.

Crops fall into six categories:

· Food crops (for humans)
· Feed crops (for livestock; for example cows)
· Fibre crops (for textiles)
· Oil crops (these can be for cooking or industrial uses)
· Ornamental crops (for example for landscape gardening)
· Industrial and secondary crops (these are for personal and industrial uses, for example rubber)

In this pack, we're going to be mostly focusing on crops that are grown for human and animal consumption.

In the UK, the most popular crop is wheat. It can be milled into a flour and be used in bread, biscuits and cakes. It can also be used in animal feed and to make bioethanol which is an alternative to petrol.

Here at Harper Adams University we do a wide range of research around crops and we would like to share some of this with you.

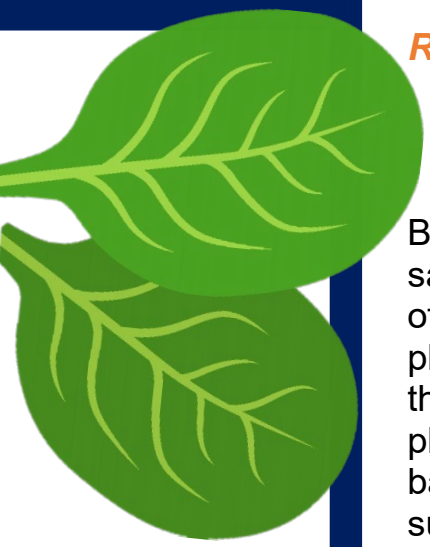
Take a read and immerse yourself in some of the research that is going on at Harper Adams on the following pages. Then as you progress through the pack use your task sheets to help your knowledge grow.

For longer texts we have created audio files to support reading if required. Click the audio link on the page to be taken to the online file.

Research 1

Growing salad all year round

Researchers grow salad in shipping containers with LED lights



Baby leaf greens are popular in salads. They are the baby plants of spinach and kale and similar plants; being harvested around three to four weeks after being planted. (Have you noticed the bags of baby spinach in the supermarket before?)

G's is a salad producer. They grow their baby leaf in Italy and Spain during the winter as it's warmer there. They grow baby leaf in the UK during the warmer summer months.

Harper Adams University is working with the company to see if we can grow baby leaf greens in the UK all year round.

They are hoping they can be grown indoors using LED lights. These lights can change colour and brightness. To test if this will work, they are growing the plants inside a shipping container (the big, metal boxes you sometimes see being moved on large boats and trains).

Ben Barnes, from Harper Adams University, says that there are two big questions they need to answer. The first is to see if growing indoors will be **efficient**. The second is to see if growing baby leaf crops during the winter indoors will be **affordable**.

Click here for the AUDIO FILE

Further Thinking

What do you think **efficient** means? _____

_____

What do you think **affordable** means? _____

_____

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Waterproofing crops

Research 2

Helping crops lose less water during drought

Harper Adams University has been looking at waterproofing a number of crops for the past 24 years.

Waterproofing a crop means reducing the amount of water that it loses. As you'll know, plants require air, light, water, room and nutrients to grow. You'll also know that some places in the world are warmer and get less rain than others. In these places, plants may struggle to grow because of the lack of water.

Watering plants can be a solution, but this is expensive and not always suitable in times when there is not enough water.

Waterproofing is like adding a layer, or 'jacket', to the plant but instead of keeping water out, it helps keep the water the plant already has inside. (Imagine you trying to stop the sweat leaving your body when you're warm!).

To waterproof the plant, the students at Harper Adams University have been using different sprays on different plants to see if they work. They are aiming to identify natural ways they can waterproof crops.

They have used a spray which uses **conifer plants** on oilseed rape. Oilseed rape is the crop you might see being grown in British farms during the summer; think of the fields that are covered in yellow flowers. Oilseed rape makes a variety of products, including edible vegetable oils for cooking, animal feed and even biodiesel.

They have used a wax that's from cauliflowers on peanut plants.

They've also used a spray from oilseed rape on grass and potatoes.

It's hoped that by waterproofing crops, **yields** can be improved in situations that would lead to waterloss.

Further Thinking

What do you think **yield** means? _____

_____

Conifer plants are plants that reproduce using cones. For example, pine trees, fir trees and yew trees. There's an activity looking more at conifer trees in this pack.

Click here for the AUDIO FILE

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Research 3

Where do strawberries come from?

Student investigates where children believe food comes from

It's important that we know where our food comes from. Naomi, one of our students at Harper Adams University has been looking into where children, like you, believe their food comes from.

