

BIOTECHNOLOGY REGULATIONS AND ETHICS

SCIENTIFIC PAPER

Genetically Modified Crops: Friends of the Environment

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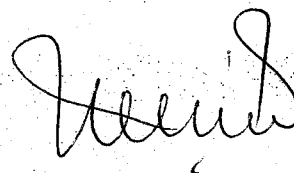
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PROPOSITION

“The use of genetically modified crop is a benefit to the environment”

For many years, crop production has been reshaping our landscape. Forests have been cleared and prairies plowed under. The landscape may still be pleasing to the eye, but the diversity of plants and animals that characterized earlier times has been lost. Not because of GM crops, but because of our need to feed an ever-growing human population coupled with our inability to increase productivity fast enough. A litany of problems: loss of species diversity, soil erosion, and salt build-up do not exist because of GM crops. Increasing sustainability and raising productivity will tax our human ingenuity to the limit.

The GM crops already in the fields require fewer pesticide applications and less tilling of the soil—thereby causing less erosion. Thus GM crops can make agriculture more productive and environmentally friendly.

Potential benefits for agricultural productivity

If crops can be made more resistant to pest outbreaks, it would reduce the danger of crop failure. Similar benefits could result from better resistance to severe weather, such as frost, extreme heat or drought. In other words, GM crops are made for better resistance to stress.

By inserting genes into crops such as rice and wheat, we can increase their food value. Many products aimed at bio-fortification are in the production pipeline. In addition, genes might be inserted into cattle to raise their milk yield. GM crops contain more nutritious staple foods.

Potential benefits for the environment

Improved productivity from GMOs might mean that farmers in the next century won't have to bring so much marginal land into cultivation. Genetically modified resistance to pests and diseases could greatly reduce the chemicals needed for

crop protection, and it is already happening. Farmers are growing maize, cotton and potatoes that no longer have to be sprayed with the bacterial insecticide *Bacillus thuringiensis* - because they produce its insecticidal agent themselves. These developments could not only reduce environmental impact - they could also improve the health of farm and farmers.

Large areas of cropland in the developing world have become saline by unsustainable irrigation practices. Genetic modification could produce salt-tolerant varieties. Trees might also be improved or modified to become more tolerant of salt and drought. They might also be selected or bred for rehabilitation of degraded land. While there is some advanced research in this area, salt and drought tolerance are the result of quite complex gene combinations, and positive results will take longer than those providing insecticide and herbicide resistance.

Rehabilitation of damaged land may also become possible through organisms bred to restore nutrients and soil structure. The genetic modification of fruits and vegetables can make them less likely to spoil in storage or on the way to market. This could expand trade opportunities as well as reduce massive wastage incurred in transport and supply.

Potential benefits for human health

Although some people are worried about the transfer of allergenic genes, molecular biology could also be used to characterize allergens and remove them.

OPPOSITION

“The use of genetically modified crop is a damage to the environment”

There were two main focuses for the anxiety about the use of genetic modification: the potential impact on human health, and the potential environmental impact. The level of concern about the latter was particularly high. If genetically modified organisms and products were released for use outside laboratory containment, the inherent instability of the technology and the high risk of human error meant it was likely modified organisms would escape from genetically modified crops and animals and contaminate unmodified plants, insects and animals in both the natural and the agricultural environments. Underlying the concerns about these adverse impacts was a widely held belief that the effects would be irreversible.

Specific concerns over genetic modified crops include:

- *Allergic reactions.* There are two concerns regarding allergic reactions. The first is with known allergens. The second concern is over the possibility of new allergies. The new combinations of genes and traits have the potential to create new allergic reactions.
- *Gene mutation.* Scientists do not know if the forced insertion of one gene into another gene can destabilize the entire organism, which would encourage mutations and abnormalities.
- *Antibiotic resistance.* GM food could make disease-causing bacteria resistant to antibiotics, which could increase the spread of disease and illness throughout the world.
- *Loss of nutrition.* Genetic engineering can change the nutritional value of food.
- *Damage to the environment.* Insects, birds and wind can carry genetically altered pollen to other fields and forests, pollinating plants and creating new species that will carry on the genetic modification.
- *Gene pollution can not be cleaned up.* Once released into the environment, genetically modified organisms cannot be removed.

- *Increased chemical use.* Many GM plants are bred to be resistant to herbicides, or weed killer, so a farmer can spray an entire field and kill only the weeds. In time, the weeds develop resistance to the herbicide, thus forcing the farmer to spray even more chemicals onto the fields.
- *Superweeds.* GM crops can cross-pollinate with weeds, potentially creating superweeds that could become difficult to control.

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CONCLUSION

There is no evidence that GM crops harm the environment or have the potential to harm the environment any more than traditional agriculture. Certain GM crops have environmental benefits because they require less pesticide to be used and less tilling of the land (and therefore less danger of erosion). GM crops can play an important role in making agriculture more sustainable and more productive.

Groups that oppose GM crops on ideological, philosophical, or economic ground have not brought forth scientific evidence to back up their claims of negative health consequences or environmental impact.

In the end, public acceptance of GM crops will come down to perceived consumer benefit. Consumer benefit is yet to be clearly demonstrated. Agricultural technologies also have negative effects. In order to make them better requires our human ingenuity.

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