



- RISK = likelihood of occurrence x consequence of an incident.
Naturally-occurring and human-caused biological risks



The Risks of GMOs

We've got the studies to prove it >

RISK ANALYSIS :

- *Risk assessment*
- *Risk management*
- *Risk communication*

■ International documents on Risk Communication



- The Cartagena Protocol on Biosafety of the Convention on Biological diversity;
- The Codex Alimentarius (international food code).



Risk communication is “ the interactive exchange of information and opinions throughout the risk analysis process concerning hazards and risks, risk-related factors and risk perceptions among risk assessors, risk managers, consumers, industry, the academic community and other interested parties, including the explanation of risk assessment findings and the basis of risk management decisions” (Codex Alimentarius Commission, 2003)



- The main goals of risk communication:
- (1) to improve knowledge and understanding on all aspects of the risk analysis process by all interested parties concerned with risk; and
 - (2) to promote interactive communication between risk assessors, risk managers and other interested parties concerned with risks in order to achieve the desired outcomes.



Characteristic of good risk communication :

- translate the scientific findings and probabilistic risk assessment into understandable terms;
- explain the uncertainty ranges, knowledge gaps, and ongoing research programmes;
- address issues of credibility and trust;
- understand the public's concern with regard to risk issues, and acknowledge their questions and concerns;
- analyze the conditions needed for the public to acquire relevant information, skills, and participatory opportunities.



Effective risk communication:

- Know the audience;
- Involve the scientific experts;
- Establish expertise in communication;
- Be a credible source of information;
- Share responsibility;
- Differentiate between science and value judgment;
- Assure transparency;
- Put the risks in perspective.



Risk communication principles:

- explain technical risks more effectively;
- understand the multi-dimensionality of risk;
- anticipate community responses to the intended activities;
- respond to public concerns and misinformation;
- increase the effectiveness of risk management decisions by involving concerned community members;
- improve dialogue and reduce tension between communities and companies;
- build relationships based on trust and respect;
- develop a good reputation with regulators and the public.



Engagement of stakeholders:

Questions in identifying relevant stakeholder groups:

- which branches of government(s)
- public hearings are officially involved in the applicable regulatory process?
- who might be affected by the risk management decision?
- who has information and expertise that might be helpful?
- who has been involved in similar stakeholder groups in risk situations before?
- who has expressed interest in being involved in similar decisions before?
- who reasonably might be angered if not included?



Tactic to engage stakeholders:

Meeting techniques

- Public hearings
- Public meetings
- Briefings
- Question and answer sessions
- Focus group discussions
- Workshops
- Inclusion of non scientific stakeholder groups in scientific meetings

Non meeting techniques

- Interviews
- Hotline and toll-free numbers
- Online survey (social media) :
Whatsapp, Facebook, Twitter,
Instagram, Line etc.

Are GMOs SAFE? **YES.** The National Academies of Sciences, Engineering, and Medicine 2016 report reaffirms

Over **900** studies and publications were examined



20+ scientists, researchers and agricultural and industry experts over a 2 year period reviewed animal studies, allergenicity testing, North American and European health data, and more



SAFE.



No substantiated evidence of a difference in risks to human health between current commercially available genetically engineered [GMO] crops and conventionally bred crops.

The National Academies of
SCIENCES • ENGINEERING • MEDICINE

Based on **20+** years of data since GMO crops were introduced

Full report available at <http://nas-sites.org/ge-crops/>



How GMOs Help Reduce FOOD WASTE & LOSS

In the United States, approximately **133 BILLION POUNDS** of food is **WASTED** annually, contributing to **18% of the total U.S. landfill methane (greenhouse gas) emissions.**¹

GM APPLES ARE NON-BROWNING AND NON-BRUISEING, ELIMINATING THOSE SUPERFICIAL ISSUES that cause people to unnecessarily throw them away.²

In 2010, each American on average



totaling 1.7 billion pounds of food waste³



GM POTATOES ARE LESS PRONE TO BRUISING AND BLACK SPOTS, meaning fewer potatoes will end up in landfills.⁵



GMOs help farmers minimize these losses and grow more food using less land.