She found an article saying that children didn't think a fish finger was made of fish, but instead from pork or chicken and that kiwi fruits were from the middle of Birmingham.

She said: "The statistic I found the most surprising was: '1 in 20 children believe that strawberries grow in the fridge'.

"I found the idea of not knowing where your food comes from as really strange.

"I went into three schools, where I talked to 150 children, between the ages of seven and 11, to see where they thought their food comes from."

Naomi found that 56% of children knew strawberries were grown on a bush, while many thought that they came straight from the supermarket, without anything having to happen before this.

Only 20% of the children recognised ice cream comes from an animal

Just 9% of children knew that pasta was from a crop which is grown above ground, while 77% thought pasta came straight from the supermarket.

Click here for the AUDIO FILE

Further thinking

Match the two parts of the statement together so they are true

Less than 10% of children knew	pasta comes straight from the supermarket
1/5 of children recognised	strawberries grow on a bush
Over 70% of children thought	that pasta comes from a crop that grows above ground
56% of children knew	ice cream comes from an animal

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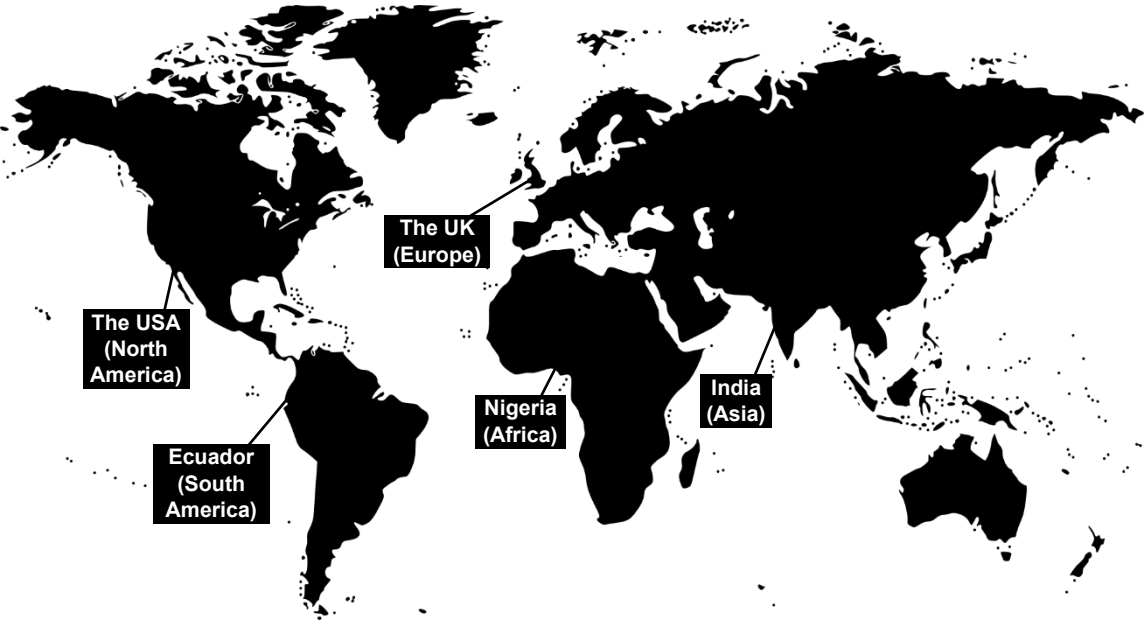
Activity 1

Where does our food come from?

Match the food products to where they grow.

(Some of the products grow in more than one country, but for this activity just match each product to one country.



Bananas can come from _____

Carrots can come from _____

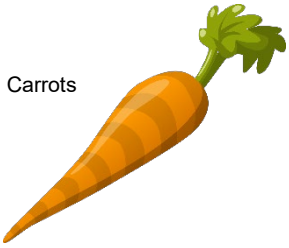
Peanuts can come from _____

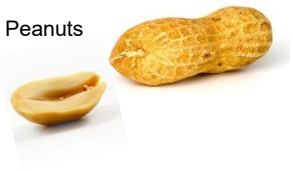
Rice can come from _____

Cocoa beans can come from _____

Can you make your own map for someone else?
This picture might help you


Bananas


Carrots


Peanuts


Rice


Cocoa beans (used to make chocolate)

Activity

Activity 2

Match the Grain

Open the ‘Match the Grain’ PowerPoint. Click on the ‘Slideslow’ button at the top or bottom of the screen, or press ‘F5’. Work your way through both levels. Click the arrows and your answers to navigate through the slides. It won’t add up your score, so if you want to track how well you do, you’ll need to write this down yourself. Feel free to use the space below if you wish.

