The Role of Biotechnology in Our Food Supply

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Presented to

[insert name here]

Date

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What We Will Cover

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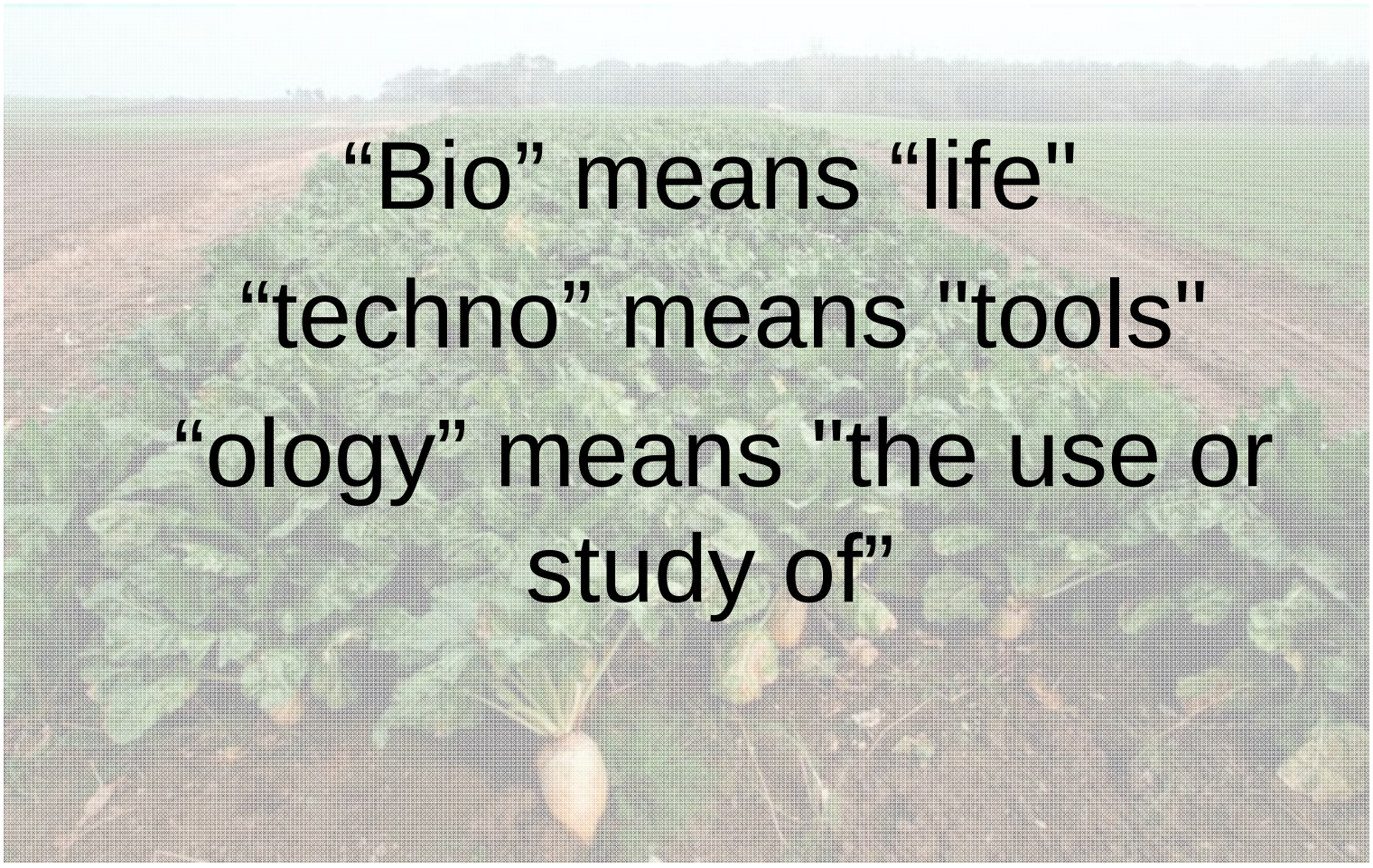
- Definition and History of Food Biotechnology
- Why Do We Use Biotechnology?
- Four Key Benefits
- Agricultural Biotechnology Today
- What Does the Future Hold?
- Communication Lessons from Other Food Technologies

What is Biotechnology?



