



European Consumers and Biotechnology

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New Directions in Cotton Breeding and Consumer Reception

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The Three Areas of Biotechnology

- **Red Biotechnology: medical biotechnology**
mostly accepted by consumers
- **White Biotechnology: industrial biotechnology**
mostly accepted by consumers
 - **Green Biotechnology**
mostly rejected by consumers

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Green Biotechnology

Why so little acceptance?

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Green Biotechnology Overview

- Classic Breeding (fully accepted)
 - Hybrid Breeding (accepted)
 - Mutagenesis (accepted)
- Smart Breeding (acceptance probable)
- Genetic Technology (heavily criticised as an obsolete technology)
 - Cis Genetic Technology (acceptance probable)

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Green Biotechnology Objectives

- Improvements in Plant Attributes
 - Pest Resistance
 - Herbicide Resistance
 - Drought Tolerance
- Improvements in Nutrient Loading, Shelf Life, Appearance

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Green Genetic Technology What is Influencing Consumers' Perception?

Intensive communication strategies of opponents of genetic technology+++

Ethics +

Religion ++

School Teaching++

Media +++

EU Law +++

National Law +++

Politics/Parties ++

Genetic Technology Industry ?????

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Reasons for Rejecting Green Genetic Technology

- Suspicion of authorities' decisions
 - Old clichés
 - Fear of changes
 - Fear of uncertain risks
- Fear spread by opponents of genetic engineering
 - Not convinced about benefits
 - Lack of knowledge
 - Lack of education

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Clichés

“Frankenstein’s Monster”, produced in 1910

Conclusion: Interfering with nature runs out of control

(Original: Frankenstein, or the Modern Prometheus) a novel by Mary Shelley, published in 1818



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Clichés

- Dolly the Sheep: First cloned mammal created by crossbreeding with a foreign gene.

Dolly (* 5 July 1996 in Roslin (Midlothian); † 14 February 2003) was a welsh mountain sheep



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Fear of Genetic Technology

Young science (1996) – many processes unexplored:

Problem 1: Introducing pieces of gene in a foreign DNA is until now not controllable and random

Problem 2: Results not measurable in time and geography

Problem 3: Damage seldom recognised directly, often firstly after years

Problem 4: Reversal no longer possible

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Arguments of Genetic Technology's Opponents

- Despite GMO-plants: worldwide spread of resistant super weeds
- Bt-poisons released in arable land
- Effective only for a limited time
- Red cotton bollworms on the increase again
- New pests can thrive
- GMO plants are more sensitive to growth pressure
- Health risks are not calculable (cancer, allergies)

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Arguments of Politicians

Christian Schmidt, German Federal Minister of Agriculture, September 2015:

“My aim is a nationwide strict ban on green genetic technology in Germany.”

Head of Department Wolfgang Reimer, February 2016:

“Green gene technology is not a technology of the future, it exacerbates agricultural problems”*

* (Head of Department Ministry of Rural Affairs and Consumer Protection, Baden-Württemberg at the world's largest Bio Food Fair “**Biofach**” Nuremberg)

Source: Informationsdienst Gentechnik, 12.02.2016

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Religious Pros & Cons of Green Genetic Technology

Pros

- Christian Tradition: The talents of mankind from the hands of God allow genetic engineering
- Occidental culture of responsibility in farming and conservation by innovation allows human active participation in divine creation

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Cons

- Wisdom of divine order of all creation cannot be ignored
- Temptation caused by human fantasies of omnipotence
- Lack of Humility
- The Christian (choice of) freedom will be undermined in the long term
- Lack of reversibility excludes regret (penance)

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Ethical Pros & Cons of Green Genetic Technology

Pros

- It would be unethical not to use the possibility of GMO crops to improve the food situation in the third world.

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Cons

- Human intervention in nature using genetic technology contradicts ethical values and has limits.
- Genetic technology may be abused for reprehensible objectives

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Development Policy Pros & Cons of Green Genetic Technology

Pros

- Safeguarding global nutrition and the livelihood of eight to ten billion people in the future is possible by increasing productivity per unit of land.