Level 1	✗ ✓		✗ ✓	**Level 2**	✗ ✓		✗ ✓
Question 1		Question 5		Question 1		Question 5	
Question 2		Question 6		Question 2		Question 6	
Question 3		Question 7		Question 3		Question 7	
Question 4		**Level 1 score**		Question 4		**Level 2 score**	

Activity

Activity 3

Online farming games

Nourish Interactive

Visit Nourish Interactive. This is a website with a variety of fun games about food and healthy lifestyles. Click on ‘Solus Fun Farm Games’ (the building in the bottom left corner). Have a go at each of the games. When playing Healthy Harvest Maze, think about what crops you are harvesting? Which come from trees, bushes or small individual plants?

Seed Survivor

Once you’ve finished playing on Nourish Interactive, visit Seed Survivor. There are even more games to play here! As you play the games, think about the variety of jobs there are within agriculture.

Activity 4
Plant reproduction

There are many ways that plants can reproduce. You may have already learnt about some, like **seeds** being transported by the wind or in fruit.

By the end of this activity, you're going to know how conifer trees reproduce using cones. Conifers were mentioned in the second research story in this pack. An example of a conifer is a pine tree. Conifer trees can be grown as a crop as their timber is used to make many different types of items, such as pencils and furniture.

Animals (including humans) and plants have **life cycles**. This is a journey of the stages they go through during their life.

Visit the BBC Bitesize webpage about a plant's lifecycle (link is on the right) now. When you're ready make sure you complete the question at the end of the webpage.

As you would have seen, pollination is an important part of a plant's life cycle.

Pollination is the process flowering plants use to reproduce. To produce offspring, a plant must first be fertilised with **pollen**, which allows it to make seeds that will grow into new plants.

Now visit the BBC Bitesize webpage on pollination. Yet again, make sure you complete the questions at the bottom of the page once you've watched the video.

You've seen pollination involves **male and female parts**. In the case of a flower this is the **stamen** for the male part and the female part is called the **carpel**, and includes the **ovary**, the **stigma**, and the **style**. The ovary contains the **ovule**. As seen in the video, some plants are fertilised through **cross-pollination**. Some plants can **self-pollinate**. This means the plant is fertilised when its own pollen finds its way from the stamens into the ovule.

Many tree species rely on **pollinators** (animals like bees and butterflies) to reproduce. Hazel, crab apple and rowan are all examples of flowering trees that are pollinated by bees and other insects.

Conifer species produce **cones** rather than flowers and rely on **wind pollination**. Male cones generate pollen, which is carried by the wind to the female cones, which then use it to develop seeds. The hard scales of the cone protect the new seeds as they grow.

Activity

Learn about a plant's lifecycle on BBC Bitesize

Learn about pollination on BBC Bitesize

Click here for the AUDIO FILE

On some conifers, male cones sit higher in the tree than female cones, this means the pollen can be carried further by the wind.

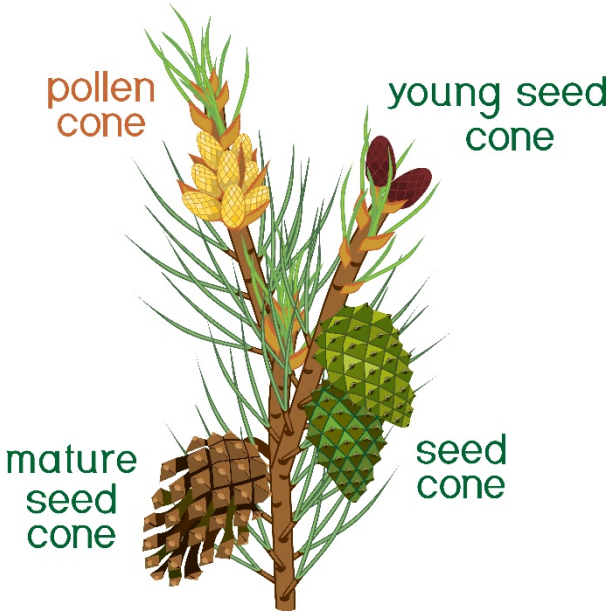


Diagram above shows cones on a pine tree branch. The male pine cone is the pollen cone and the female is called 'seed cone'.

