ENVIRONMENTAL IMPACT OF GENETICALLY MODIFIED CROPS

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INTRODUCTION

- Genetically modified crops are plants used for food and feed its genome have been genetically modified to obtain new qualities.
- Obtained new traits are very variable, but the most common are resistances to selected herbicides, insects and viruses.
- GM crops suppose a high economic benefit due to high production rates and weed management improvement.
- In about 10 years GM crops adoption raised worldwide dramatically.

OBJECTIVES

- Study of the risks and benefits of GM crops used for food and feed, focalizing on environmental impacts.
- Comparative of different opinions from different sources.
- Research of latest developed GM crops and their uses.

Genetically Modified Crops

ENVIRONMENTAL BENEFITS

- **Increase yield**: GM crops production rates are higher than non-GM.
- **Use of adverse environmental lands**: consequence of the development of drought, cold and salt tolerant crops.
- **Decrease use of pesticides** in Herbicide and Insect-Resistant crops.
  - Less secondary pesticide effects
  - Focus on a single pesticide type
- **Reducing global greenhouse gas (GHG) emissions**: due to reduction in the energy use in soil cultivation and herbicide or insecticide applications.
- **Use in bioremediation**: bioaccumulation of pollutants from contaminated site.
- **Use of less fertilizers**: GM Crop that plants that take-up and metabolize nitrogen more efficiently.

ENVIRONMENTAL RISKS

- **Unexpected and unwanted transgene outcrossing**: spread of transgenes to genetically similar weeds or non-GM crops. Through sexual reproduction (GM plants pollen may fertilize other plants) or via bacterial transformation.
  - Appearance of herbicide/virus/ insect-tolerant "superweeds“ → Impact on weed management → Increase of pesticide needs
  - Other side-effects like changes in plant characteristics, sickness susceptibility, etc .
- **Non-target organisms affected by GM crops**: toxins and other sub-products may affect surrounding and consumer organisms in unknown ways.
  - GM crops pollen cause death of butterfly larvae
  - Bees shown terminal digestive tract diseases after eating GMO's pollen → Pollination required fruits and nuts crops endangered → Biodiversity decline
- **Uncontrolled GM crops environmental distribution**: due to seed's natural dispersal vectors and high survival rates.

CONCLUSIONS

- The long-term environmental impact has yet to be completely understood.
  - Many factors are considered.
  - The technology is relatively new, so there is not enough data to assess properly.
- Risk assessment depends on the role of the introduced gene, and the effect that it brings into the recipient plant.
- Evaluation of environmental and ecological potentially associated concerns and post approval monitoring is necessary for every GM crop to ensure that biotech crops continue to be safe for consumers and the environment.
- So far, GM crops caused a large amount of environmental imbalances due to an economic benefit basis. Therefore, GM crops are able to recover contaminated lands, which open new ways to take profit of biotech engineering.