Cons

- World Hunger is not a production problem but a distribution problem
- Higher socio-economic dependency on international seed producers
- In the long run no income-generating effects

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Environmental Pros & Cons of Green Genetic Technology

Pros

- Efficient weed management with herbicide resistant plants and less fuel consumption
- Efficient crop protection with virus resistant und insect resistant Bt plants.
- Reduction in use of pesticides

Cons

- Danger of monoculture
- Developing resistance
- Increased use of pesticides
- Loss of biodiversity
- Lack of irreversibility
- BT cross less robust
- Outcrossing problematic

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GMO Plants in Europe

- GMO cotton is not planted in Europe
- Exception: controlled field trials i.e. in greenhouses possible
- 2014 merely Bt corn in Spain, Portugal, Czech Republic, Slovakia and Romania
- 2015 EU permitted imports of 19 GMO plants to be used in the food and animal feed industry.
- According to the European Food Safety Authority (EFSA) the plants are harmless

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Genetically Modified Organism EU Law and Regulations

- Very lengthy approval procedure for putting GMO crops into circulation and use
- Guideline 2001/18/EG
- EG regulation no. 1829/2003 on genetically modified food and feed stuffs
- EU guideline 2015/412 of 02.04.2015: Makes it possible for EU members to restrict or prohibit (opt out of) the growing of genetically modified plants in their country.
- The regulations are the basis of ensuring GMO- free nature and agriculture in Germany.

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GMO/GMO-Free Labelling

Mandatory Labelling:

In Europe: All food, its ingredients, additives and vitamins processed in food or animal feed and made of GMO or GMO micro organisms with content above 0.9 percent must be labelled on product or packaging.

Voluntary Labelling:

Currently, there is an unmanageable amount of eco-labels on the market to show that there is no genetic technology used in a product offered to end consumers. Also to promote sales to a still small but slowly growing target group.

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Consumer Opinion of GMO/Gene Transfer

Source: Eurobarometer, Special Biotechnology, EU Commission 2010

Definition:

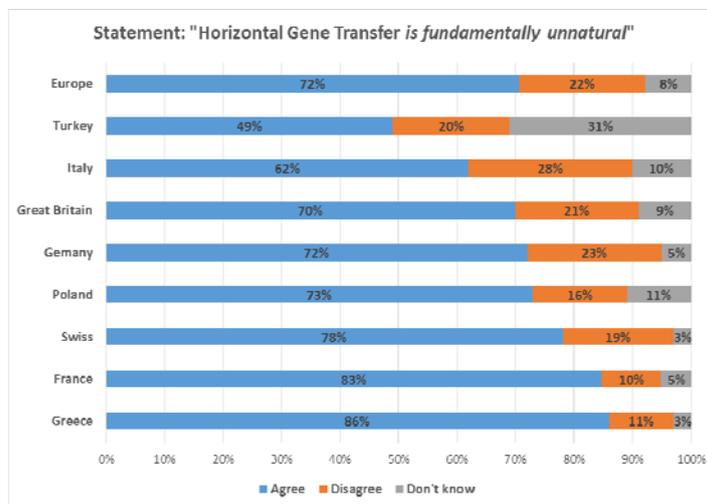
- Gene transfer is where an organism receives genetic material from another.
- Horizontal gene transfer is a process whereby an organism incorporates genetic material from another, unrelated organism.
- Vertical gene transfer - an organism receives genetic material from a related organism, or ancestor.