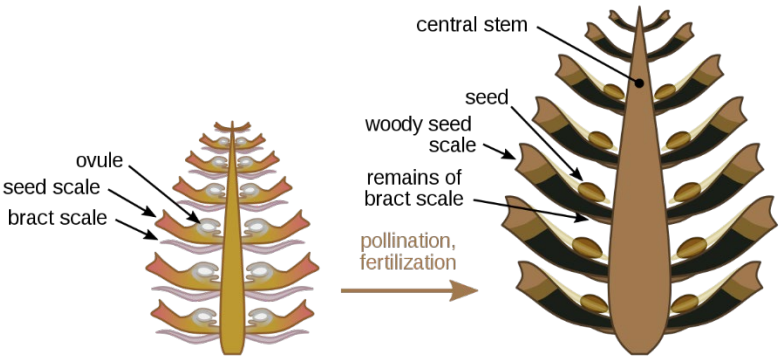


Diagram above shows an unfertilised female cone and a fertilised female cone. Can you see it has an ovule too?
Image: Nefronus

The seeds of a conifer are winged seeds. When they are released by the cone, they will float on the wind until they reach the ground where they will **germinate** and **grow**.

Next time you see a pine tree with cones, try and identify the female and male ones.

The Ducksters website looks at a number of ways non-flowering plants reproduce. Have a read through the summaries and then answer the quiz at the bottom. The quiz is quite hard, so don't worry if you get some answers wrong.

Record your score here

_____

Further thinking

Have a look at plants in your garden or while on a walk. Can you see how they reproduce? Design a poster, write a story or a song about the story of a flower or a conifer tree's pollination. How many of the words in **bold** are you able to use?

Activity

Activity 5

Scarecrows

Vocabulary

Quail

Small ground-nesting bird. Part of the pheasant family.

Gourd

Includes the fruits of some flowering plant species in the family Cucurbitaceae. Cucumber and pumpkins are types of gourd.

How to draw a scarecrow

How to make a scarecrow bookmark

For thousands of years, people have been using scarecrows to protect their crops from being eaten by birds.

The ancient Egyptians used to put wooden frames covered in nets in their wheat fields along the River Nile. They would then hide and surprise the **quails** which would get caught in the nets. The farmers would then have quail for dinner!

In 2,500 B.C. Greek farmers carved wooden scarecrows to look like a minor god who was supposedly so ugly he scared the birds away. The farmers painted their wooden scarecrows purple, putting a club in one hand to scare away the birds and a sickle (like a mini scythe) in the other for a good harvest.

The Romans then copied the Greeks' idea of carving scarecrows and spread the tradition to many farmers as they conquered Europe.

Meanwhile, in Japan, farmers were using bamboo poles with old rags, rotten meat and fish bones. They were called 'kakashis' meaning 'that which smells bad'.

In Medieval Britain there was the job of 'bird scarer' for young boys. They would wander the fields and throw things at the birds. However, during the Great Plague in 1348, there was a lack of bird scarers so landowners had to use stuffed sacks with turnips or **gourds** for faces on poles instead.

In American colonies in the 1700s, more grain was needed, and farmers had decided that bird scarers weren't working well enough. They therefore offered bounties (cash payment) for killing crows. This led to so many crows being killed that in the 1800s there were huge problems with pests and worms. It was decided to stop the bounties and go back to scarecrows.

At this time, immigrants to America were bringing a variety of ideas of how to make scarecrows. The German farmers named their scarecrows "Butzemann" or "bogeyman" and his wife was "Butzefrau" or "bogeywife". They looked similar to what we imagine scarecrows looking like; a wooden cross, wearing clothes and a head stuffed with straw.

Now it's your turn to design your own scarecrow. You could draw your own unique creation, or a 'normal' scarecrow and choose the clothes it wears and its facial expression. Then see (with parents/guardian consent) if you can make it.

The 'how to draw a scarecrow' link will help you draw a scarecrow outline that you can then colour in and make your own

If you want, you can also see if you can make a scarecrow bookmark to save your page in your reading book.

Click here for the AUDIO FILE

Activity 6

Plant diary

Grow a plant of your choice. Document its progress by printing this page once and the next one for the number of entries you wish to write.

