Biotechnology and GMO

How plant biotechnology can "save the world"

Objectives of the lesson

- To introduce the students to the concept of Plant Breeding and Biotechnology.
- To emphasize with the students the importance of plants in our everyday lives.
- To highlight with the students how Plant Biotechnology can be a solution to producing more food to feed a growing population.
- To introduce the term "GMO".
- To explain 'The Green Revolution' and its impact on the developing world's population.

Food is a basic human right

Universal Declaration of Human Rights (UN, 1948)

Article 25

 "Everyone has the right to a standard of living adequate for the health and well-being of himself and his family, including food..."



recognition of the inherent dignity and of the equal and determined to promote social progress and better standards of life in inalienable rights of all members of the human family is the foundation larger freedom, of freedom, justice and peace in the world,

WHEREAS disregard and contempt for human rights have resulted in arbarous acts which have outraged the conscience of mankind, and the advent of a world in which human beings shall enjoy freedom of speech and belief and freedom from fear and want has been proclaimed as the highest aspiration of the common people,

WHERDAS it is essential, if man is not to be compelled to have recourse, s a last resort, to rebellion against tyranny and oppression, that human rights should be protected by the rule of law,

WHEREAS it is essential to promote the development of friendly relations

WHEREAS the peoples of the United Nations have in the Charter reaffirmed their faith in fundamental human rights, in the dignity and worth of the human person and in the equal rights of men and women and have themselves and among the peoples of territories under their jurisdiction.

WIERRAS Member States have pledged themselves to achieve, in cooperation with the United Nations, the promotion of universal respect for and observance of human rights and fundamental freedoms.

WHEREAS a common understanding of these rights and freedoms is of the greatest importance for the full realisation of this pledge,

this Universal Declaration of Human Rights as a common standard of achievement for all peoples and all nations, to the end that every individual and every organ of society, keeping this Declaration constantly in mind, shall strive by teaching and education to promote respect for these rights and freedoms and by progressive measures, national and international, to secure their universal and effective recognition and observance, both among the peoples of Member States

ATTICLE ! —All human beings are born free and equal in dignity and rights. They are endowed with reason and conscience and

NUTRICE 2 -1. Everyone is entitled to all the rights and for ad-NERGE 2 — I. Ewayses is serified to all the rights and fracdoms set forth in this Deleteration, without additurnities of any sizel, sets as resc. colour, sex, Ireguege, religion, palitical or other opinion national or social origin, peoparty, briter or after status.

2. Furthermore, ne distriction shall be made on the basis of the political, jurisdictional or international status of the country or tentilety to which a person belongs, whether this tentury be an independent, Further to Not delice-overing senting, or order any independent, Further to Not delice-overing senting, or order any independent, Further to Not delice-overing senting, or order any

CITELL II = 1, Everyone has the sight to seek and to cajpy in other countries asylum from persecution.

2. This right may not be invalued in the case of prosecutions generally using from non-position crimes or from onto contrary to the purposes and principles of the United Nations.

STREET -1. Everyone has the right to a perioaelit

Marriage shall be entered into only with the free and full consent of the intending spauses.

others. If :--- theoryone has the right to own property alone as well as in association with athers.

2. No one shall be arbitrarily deprived of his property.

MINUX III —Everyane hos the right to freedom of thought, secience and religion; this right includes freedom to change his ligious or halled, and freedom, either alone or in community with these and in public or private, to marifest his religion or belief in

STREET - Decryone has the right to freedom of opinion and

2. Everyone has the right of agual access to public service in his

3. The will of the people shall be the basis of the authority of any

NETREE 21 -1. Everyone has the right to work, to free choice of mplayment, to just and favourable conditions of work and to pro-

2. Everyone, without any discrimination, has the right to equal pay for equal work.

NETICE 21 —Everyone has the right to rest and leisure, including reasonable limitation of working hours and periodic helidays with

MERCLL 23 —1, Everyone has the right to a sheadend of living adequate for the health and well-being of hinself and of his family, including food, skilling, housing and medical one and necessary social services, and the right to security in the event of unemployment, sickness, dischifty, widerwhood, all age or other facils of irrelated in chromitance beyond his control.

