ZERO HUNGER

Everyone knows food is essential for life. But did you know that 75% of the world's population is fed with food provided locally? Most of this is grown on small-scale family run farms, where most farmers have up to two hectares of land…that's the size of two athletics tracks!

Big smiles from Jui, a young girl in Bangladesh

Giant cucumbers grown in Sudan

Have you heard about the **Sustainable Development Goals (SDGs)** or **Global Goals?**

These are 17 Goals that were put together by global leaders from many countries around the world to **end poverty**, **protect the planet and ensure prosperity for all** by 2030.

To find out more about the Global Goals, you can watch a video about them here vimeo.com/181766755 and/or go to www.globalgoals.org

One of these, **Global Goal 2** is called **Zero Hunger**. Being able to produce enough food for everyone on our planet is a major global challenge.

Currently, there are over **one billion people in the world who don't have enough food**. Land degradation, climate change, deforestation and the global financial crisis are all having a negative impact on small-scale farming around the world.

Targets for Global Goal 2 include:

- By 2030, end hunger and ensure access by all people to safe, nutritious and sufficient food all year round.
- By 2030 double the agricultural productivity of small scale farmers.

These are the targets that the use of STEM knowledge and skills can help us reach.

SOME IDEAS TO GET YOU STARTED

We hope you will do a lot of research yourself, looking at websites, videos etc. so that you get a clear picture of what is happening in the world before you start designing your Global STEM challenge. To help you we have some ideas and links to things you might like to look at - all related to zero hunger. Don't feel you have to select one of these, what you do is up to you!

The main thing to keep in mind is how STEM skills can help deliver this Global Goal, either in Europe or a developing country.

Growing food

Obviously being able to grow food is essential to feeding people on our planet. Plants mostly just need water and nutrients to grow.Many farmers around the world are women so helping them grow produce more effectively will really benefit them.

Irrigation

There are a number of techniques which can be used to help keep land irrigated and fertile, and prevent erosion. You could build a challenge around looking at different solutions.

For initial ideas go to **practicalaction.org/irrigation-4**

ZERO HUNGER

Vegetables grown on previously barren land in Sudan

Multiple use water systems

Sometimes many different systems are combined to produce ways of collecting water, storing it and using it for irrigation and drinking water. One idea for a challenge could be around designing a model of such a system… this would be a very big challenge indeed!

Sprinkler pipes use the pressure created by falling water to jet water out of the pipe. As the water falls down the hillside, the pressure increases so the water jets further from the pipe. Could your challenge include building a sprinkler system fit for flat and/or mountainous areas? Think about how your different designs could be tested, and the mathematics that could be used to help you work out the reach of the jets.

To see these in action go to
practicalaction.org/multiple-use-water-systems

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FLOATING GARDENS IN BANGLADESH

A floating garden is built using aquatic weeds as a base on which vegetables can be grown. This approach can extend the growing capabilities of rural communities where land would otherwise be unavailable. It is cheap and sustainable.

Introduction

Bangladesh is one of the world's poorest countries, criss-crossed by more than 230 of the world's most unstable rivers. For poor families living in rural Bangladesh land is a scarce commodity and people have to make use of whatever space is available. Each year the situation is exasperated by flooding which restricts the time that crops can be grown. Floods affect over one million people in the country and more than 100,000 women, men and children are forced to move as villages and livelihoods are literally washed away. In recent years flooding has intensified and lasted longer and now the fields can be submerged for far longer than the traditional two months. During the monsoon season, much of the farm land in the Gaibandha district is covered by water, making it impossible to grow crops. Even when the floods recede the land remains waterlogged restricting people's ability to cultivate vegetables to feed themselves and to generate an income, particularly when land is flooded and other cultivation options are unavailable.

Taking practical action

Floating gardens are amongst the many options developed and promoted to address the needs of poor farmers in Bangladesh combining to make a real difference to production levels in the Gaibandha district. Training on the construction and use of floating gardens was provided by Practical Action, formally Intermediate Technology

Figure 1: Laying bamboo across the water hyacinth. Photo credit: Practical Action Bangladesh

Development Group (ITDG) and Gono Unnayan Kendro (GUK), a local NGO and have now become popular in the area.

Although floating gardens have been successful for many people there are some who cannot make use of this farming technique. Some of the landless poor do not have access to areas where the gardens could be set up. Even when areas of

Figure 2: Collecting and stacking the water hyacinth. Photo credit Practical Action Bangladesh

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technical brief

Turning Compost into food

People in Bangladesh now grow pumpkins on sandbars - infertile land by the side of rivers. One idea for a challenge may be around growing different types of pumpkins (or other vegetables) under different conditions to see what types of compost and/or manure help them grow best. You could think about the effects of using natural liquid feed e.g. comfrey tea.

To find out more go to
practicalaction.org/turning-compost-into-food

Growing on flooded land

Many parts of the world have the problem of growing food in areas where water is scarce but some like Bangladesh have the opposite, where land is often flooded so plants cannot grow. How about a challenge around how to grow crops on land that is flooded? One solution being shared by Practical Action is the use of 'floating gardens', rafts made form locally grown materials. Maybe your challenge could be about designing, building and testing a model of a floating garden.

If you have access to a pond you could even get pupils thinking about making a life size model!

For general information go to
practicalaction.org/floating-gardens

Floating gardens in Bangladesh

ZERO HUNGER

Processing and storing food

One important way to prevent hunger is to enable food that is grown locally to be stored for use later on or to be sold.

Refrigeration—zeer pots

Zeer pots are used in hot countries to refrigerate food when there is no electricity available. Designing ways of keeping food cool using a zeer pot design or an alternative design could be a great challenge. As a starting point pupils taking part in your challenge could make their own zeer pot using terracotta plant pots. Think about how they would test how well it keeps temperature down and for how long.