Activity

Equipment for planting:

_____

_____

_____

_____

Planting Day

Date:

You might want to write about:

- Type of plant you're growing
- How you planted it
- What your plant requires to grow
- Where you're going to grow it

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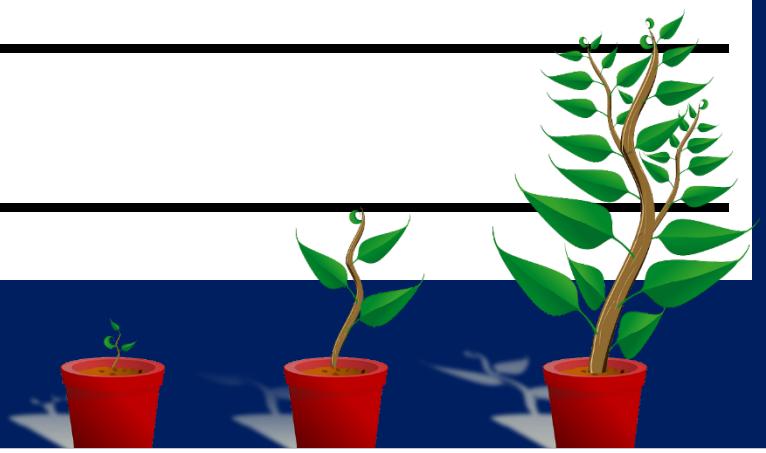
Date: _____

Picture

Today's facts

Height (cm):

Number of leaves:



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Activity 7

Careers in crops

Now for the final activity of this pack! Have a look through the crops careers information on the following pages.

You'll read about a selection of jobs available in the crops industry. Do any surprise you? Can you think of other careers that weren't included? Your experience of playing on the Seed Survivor website may help you with this. Write a couple of thoughts in the space provided below.

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Jobs in crops
Primary edition

Agronomist
(like a doctor for crops)

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Responsibilities include:

- Increase crop yield by studying plants and soil
- Visit fields to collect seed, plant, and soil samples to testing for nutrition and diseases
- Assisting with choosing plants and timelines.

Requirements:

- Degree in agriculture or agronomy
- Can use computers
- Want to work outside

Farm Manager
(in charge of the running of the farm)

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Responsibilities include:

- Look after farm finances and crops
- Tractor driving, operating machinery or spraying fields
- Buy seeds and fertiliser
- Understand how the weather impacts on the crop
- Sell produce

Requirements include:

- Hands-on experience
- A degree in agriculture can help but is not essential
- Wanting to be outside

Food Buyer
(chooses food products and suppliers for supermarkets)

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Responsibilities include:

- Look at what people are buying and predict what they will want in the future
- Maintain good relationships with the people who provide the food (i.e. farmers) and find new ones
- Select new products for the supermarket to sell

Requirements include:

- A degree in agri-business can help
- Able to work under pressure
- Good communications and negotiation skills