2. Matherhood and childhood are entitled to special care and assistance. All children, whether born in or out of wedlock, shall enjoy

ICLE IN -1. Everyone has the right to education Education thall be free, at least in the slimmthary and fundamental stages. Elementery education shall be compaliary. Technical and professional education shall be made generally available and higher education shall be equally occasible to all on the basis of meet. esucanon stem to equally accessible to all on the basis of merit. 2. Education shall be disacted to the full development of the human personality and to the strengthening of respect for human right and fundamental freedoms. It shall promote understanding, state-care and frinchible senong all nations, read or religious proups, and shall further the activities of the United Nations for the male-

MINULE 27—1. Everyone has the right fixely to participate in the cultural life of the commonly, is only; the arts and to share in scientific advancament and its benefits.

2. Everyone has the sight to the protection of the more land material interest resulting from any scientific, literary ar artistic production of which he is the surface.

STREET :— = 1, Becryane has deties to the consumity in which often the free and full development of his persentility is possible.

2, in the secretic of his rights and freedom, everyone shall be sub-cinctly and the secretic of his rights and freedom, everyone thall be sub-plicated by the interactions are determined by two scholler for the purpose of security due recognition and expect for the rights and freedom of often and off-meeting his pair requirements of mostility.

SUSTAINABLE GEALS



































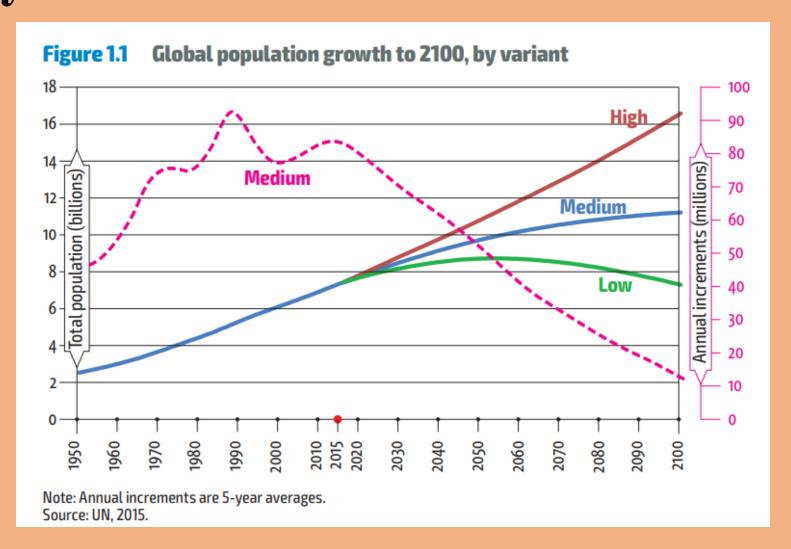




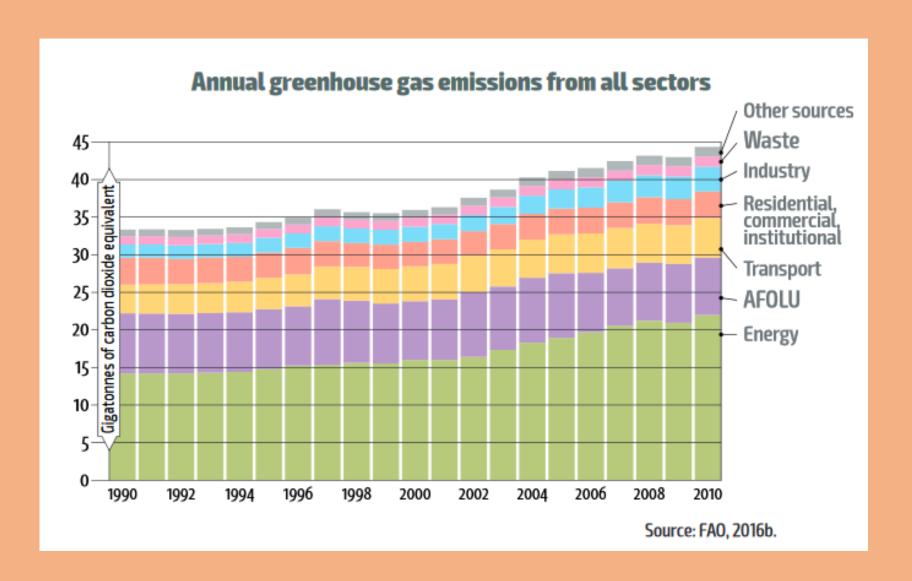
821 million

• The number of people who are "undernourished".

World population increase projected to reach 8.3 billion by 2020



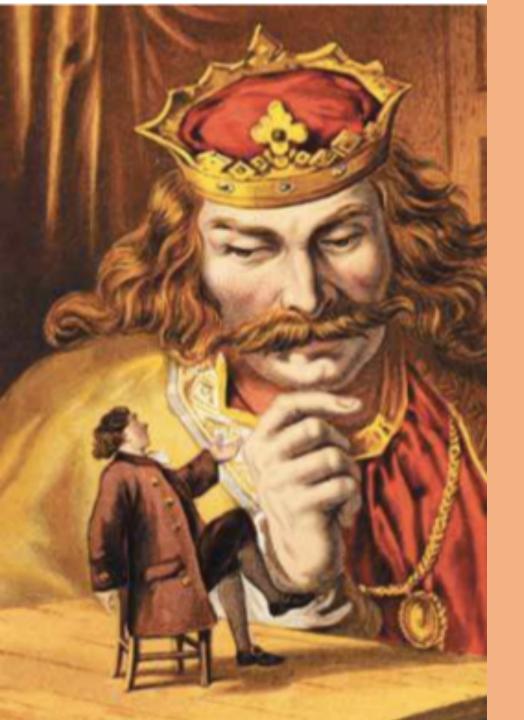
But food production is a major contributor to global climate change



The Big Question

How can we waste less and produce more food to feed a growing human population whilst limiting our use of natural resources (water, land, etc.) and protecting our environment and biodiversity....all in the context of a changing climate?

Plant Biotechnology can be one part of the solution.



"Whoever could make two ears of corn grow upon a spot of ground where only one grew before, would deserve better of mankind, and do more essential service to his country, than the whole race of politicians put together," -

Ways we benefit from plants: Let's create a word cloud

• https://www.wooclap.com/YRZHHJ

• Code: YRZHHJ

• Let's do a word cloud and gather your thoughts!!!







Food









Clothing









Energy









25% of the West's prescription drugs are plant derived.

Medicine





Some of the bestknown drugs derived directly from plants:

- Aloe vera

Plant breeding

• Clearly, human society relies on plants for a whole variety of reasons.

Plant breeding means improving plants to make them higher yielding, more resistant to disease, more resistant to environmental conditions.

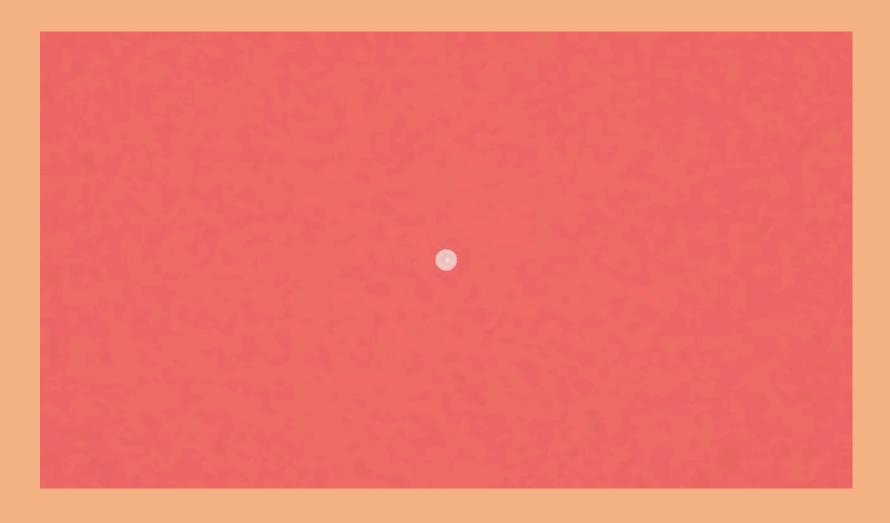
We breed plants to breed better plants to support human development – food, medicine.

