

Super rice

39 Ways to Save the Planet

Rice facts, true or false?

The following activity is based on episode 1 of the BBC Radio 4 series *39 Ways to Save the Planet*. In order to complete this worksheet, listen to the 14-minute episode [Super Rice](#).

1. Circle the statements about rice farming in Table 1 which you believe to be false.

Rice is a staple food crop for 3 billion people worldwide	Rice is grown on every continent around the world	Rice seedlings require waterlogged fields to grow
Rice accounts for one-fifth of the world's total calories	Rice has the same carbon footprint as aviation	Rice production needs tropical or semi-tropical climates
There are only a handful of varieties of cultivated rice	'Puddling' is the technique of destroying soil by submersion	2 to 3% of human-caused global warming is from rice
DSR stands for 'Direct Seedling Rice'	Asia produces and consumes 10% of the world's rice	The production of rice emits methane

Table 1

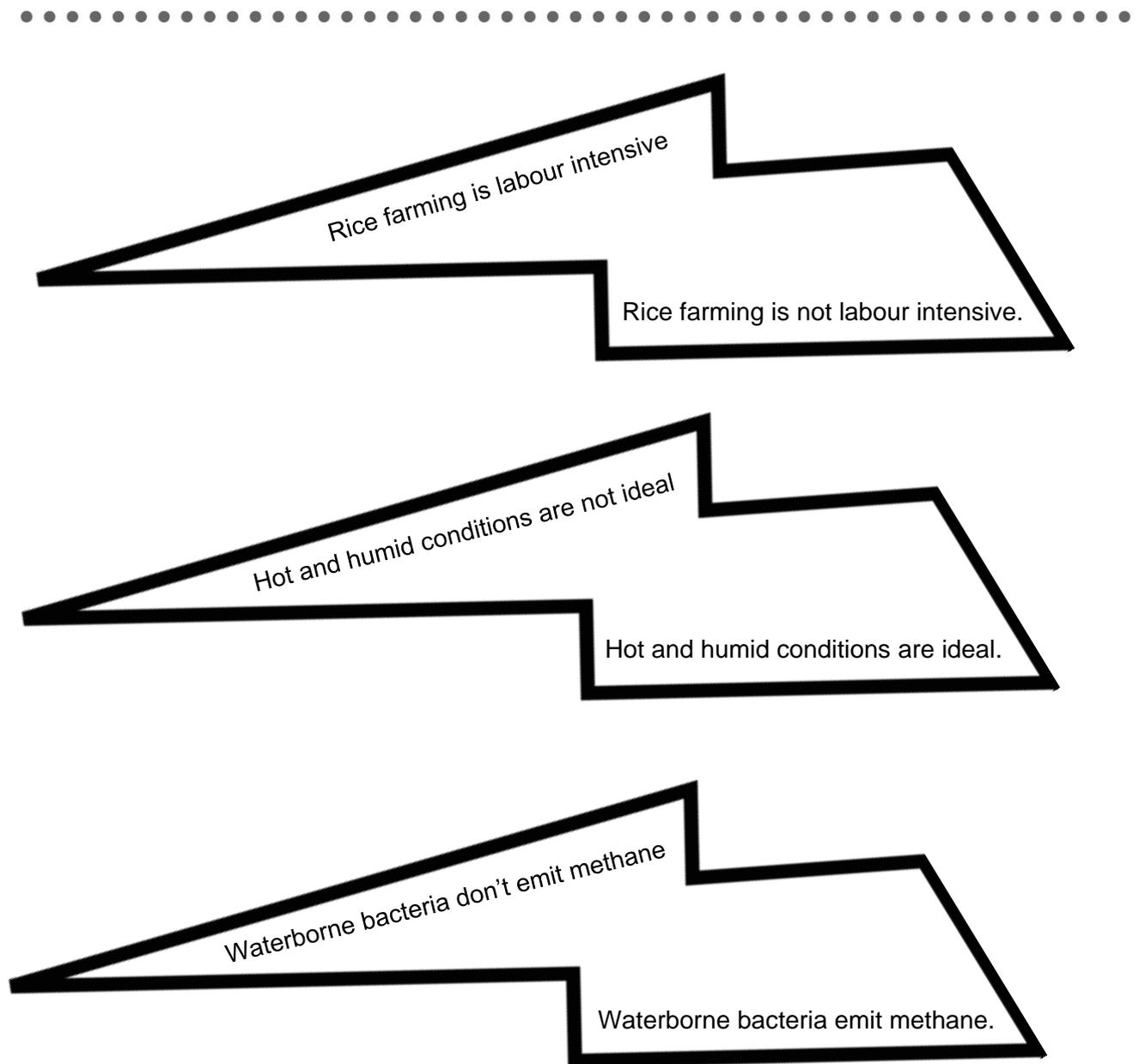
Puddling transplanted rice

Puddling is the widely practised agricultural process of destroying soil structure of a field by submerging it under water and then ploughing it. This 'wet system' of rice cultivation requires repeated re-ploughing and planking for rice seeds to then be sown in compact nurseries.

2. Below is an image of a rice field in Bangladesh. On the next page are split right/wrong sentences. Using Figure 1 to help, scribble out the wrong ½ of the sentences.



Figure 1 Rice field, Araihasar, Narayanganj, Bangladesh © Ashraful Haque Akash



Super rice

Super rice is seen as the solution to tackling climate change and the dilemma of a growing world population (with a fixed amount of agricultural land). It will help solve the problem of food insecurity for many NICs (Newly Industrialised Countries) and LICs (Low Income Countries) reliant on rice, such as Bangladesh. Food security means having access to enough safe affordable nutritious food to maintain a healthy and active life.