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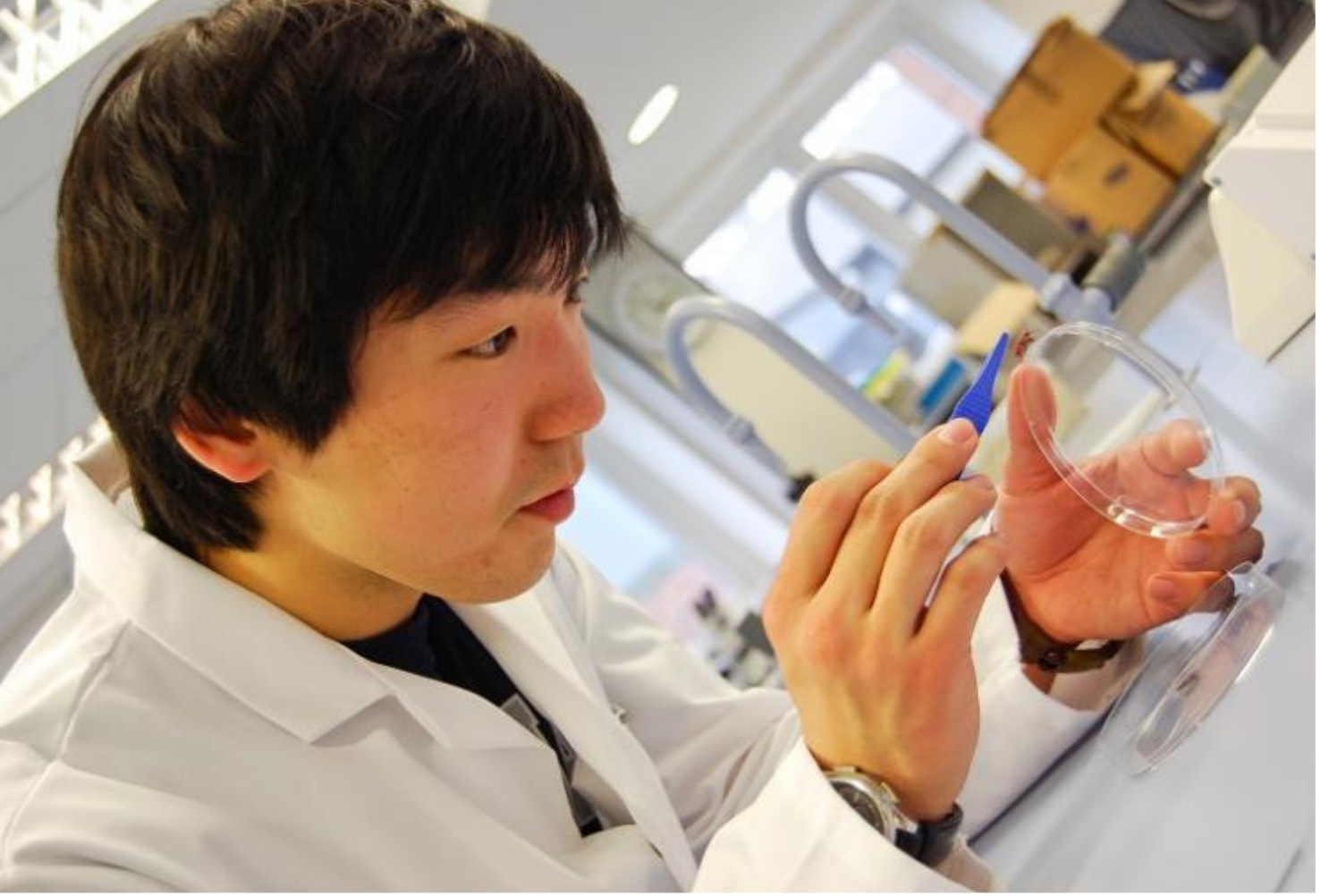
Plant Breeder
(Breeds new varieties of plants)

Responsibilities include:

- Research methods for improving plant breeding
- Identify and select plants showing wanted traits (for example stronger against diseases)
- Cross plants to produce new plants

Requirements include:

- A degree in medical sciences or agriculture and plant sciences.
- Good problem-solving skills
- Strong communication skills
- Good at working in a team
- Can use computers



Agricultural Entomologist

(Studies how to protect crops from pests, without harming beneficial insect species like bees)

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Responsibilities include:

- Collect samples from farmers' fields
- Provide advice to farmers to deal with insect problems but also consider beneficial insects like bees

Requirements include:

- Degree in entomology or science
- Comfortable with insects
- Strong observation skills
- Good communication skills
- Critical thinking skills

Drone Pilot

(Take photos of fields to see how the crop is doing)

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- **Responsibilities include:**
- Plan flight paths
- Gather digital images and data
- Produce maps based on flight data
- Work with other professionals to understand data

Requirements include:

- Permission for Commercial Operations (PfCO)
- Pay attention to detail
- Flexible and open to change
- Work well under pressure

Answers to Research Story 1 Further Thinking

Efficient means getting a desired result without requiring too much energy or time or wasted materials.

Affordable means it's not too expensive.

Answers to Research Story 2 Further Thinking

Yield means the amount produced by an agricultural crop (e.g. 9 tonnes of wheat).

Answers to Research Story 3 Further Thinking

- Less than 10% of children knew – that pasta comes from a crop that grows above ground
- 1/5 of children recognised – ice cream comes from an animal
- Over 70% of children thought – pasta comes straight from the supermarket
- 56% of children knew – strawberries grow on a bush

Answers to Activity 1

- Bananas can come from Ecuador
- Carrots can come from the UK
- Peanuts can come from the USA
- Rice can come from India
- Cocoa beans can come from Nigeria

Harper Adams University

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Thank you for completing your activities around crops. We hope you enjoyed learning more and getting creative.

If you would like to have a look at more of our education packs, please visit our website for more information.

Do not forget to send us your evidence of completion if you would like to submit your work for the CREST SuperStar Award.

Please email your work to:

schoolsliasion@harper-adams.ac.uk

Use the subject line ‘Crops Matter – CREST award submission’

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