Using biology (the study of life) to create or improve tools, products, or processes.

E.g., Food Crops & Animals

History of Food Biotechnology

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Food Biotechnology Timeline

The following timeline shows the progression of food biotechnology from the earliest domestication of crops and animals to modern, efficient methods of selecting and producing plants and animals with the most desirable qualities. These dates are benchmarks of scientific and regulatory breakthroughs and highlight the important role of food biotechnology, a modern way of improving crops, food, and animals.

8500–5500 B.C. People begin to settle in one place and raise plants and animals; the best of their crop was saved to use as seed the next year.

1800 B.C. The Babylonians improve the quality of date palms by pollinating female trees with pollen from male trees with desirable characteristics.

1863 From observing pea plants in a garden, renowned scientist Mendel concludes that certain "unseen particles" (later described as genes) pass traits from parents to offspring in a predictable way–the laws of heredity begin to be understood.

1875 The first higher-yield, hardier wheat-rye hybrid grain is created.

1953 The structure of DNA is described by Watson and Crick.

1961 USDA registers *Bacillus thuringiensis* (Bt) as the first biopesticide.

1973 Scientists Cohen and Boyer successfully transfer genetic material from one organism to another.

1986 EPA approves commercial growing of the first genetically engineered crop–tobacco plants resistant to tobacco mosaic virus.

1992 FDA issues a policy stating that foods from biotech plants would be regulated in the same manner as other foods. Pre-market consultation with FDA is encouraged, consistent with industry practice.

1993 Recombinant bovine somatotropin (rbST)–a naturally occurring protein that is reproduced using biotechnology and used in cows to increase milk production–is approved in the U.S.

1994 The first whole food produced using biotechnology–the FlavrSavr® tomato–enters the marketplace after FDA issues its advisory opinion on safety. Virus-resistant squash is also planted.

1996 Biotech varieties of soybean, cotton, corn, canola, tomato, and potato seed are planted on 4.5 million acres in Argentina, Australia, Canada, China, Mexico, and the US.

1996 Dolly the sheep is the first animal clone to be born.

1998 Virus-resistant papaya, developed through biotechnology to save the crop from devastation, was planted in Hawaii. Insect-protected sweet corn is also planted.

1999 The Enviropig™ is genetically engineered in Canada to produce an enzyme in its saliva that would allow it to get more phosphorus from its feed. This would reduce phosphorus runoff into waterways.

2008 FDA releases its risk assessment on animal clones, concluding that food from clones is as safe as other food.

2008 Sugar beets produced with biotechnology are commercialized.

2011 "High-oleic" soybean varieties higher in heart-healthy monounsaturated fats are available in the U.S.

2011 Additional whole foods enhanced by biotechnology are submitted for government review, including non-browning apples, and low-acrylamide potatoes.

2012 Researchers report that the first "hypoallergenic" cow, Daisy, has been genetically engineered to remove a protein that can trigger whey allergy in humans.

2012 Biotech crops are planted on 420.8 million acres by 17.3 million farmers in 28 countries. More than 90% of farmers planting biotech seed are small, resource-poor farmers in developing countries.

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WHY DO WE USE BIOTECHNOLOGY?

Why Biotechnology?

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"...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.