In 2014, GMOs enabled farmers to use 51 million less acres of land to produce the same amount of crops⁸—equivalent to nearly four times the size of America's largest national park, Wrangell-St. Elias National Park and Preserve.⁹



20 - 25% of all crop yields in the U.S. are **LOST** to pests, crop diseases, or post-harvest losses. In the developing world, it's as high as 40 - 50%.¹⁰



1. Food and Agriculture Organization, 2010. World agricultural production and trade in food and agricultural products. Rome, Italy: FAO.

2. USDA, 2010. National Organic Program. 2010. Organic Standards. Washington, DC: USDA.

3. National Food Processing Board, 2010. Food Waste. Washington, DC: NFPB.

4. National Food Processing Board, 2010. Food Waste. Washington, DC: NFPB.

5. National Food Processing Board, 2010. Food Waste. Washington, DC: NFPB.



Can GMOs HELP PROTECT THE ENVIRONMENT?



THEY ALREADY DO.

Contrary to myths about GMOs hurting the environment, GMOs allow farmers to preserve the land while doing more with less resources.

The Environmental CHALLENGE:

20% POPULATION INCREASE BY 2050 = **HIGHER DEMAND FOR**



2 POTENTIAL PATHS

- 1** Convert more land, like forests and prairies, into agricultural production
- 2** Use agricultural technologies like GMOs to increase crop yields on existing farmland

GMOS are ONE SOLUTION

In 2014, GMOs allowed farmers to use **51 MILLION** less acres of land to produce the same amount of food, fuel and fiber crops



Without access to GMOs, farmers would have needed to plant an additional:

- 22 MILLION** acres of corn
- 19 MILLION** acres of soybeans
- 9 MILLION** acres of cotton
- 1.5 MILLION** acres of canola

to keep up with global production levels in 2014!

HOW DO GMOs HELP PRESERVE H₂O?

According to the Environmental Protection Agency, drought and water scarcity has been rising steadily since the 1970s and the agency is predicting a significant increase in areas of high drought risk worldwide by the end of the century.¹ To combat this, GMOs are helping agriculture use less water and grow more drought tolerant plants.



GMO AGRICULTURE = MORE WATER CONSERVATION...

According to Massachusetts Institute of Technology, GM crops can decrease the rate at which water is lost through transpiration, while improving yield in drought conditions with crops like rice.²



...AND CLEANER WATERWAYS

6,400 - Bodies of water that can benefit from reduced soil erosion from GM crops.³ That's an average of 128 lakes, streams and rivers per state in the US!



Drought-tolerant GM crops are estimated to potentially increase yield by 15% more per acre.^{4,5} Applied to the worldwide rice production estimate, that's an increase of **118 MILLION METRIC TONS OF RICE**. That's 19 times heavier than the pyramid of Giza!



Thanks to drought-tolerant GM crops, Ethiopia's production of corn (of which the country is the second largest producer globally) **GREW BY OVER 40 MILLION POUNDS PER YEAR** from 2000-2013!⁶

50%

Reduction in irrigation requirements for cotton in the last 20 years due to GM crops.⁷

Have a question about GMOs? Visit <http://gmoanswers.com>

1. <http://www.epa.gov/epa/press/2012/03/2012-03-20-epa-press-release-2012-03-20.html>
 2. <http://www.mits.edu/~mitpress/2012/03/2012-03-20-epa-press-release-2012-03-20.html>
 3. <http://www.epa.gov/epa/press/2012/03/2012-03-20-epa-press-release-2012-03-20.html>
 4. <http://www.epa.gov/epa/press/2012/03/2012-03-20-epa-press-release-2012-03-20.html>
 5. <http://www.epa.gov/epa/press/2012/03/2012-03-20-epa-press-release-2012-03-20.html>
 6. <http://www.epa.gov/epa/press/2012/03/2012-03-20-epa-press-release-2012-03-20.html>
 7. <http://www.epa.gov/epa/press/2012/03/2012-03-20-epa-press-release-2012-03-20.html>





“...The First Essential Component of Social Justice Is Adequate Food For All Mankind.”



*Norman Borlaug,
Agronomist &
Humanitarian, Father
of the 'Green
Revolution,' 1970
Nobel Peace Prize
Winner*

*Scientists
and farmers
have been
striving for
generations
to increase
quality and
quantity of
food for
world's
growing
population.*



IPB University
Inspiring Innovation with Integrity



Thank you