Super rice is an example of biotechnology in agriculture, when living organisms are used to modify the genetic make-up of a crop (rice), otherwise known as genetically modified (GM) crops. The Super Rice referred to in *39 Ways to Save the Planet* is a Direct Seeding Rice (DSR), designed by Rothamsted Research in Hertfordshire, the oldest continually operating agricultural research station in the world. It is hoped that, once established in Asian agricultural practice, it will be an 'appropriate technology'. Appropriate technology is the concept that any improvements or technological developments to a community should be sustainable in terms of the components needed, the maintenance required and the investment over time.

So, what are the benefits of Super rice? They can be summarised as:

- The needs of rice cultivation can be 'built in' i.e., drought tolerance and weed resistance
- Crucially, it does not allow waterborne microorganisms to grow, thereby limiting methane

There are further benefits from direct seeding:



- DSR requires less water, labour and money compared to transplanting rice
- Harvests mature roughly 10 days earlier when other crops are still in the field
- This early harvest from DSR creates early employment for day labourers
- Harvesting rice earlier means a farmer can plant fall (autumn) crops sooner

In 2014 the first GM rice crop was released throughout the world, called Golden rice. The Golden Rice Project involved 30-years of research and is designed to tackle the widespread problem of vitamin A deficiency. In the developing world a lack of vitamin weakens children's immune systems and can cause blindness and even death. Around 2,000 deaths a day in the developing world are attributed to a lack of vitamin A — more than HIV, tuberculosis, or malaria.

However, despite the benefits of Golden rice this GM crop has had very limited rollout due to overcautious regulation and the anti-GM crop movement. In particular, eco groups such as Greenpeace argue the crop detracts from dealing with general global poverty. Scientists now fear the crop has become a lightning rod for the anti-GM movement.

Overall, grains make up 45% of the world's diet. If you are interested in learning more about grains and dietary reliance on them read our teaching resource [TEFF, the next superfood?](#) which explains that whilst there are more than 5,000 known edible plants in the world, 'two-thirds of plant-derived food is provided by only three grains: maize, wheat, and rice'.

Alongside the biotechnology of GM crops the future of world food will also be reliant on insect nutrition. In December 2020, Forbes journalist Scott Carpenter reported that 'frontier agriculture' was 'about to take a big step closer to going mainstream' with the announcement of a planned insect protein mega facility in Decatur, Illinois. This will be the world's largest insect farm, growing and harvesting the black soldier fly to produce nutrient-rich animal feed.

Further reading

- Dr Kupur from Rothamsted Research explains the Super Rice solution and her research into rice varieties that can be grown with less water <https://www.rothamsted.ac.uk/news/future-rice-could-reduce-reliance-water-intensive-paddy-fields>
- Tom Heap BBC News [Why I'm feeling hopeful about the environment in 2021 - BBC News](#)
- Learn more about Rothamsted agricultural science [Rothamsted Research | Global Science, Lasting Benefits](#)
- Rice Farming pollution [Rice farming up to twice as bad for climate change as previously thought, study reveals | The Independent | The Independent](#)
- Cambodia and rice production [Scientists at work: bridging the divide between development and conservation in Cambodia \(theconversation.com\)](#)
- Could rice straw be a renewable fuel [Rice growing produces tonnes of excess straw – can we turn it into 'bioenergy'? \(theconversation.com\)](#)
- Golden rice could be sown in the Philippines [After 30 years, is a GM food breakthrough finally here? | GM | The Guardian](#)
- Why Greenpeace is against Golden rice [Golden Rice - Greenpeace Southeast Asia](#)

- Golden rice [Block on GM rice 'has cost millions of lives and led to child blindness' | GM | The Guardian](#)
- GM crops: Golden Rice and herbicide-resistant crops [GM crops - Genetic modification and cloning - GCSE Biology \(Single Science\) Revision - BBC Bitesize](#)
- The black soldier fly [World's Largest Insect Protein Farm Signals Future Of Food Supply \(forbes.com\)](#)

Suggested questions for Super rice

- What is a 'staple crop'?
- Why do you think so many people around the world rely on rice for their daily calorie intake?
- What is said about the mesocotyl tissue in the wet system of puddling rice fields?

Answers

Rice is a staple food crop for 3 billion people worldwide	Rice is grown on every continent around the world	Rice seedlings require waterlogged fields to grow
Rice accounts for one-fifth of the world's total calories	Rice has the same carbon footprint as aviation	Rice production needs tropical or semi-tropical climates
There are only a handful of varieties of cultivated rice	'Puddling' is the technique of destroying soil by submersion	2 to 3% of human-caused global warming is from rice
DSR stands for 'Direct Seedling Rice'	Asia produces and consumes 10% of the world's rice	The production of rice emits methane

Table 1

- Rice is grown around the world, but it is not cultivated on the continent of Antarctica. Rice seedlings do *not* require waterlogged fields, Direct Seedling Rice can be produced in 'dry' fields. Asia produces and consumes 90% of the world's rice.
- Answers to 'split right/wrong sentences' activity. Rice farming *is* labour intensive, hot and humid conditions are ideal for rice cultivation and waterborne bacteria does emit methane.

An RGS-IBG expert

Go to [What our expert says](#) to hear further analysis from Professor Vincent Gauci on the potential of low-carbon Super rice in *39 Ways to Save the Planet*.