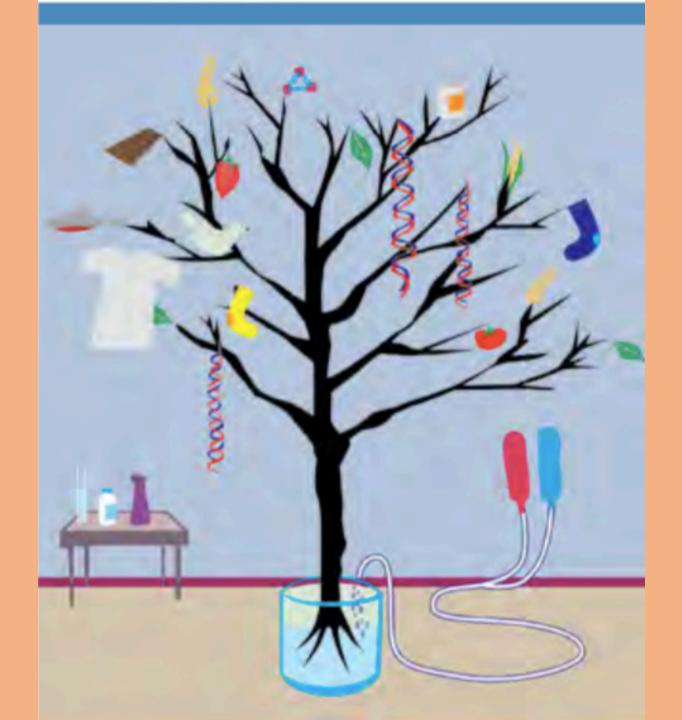
What is Biotechnology?

- "any technological application that uses biological systems, living organisms, to make or modify products for specific use."
- -UN Convention on Biological Diversity



Biotechnology.....Let's watch a video





Genetically Modified Organisms

• Genetic modification is the process of changing the DNA of any living thing (Plants, animals or micro-organisms) in a way that does not occur in nature.

Which crops have been modified?

- So far, most GM crops have been modified to help overcome two of the major problems faced by commercial farmers, namely insect pests and weeds.
- As an alternative to spraying insecticides onto the crop, it has been possible to introduce genes that allow the plant to manufacture insecticides.
- It is estimated that 62% of global cotton production involves the use of genetically modified cotton.



Remember Golden Rice and its benefits- a genetically Modified Organism

 Genetic modification could also be used to help create plant varieties with other properties to give foods improved nutrient levels (increased Vitamin A in rice or increased polyunsaturated oils in cereals).



How can we tell if GM products are on sale in Ireland?

- All products made using GM ingredients must be labelled as such.
- GM foods are only authorized for sale if they are judged not to present risk to health or the environment, and to be of no less nutritional value than the foods they are intended to replace.

On balance the advantages of genetically modified (GM) food outweigh any dangers.

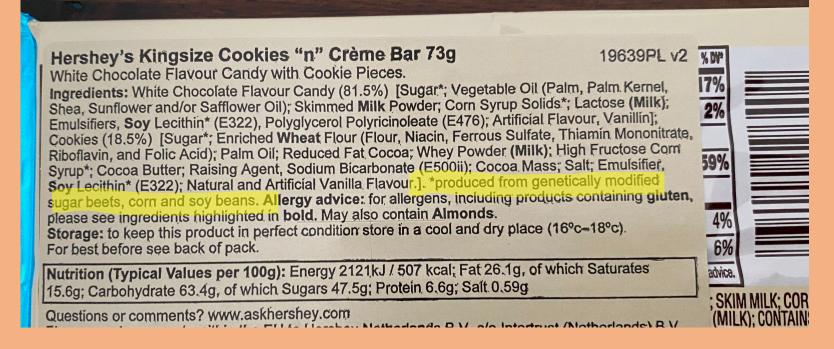


Treat Yourself



Look at the Ingredients list of your chocolate bar!