Consumers Expect Benefits from Biotechnology

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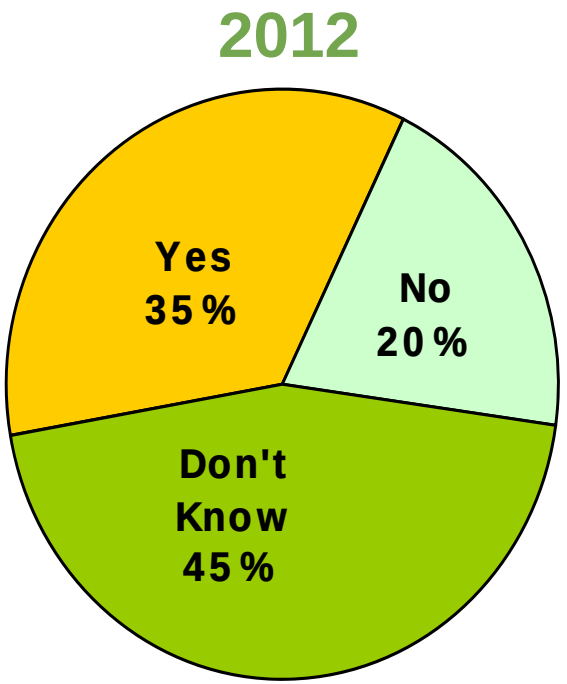
(Among those who say "yes")

Benefits of Biotechnology in Next 5 Years:

Nutrition / health benefits	35 %
Improved quality / taste / variety	22 %
Price / economic benefits	21 %
Improved crops / agricultural production	13 %
Safer foods	11 %
Reduced pesticides / chemicals	3 %
Other	13 %
Don't know	3 %
Nothing	2 %
Missing / Refused	8 %



Q 17. Do you feel that biotechnology will provide benefits for you or your family within the next five years?

Q 18. What benefits do you expect? [OPEN END]

Source: IFIC 2012 Consumer Perceptions of Food Technology Survey

IFIC International Food Information Council

Four Key Benefits

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1. Food Safety
2. Consumer Benefits
3. Sustainability
4. Feeding a Hungry World

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FOOD SAFETY

Food Safety

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"For thousands of years we've been breeding plants…so that we can have fruits and vegetables that are safe and healthy. We're now using the latest generation of biotechnology to…make them even safer."

Ronald Kleinman, MD, Physician in Chief, Massachusetts General Hospital for Children

Top medical professionals agree that biotechnology is a safe food technology.

Plant-Based Foods Currently Available Using Biotechnology are Safe

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- Extensive research
- Consumed safely around world
- No evidence of harm
- Safe for children
- No increased risk for allergies

Groups that have deemed food biotech safe:

- WHO

- FAO

- AMA

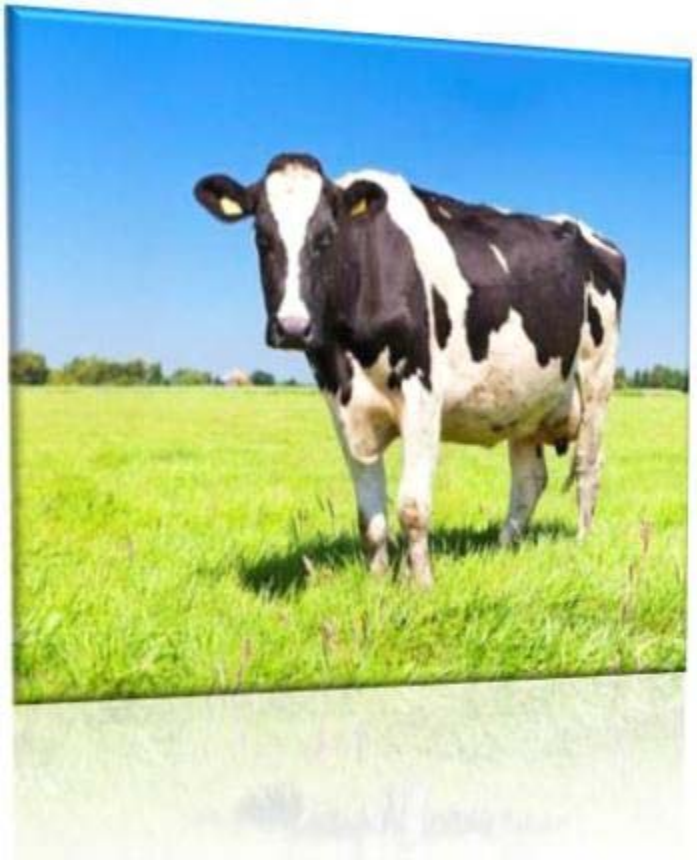
- IFT

- FDA

- EPA

- USDA

Animal biotechnology is a safe technique for producing meat, milk, and eggs



rbST: Safety of food products using rbST has been established and reinforced through decades of research.