To look at zeer pots go to
practicalaction.org/zeer-pot-fridge

The zeer pot is a simple fridge made of local materials. It consists of one earthenware pot set inside another, with a layer of wet sand in between. As the moisture evaporates it cools the inner pot, keeping up to 12kg of fruit and vegetables fresh for as long as 20 days.

Drying

Drying is a really effective way to preserve food for a long period of time. In India, Practical Action has worked with communities to help them implement solar drying technology. This isn't just leaving things lying in the sun, it's using tents or boxes and other structures to increase the speed at which vegetables, fruits, meats and fish dry out. Also, it makes the process more hygienic,

Would you be interested in a challenge around designing a solar dryer that could work in Europe or elsewhere in the world? Perhaps pupils could look at other ways to make a solar dryer?

Maybe the challenge could include looking at which foods can be dried in this way and which ones can't.

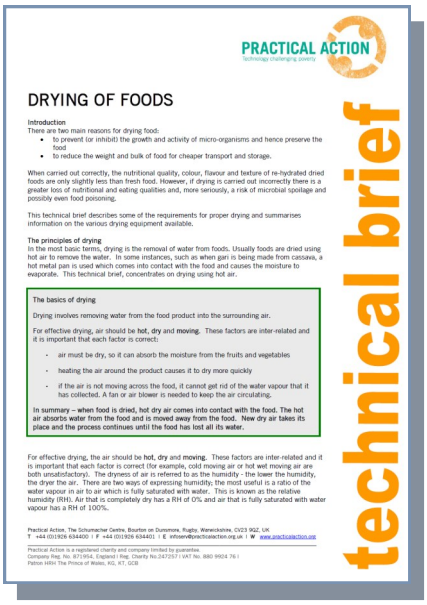
Juices and drinks

Making fruit into juice helps preserve it. Could you design a challenge around a way of making fruit juice. Think about setting this in a country where there are only limited resources for the machinery.

Preservatives

Pickling, adding sugar and salt are all ways in which food can be preserved. A challenge could involve finding effective ways of doing this with limited resources. Maybe it could include a number of experiments to determine how much of a given preservative is needed to store food for a certain time.

Farmer in Kenya



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DRYING OF FOODS

Introduction

There are two main reasons for drying food:

- to prevent (or inhibit) the growth and activity of micro-organisms and hence preserve the food
- to reduce the weight and bulk of food for cheaper transport and storage.

When carried out correctly, the nutritional quality, colour, flavour and texture of re-hydrated dried foods are only slightly less than fresh food. However, if drying is carried out incorrectly there is a greater loss of nutritional and eating qualities and, more seriously, a risk of microbial spoilage and possibly even food poisoning.

This technical brief describes some of the requirements for proper drying and summarises information on the various drying equipment available.

The principles of drying

In the most basic terms, drying is the removal of water from foods. Usually foods are dried using hot air to remove the water. In some instances, such as when gari is being made from cassava, a hot metal pan is used which comes into contact with the food and causes the moisture to evaporate. This technical brief, concentrates on drying using hot air.

The basics of drying

Drying involves removing water from the food product into the surrounding air.

For effective drying, air should be **hot**, **dry** and **moving**. These factors are inter-related and it is important that each factor is correct:

- air must be dry, so it can absorb the moisture from the fruits and vegetables
- heating the air around the product causes it to dry more quickly
- if the air is not moving across the food, it cannot get rid of the water vapour that it has collected. A fan or air blower is needed to keep the air circulating.

In summary – when food is dried, hot dry air comes into contact with the food. The hot air absorbs water from the food and is moved away from the food. New dry air takes its place and the process continues until the food has lost all its water.

For effective drying, the air should be **hot**, **dry** and **moving**. These factors are inter-related and it is important that each factor is correct (for example, cold moving air or hot wet moving air are both unsatisfactory). The dryness of air is referred to as the humidity - the lower the humidity, the dryer the air. There are two ways of expressing humidity; the most useful is a ratio of the water vapour in air to air which is fully saturated with water. This is known as the relative humidity (RH). Air that is completely dry has a RH of 0% and air that is fully saturated with water vapour has a RH of 100%.

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Useful Links

Global Goal 2: Zero hunger
http://www.globalgoals.org/global-goals/no-hunger/
Useful information on Global Goal 2 and how to get involved

Global Goal 2: Zero hunger
http://www.un.org/sustainabledevelopment/hunger/
Information from the UN about Global goal 2:

Technical briefs on food
practicalaction.org/technical-briefs-schools-food
Technical information on food processing

Technical briefs on agriculture
practicalaction.org/technical-briefs-schools-agriculture
Technical information on agriculture

Food videos
www.practicalaction.org/videos-food-agriculture
Videos from Practical Action showing the technologies involved in growing, transporting and preserving food.

Worldometers
www.worldometers.info
Information about the availability of food to people around the world.

OXFAM's Grow
www.oxfam.org/en/grow
Useful information from Oxfam linked to their 'Grow' campaign

Food and Agriculture Organisation of the United Nations
http://www.fao.org/home/en/
Information and links on agricultural topics

Food and Agriculture Organisation
https://www.youtube.com/watch?v=WeoIsjYBQH0
Video about sustainable food and agriculture

Blog by Practical Action
http://practicalaction.org/blog/category/programmes/food-and-agriculture/
Blog thread on food and agriculture

Crops grown in Sudan

Images of farming and plants
http://practicalaction.org/plants-image-gallery
http://practicalaction.org/farming-image-gallery

Videos around agriculture
http://practicalaction.org/videos-food-agriculture

Man with potatoes in Peru