



# GM plant dilemmas

## Teacher guide

### General background to the activity

This activity is suitable for use in Biology/Science with secondary school pupils. It has been designed to encourage pupils to consider some of the issues which have arisen due to the advances in modern Plant Science and Technology.

### Curriculum links

This activity supports the following CfE outcomes:

- I can explain the use of different types of chemicals in agriculture and their alternatives and can evaluate their potential impact on the world's food production [SCN 3-03a].
- I can debate the moral and ethical issues associated with some controversial biological procedures [SCN 4-13c].

### National 4, Unit 1, Cell Biology

Key areas	Suggested learning activities	Exemplification of key areas
3 Therapeutic uses of cells.	Investigate uses of genetic engineering. Investigate e.g. insulin/factor VIII/ human growth hormone.	Insulin or other protein production via genetic engineering. Other examples may include products of genetic engineering, stem cell technology or using cells to grow artificial organs.

### National 4, Unit 3, Life on Earth

Key areas	Suggested learning activities	Exemplification of key areas
8 Controversial biological procedures.	Investigate/debate any relevant interesting topic eg gene therapy, pharming, transgenic animals and plants.	

## National 5, Unit 1, Cell Biology

Mandatory Course key areas	Suggested learning activities	Exemplification of key areas
<p><b>Unit 1 cell biology</b>  <b>6 Genetic engineering</b>            Genetic information can be transferred from one cell to another naturally or by genetic engineering. Stages of genetic engineering to include: identify section of DNA that contains required gene from source chromosome, extract required gene, insert required gene into vector/bacterial plasmid, insert plasmid into host cell and grow transformed cells to produce a GM organism.</p>	<p>Research current genetic foods/ issues such as golden rice, less toxic rape seed oil, bird resistance to bird flu, tomatoes with longer shelf life, blight resistant potatoes, production of medicines for human use e.g. insulin and growth hormone.</p>	<p>DNA can be transferred naturally between cells either by bacterial plasmids or viruses.            There are opportunities throughout this topic for learners to investigate and debate ethical issues.</p>

In addition the activity encourages children and young people to develop as scientifically literate citizens with a lifelong interest in science by:

- assessing risk and benefit of science applications;
- making informed personal decisions and choices;
- expressing opinions and showing respect for others' views;
- developing informed social, moral and ethical views of scientific, economic and environmental issues;
- discussing and debating scientific ideas and issues.

### Classroom set up

It may be appropriate to have a class discussion at the start of the activity about what is meant by morally right and wrong. The teacher could read the 'Response Instruction Card' with the class and then ask the class to give some examples of things which society would consider to be morally right, wrong and neutral. Then the teacher would explain that they are going to make some moral decisions about some issues for society. They will have to come to group decisions, so they may find that they have to give a response which is a compromise of all the group's ideas. Some of the cards have a statement which is not a moral dilemma at all and pupils may find this odd, so it might be important to point this out at the start. They can respond to say that such a statement is morally neutral, if that is appropriate, or they can just place a '-' on the response card.

In the classroom pack there are 5 dilemmas:

- 1) Golden rice
- 2) GM crops as food aid
- 3) Less toxic oil seed rape
- 4) New potatoes
- 5) Turbocharged rice



## Instructions

Each dilemma has a set of 5 cards numbered (1- 5) and they must be read in sequence. After each card is read a judgement is made. A response instruction card must be available for each group - this tells the students how to record their decisions. A response record card is also available for each dilemma.

- 1) One person in each group begins by taking the dilemma cards and reading out the first card to the group, then he or she begins the group discussion.
- 2) The group discuss the dilemma and decide on their response as a group and record it on the response record card.
- 3) The same person in the group reads out the next card, leads the discussion and then records the group response - this continues until all cards are read and responses recorded. It may be that students wish to alter their earlier responses due to information in later cards.
- 4) The process is repeated with another student choosing a different dilemma.

About 40 minutes is sufficient time for this activity

*(The idea and format for this resource is based on an activity adapted from The Wellcome Trust Lab Notes (issue No 1, pages 5-8) courtesy of the Wellcome Trust ([www.wellcome.ac.uk/lab notes](http://www.wellcome.ac.uk/lab%20notes)).*