FDA on Animal Cloning: Meat and milk from cows, goats, and pigs are the same as from other animals.

Biotechnology: Not a Food Safety Concern for Americans

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Percent concerned with each food safety issue (unaided):

	2012	2010
Disease/contamination	29%	29%
Handling/preparation	21%	23%
Preservatives/Chemicals	13%*	8%
Health/nutrition	8%	7%
Agricultural production	7%	6%
Food sources	7%	8%
Packaging/labeling	5%	4%
Biotech	2%	2%
Processed foods	1%	1%
Other	1%	1%

*Denotes statistical significance from 2010.

Q12. What, if anything, are you concerned about when it comes to food safety? [OPEN END]

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Biotech Foods Are Regulated to Ensure Safety

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U.S. regulation coordinated by:

- USDA
- EPA
- FDA

- Regulations in place for foods from plant and animal biotechnology

Food Biotech Labeling

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Special labeling required only to disclose a material change, such as:

- Allergens present in the food.
- Increased levels of naturally occurring toxins.
- Changes to nutrient composition or profile.

FDA has determined the process of biotechnology is not a "material fact" to be mandated on the food label.

Potential for Biotechnology to Improve Food Safety

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Benefits today:

- Protects against mold in corn
- Enzymes that produce low-lactose milk more efficiently

Products being developed to:

- Protect rice and sugar cane from insects
- Produce a potato with reduced acrylamide levels
- Remove allergenic proteins (e.g., peanuts, milk, soy)

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CONSUMER BENEFITS

Potential to Deliver "Heart-Healthy" Oils

- Advanced breeding, modern food production are used to develop canola, soybean, and sunflower oils that do not produce trans fats.
- Soybean, canola oils being developed with biotechnology to provide the specific omega-3 fats that are most protective for heart health.

Biotechnology Improves Food Taste & Quality

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Under regulatory review:

- Non-browning apples
- Keep their original color longer, stay crisp longer.

In development:

- Potatoes
- Tomatoes, melons, etc.
- Enzymes used in food production

Above all else, consumers want food that tastes good. 69% say they'd buy foods enhanced through biotech to taste better
- IFIC 2012

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Biotechnology Contributes to a Consistent, Affordable Food Supply

Biotechnology facilitates:

- Greater efficiencies on the farm.
- More reliable harvests.
- Less risk of spoilage or contamination from farm to store.

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SUSTAINABILITY

Sustainability

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Sustainability in agriculture is about meeting today's needs in a manner that ensures we can continue to meet those needs tomorrow, as well as or better than today.

Biotechnology Allows for More Judicious Use of Insecticides

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Important tools for protecting crops, the environment:

- Responsible use of biotech seeds
- Responsible use of crop protection products
- Integrated weed and pest management practices

Biotechnology Allows for Use of Safer Herbicides

- Glyphosate: 16 times less toxic than older herbicides
- Newer biotech varieties addressing weed resistance

New types of herbicide-tolerant corn and soy have been developed that help address ongoing challenges with herbicide resistance of certain weeds.

Biotechnology Protects Soil Quality

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***Less* Sustainable**

Moldboard Plowing: Exposes soil to wind, erosion

***More* Sustainable**

No-Till Farming: Plants seeds directly into residue of previous crop

Biotech-nology allows for improved soil quality.