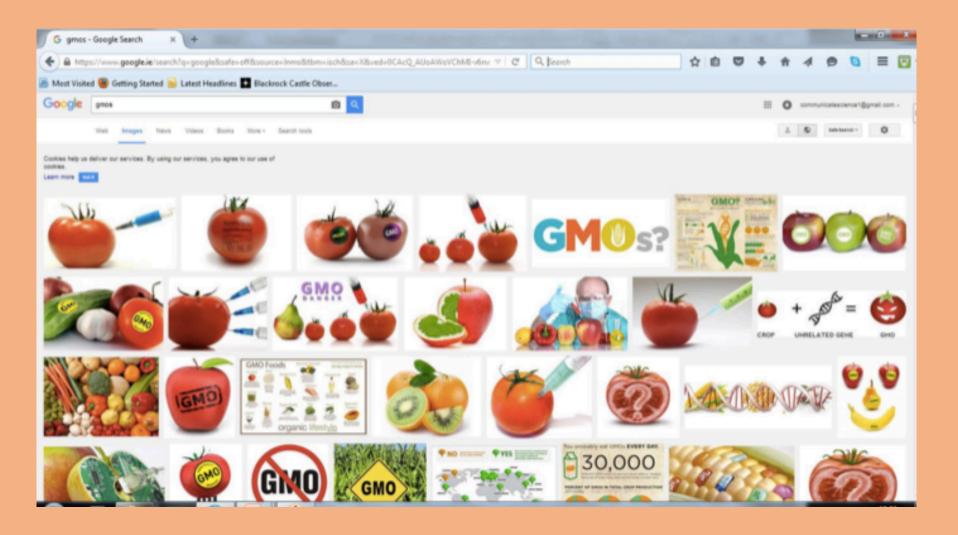
"GM crops are not the problem but part of the solution to sustainably feeding 9 billion people".

 The European Union, the Royal Society and the US National Academy of Sciences all conclude that GM crops are safe and effective.

• The global population is estimated to increase to 9 billion by 2050 and the Food and Agriculture Organization estimates that global food demand will increase by 70%.

• In this context we need to consider all the options. GM approaches within plant breeding are one of the potential tools.

However, if we google GMOs....



The reality...







The Green Revolution

Norman Borlaug (1914-2009)
"Father of the Green Revolution"



"You can't build a peaceful world on empty stomachs and human misery"

- Borlaug worked in Mexico after his PhD and developed high-yielding dwarf wheat varieties. Such varieties were less prone to falling over during wind and rain.
- Borlaug led the introduction of these new varieties into Mexico, India and Pakistan.
- Mexico within 20 years doubled its wheat harvest.



Borlaug was awarded the Nobel Peace Prize in 1970 for "a technological breakthrough which makes it possible to abolish hunger in the developing countries in the course of a few years".

"The man who saved a billion lives"





Debate?

Genetically modifying food crops through Biotechnology can be one of the solutions to World Hunger. Using Biotechnology we can harvest, high-yielding, pest-resistant, nutrient-rich crops to feed our ever-growing human population.

Do you agree with the above statement. Do you believe that we should be consuming genetically modified organisms. Do you believe that such produce should be clearly labelled to the consumer as a GMO. Do you think there is a better solution to fighting World Hunger particularly in the developing world.



Learning Outcomes

At the end of the lesson students should be able to:

- Define Plant Breeding and Biotechnology.
- Recite the importance of plants in our everyday lives with examples.
- Highlight how Plant Biotechnology can be a solution to producing more food to feed a growing population.
- Explain the term "GMO".
- Explain 'The Green Revolution' and its impact on the developing world's population.