UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education
Advanced Subsidiary Level

GLOBAL PERSPECTIVES **8987/12**

Paper 1 Written paper **May/June 2012**

1 hour 30 minutes

INSTRUCTIONS (Resource Booklet)

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READ THESE INSTRUCTIONS FIRST

This Resource Booklet contains Documents 1 and 2 which you should use to answer the questions.

You should spend approximately 10 minutes reading the documents before attempting to answer the questions. This is allowed for within the time set for the examination.

This document consists of **3** printed pages and **1** blank page.

The documents below consider Genetically Modified crops. Read them **both** in order to answer **all** the questions on the question paper.

Document 1: adapted from an article by the Food and Agriculture Organisation of the United Nations, published in December 2010.

Genes can end up in unexpected places. Through gene escape they can pass on to other members of the same species and perhaps other species. Genes introduced in GMOs (Genetically Modified Organisms) are no exception. Environmental problems could result if, for example, herbicide-resistant genes got into weeds. So far, research on this is inconclusive, with scientists divided. But there is scientific consensus that once widely released, recalling foreign DNA sequences, whose safety is still subject to scientific debate will not be feasible.

Genes can mutate with harmful effect. It is not yet known whether artificial insertion of genes could destabilize an organism, encouraging mutations, or whether the inserted gene will keep stable in the plant over generations. There is no conclusive data.

GMOs might interact with wild and native populations. They could compete and breed with wild species. Farmed fish, in particular may do this. GM (Genetically Modified) crops could pose a threat to crop biodiversity, especially if grown in areas that are centres of origin of that crop. In addition, GM crops could compete with and substitute traditional farmers' varieties and wild relatives that have been bred, or evolved, to cope with local stresses. Such plants often help improve climate tolerance and disease resistance. If GM crop varieties substitute them, they could be lost, but the same applies to improved varieties developed by conventional breeding.

There is the potential risk to non-target species, such as birds, pollinators and micro-organisms. Nobody quite knows the impact of the flow of GM pollen to bees' guts or of novel gene sequences in plants to fungi and soil. Besides it is feared that widespread use of GM crops could lead to the development of resistance in insect populations exposed to the GM crops.

GM food may have a negative effect on human health. Genes could be accidentally transferred to other species causing dangerous reactions in people with allergies. For example, an allergenic Brazil-nut gene was transferred into a transgenic soybean variety. Its presence was discovered during the testing phase and the soybean was not released. Unauthorised GM products have appeared in the food chain. For example, the GM maize variety Starlink, intended only for animal feed, was accidentally used in products for human consumption. Genes that confer antibiotic resistance are inserted into GMOs as markers to indicate that the process of gene transfer has succeeded. Concerns have been expressed about the possibility that these marker genes could confer resistance to antibiotics. This approach is now being replaced with the use of marker genes that avoid medical or environmental hazards.

The socio-economic threat is an issue. Biotechnology research is carried out predominantly by the private sector and there are concerns about the market dominance of a few powerful companies. This could have a negative impact on small-scale farmers all over the world.

Document 2: adapted from an article on AgBioWorld website, written by Ben Miflin. AgBioWorld is an organisation of 3,400 scientists that supports biotechnology and its use for the developing world. The organisation has 25 Nobel winners as members. Miflin is a Senior Fellow at an agricultural research centre.

Mankind has been manipulating the genetics of crops for around 10,000 years. Wheat, the world's major crop, is a hybrid of different species. It probably arose from a rare natural occurrence but has subsequently been maintained artificially.

The modern (non-GM) wheat is unable to exist in the wild because it cannot disperse its seed. Furthermore, plant breeders have added pieces of chromosomes from other species. The crop has been spread from a small fertile crescent in the Middle East to nearly every country in the world. Much experience has been gained in this evolution that is relevant to GM crops. The new GM technology allows genes to be added more precisely and their effects to be studied more carefully. However, because it also allows almost any source of genes to be used it is an extremely powerful technology that has to be treated with care and respect.

GM technology is the only technology to be regulated from its inception, before any mishaps had occurred. Researchers set up a series of voluntary regulations in 1974 which have become officially incorporated by governments throughout the world. GM crops have been extensively tested in hundreds of thousands of field tests. Foods from these crops have to pass much more rigorous regulations than from conventionally bred crops.

Over the last 12 years between 50-100 million euros have been spent by the EU on bio-safety research. GM technology is used widely in the production of foods (e.g. the majority of cheese in the UK and US is made with an enzyme that is the product of GM technology) and medicines (e.g. the production of human growth hormone by GM methods removed the major cause of CJD (Creutzfeldt-Jakob Disease). GM crops have been grown on many millions of acres since 1966 in North and South America and Asia. There are no proven examples of GM products adding risks. In contrast, there are many examples of the technology reducing risks. GM technology is not safe – nothing is – but it has a very effective record.

Critics claim that GMOs may increase the use of chemical pesticides and the profits of agribusiness. Pigs might fly. It is a matter of fact that GM crops have drastically cut the use of such pesticides. GM cotton, containing a built in insecticide, uses 50% less chemical insecticides. In 1998 around 1,000 tonnes less insecticide was used in the US Cotton Belt than before the introduction of GM cotton. That insecticide was mainly sprayed from planes. Only a small percentage reached its target. The rest drifted into the wider environment killing susceptible insects, whether pests or not. GM cotton only kills those insects that feed on the crop.

With this record of proven environmental benefit in practice, I find it hard to explain why there is such fierce opposition to the technology. Why are Friends of the Earth and Greenpeace trying to block technology that is decreasing pesticide use?

GM technology is not the real target but rather the weapon to use against multinationals and global corporations. It is effective because it can be used to stir emotions – 'Frankenstein Foods' might be nonsense but it is an eye-catching, gut-wrenching headline.

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