Biotechnology Reduces Carbon Footprint

- No-till / Conservation tillage:
  - Agriculture's "carbon footprint" decreased by: **46.5 billion pounds**
- Carbon emissions are lower on farms that use biotechnology
  - 2011: Estimated carbon dioxide reductions: **4.19 billion pounds**

Biotechnology Makes it Possible to Produce More Food Per Acre and Per Animal

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- Crops thrive with better weed and insect control.
- Less land, insecticides, fertilizers, fuel, animals, and feed needed to produce same amount of food.
- With rbST and proper management, **5** cows can produce as much milk as previously took **6** cows = **More Sustainable**

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Biotechnology Improves Economic Sustainability for Family Farms Worldwide

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We can help poor farmers sustainably increase their productivity so they can feed themselves and their families. By doing so, they will contribute to global food security. But that will happen only if we prioritize agricultural innovation."

- Bill Gates, co-founder, The Bill & Melinda Gates Foundation, 2012

Biotechnology Improves Social Sustainability for Family Farms Worldwide

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Efforts being pursued in developing nations:

- Cooperation with local people ensuring a positive social impact.

Food security *(or regular access to food) is essential to a nation's overall stability.*

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FEEDING A GROWING WORLD

More Food, Better Nutrition Needed for a Growing Global Population

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By **2050**, the global population is expected to reach **9 billion** people, requiring **70%** more food than is produced today.

"The past 50 years have been the most productive period in global agricultural history, leading to the greatest reduction in hunger the world has ever seen."

Former President Jimmy Carter. Wall Street Journal, October 14, 2005.

Biotechnology Improves Harvest Per Acre

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- Increasing yield in developing nations, ensuring greater access to food.

- Strengthening crops against extreme temperatures, drought, poor soil conditions – critical in developing nations

Biotechnology Offers Solutions for Reversing Malnutrition

Where malnutrition is rampant, nutritionally improving staple food crops and native foods has great potential to improve the health of entire communities

In development:

- Golden Rice
  - beta-carotene →vitamin A
- Biofortified sorghum
  - vitamin A, iron, zinc

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AGRICULTURAL BIOTECHNOLOGY TODAY

Biotechnology Applications in the U.S. Today

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In Crops:

- Insect protection
- Herbicide tolerance
- Virus resistance
- Stacked traits, tailored to agricultural needs

In Dairy Cows:

- Protein hormones for increased milk production efficiency

Foods From Crops & Animals Raised Using Biotechnology

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- Sweet Corn
- Papaya
- Dairy Products
- Food ingredients
  - Sweeteners (e.g. corn syrup, sugar)
  - Vegetable oils
  - Corn starch
  - Soy protein
  - And more

Biotechnology: An Important Factor in Our American Harvest

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Biotechnology: An Important Factor In Our Global Harvest

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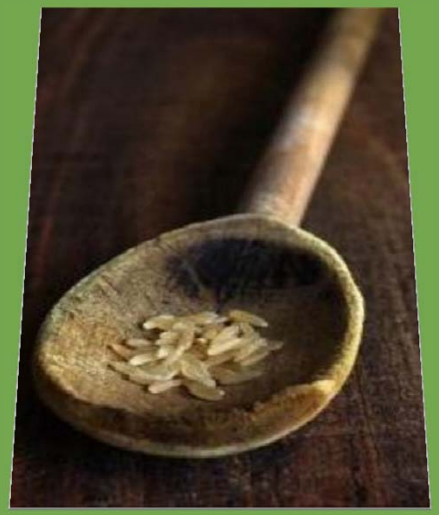
WHAT DOES THE FUTURE HOLD?

Future Biotechnology Benefits

- Foods higher in omega-3s and other nutrients.
- Foods with better taste, freshness.
- Ability to grow crops in difficult climates and poor soil.
- Further improvements in yield and disease protection.



Communication Lessons from Other Food Technologies

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For example:

- Animal antibiotics
- Animal protein hormones
- Ractopamine
- Nanotechnology

Biotechnology: Benefiting the Common Good

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"When we look back over the last century, we see that biotechnology is responsible for some of our greatest progress in public health, from the discovery of penicillin to the development of effective therapies for HIV infection …Today… we can see even bigger opportunities ahead."

- Kathleen Sebelius, USDA Secretary of the Department of Health & Human Services. The Biotech Meeting, 2010.

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THANK YOU!

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