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Consumer Opinion of GMO

Source: Eurobarometer, Special Biotechnology, EU Commission 2010



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“Horizontal Gene Transfer is fundamentally unnatural”

Sociodemographic

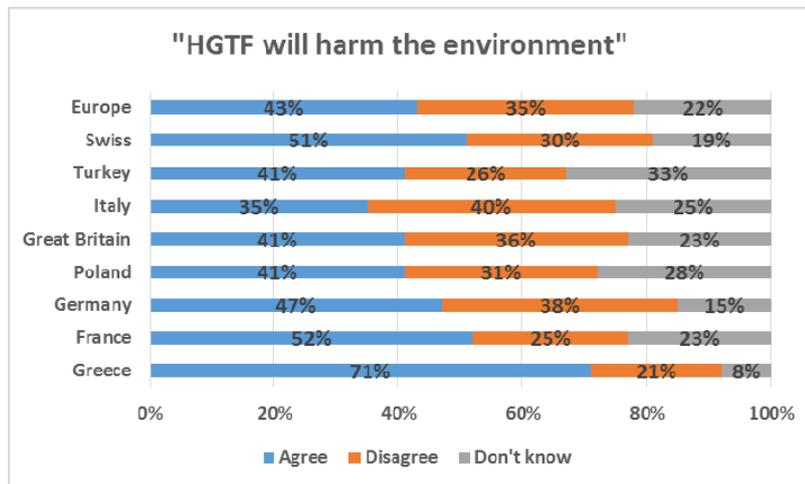
- Among all sociodemographic groups, there is widespread agreement that horizontal gene transfer is unnatural
- Agreement level is 69% among Europeans who left full-time education aged 15 or younger
- Agreement levels 75% among Europeans who place themselves politically on the left

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Consumer Opinion of GMO

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"Horizontal Gene Transfer will harm the environment"

Sociodemographic

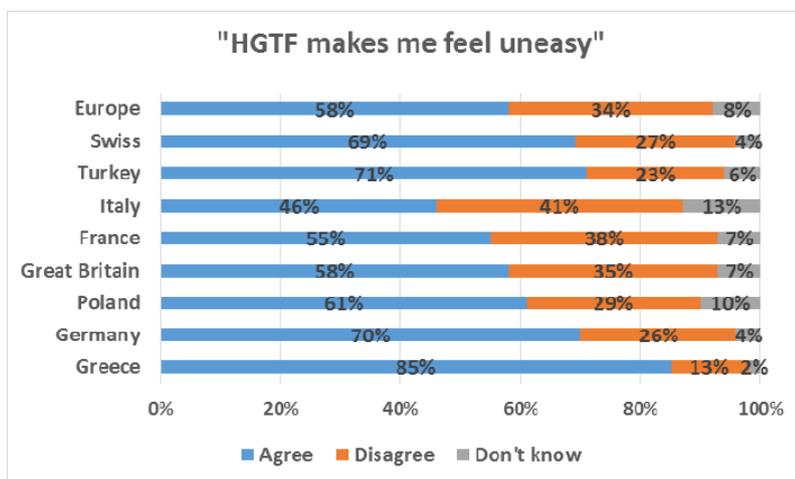
- Looking at the sociodemographic data, we see that those living in rural areas and those left of centre in their political views agree the most (47%).
- Gender may also be a factor, with 46% of women compared to 40% of men agreeing that horizontal gene transfer will harm the environment.

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Consumer Opinion of GMO

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"Horizontal Gene Transfer makes me feel uneasy"

Sociodemographic

- Men and the young are less likely to feel uneasy than women and older people.
- Those who live in rural villages tend to more often feel uneasy (61%) than their urban counterparts (57%).
- A background in science education is an influence with 56% of those with such an education feeling uneasy compared to 61% of those without such a background.
- Religion also seems to have some effect on opinions: 60% of Europeans who believe in God feel uneasy compared to 56% of non-believers.

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Consumer Opinion of Vertical Gene Transfer

Source: Eurobarometer 2010

- A majority of 63% of Europeans agree that vertical gene transfer will be useful, while only 25% disagree. 12% lack an opinion.
- Students (72%) and managers (69%) are most likely to consider vertical gene transfer useful.
- Having a scientific education also influences people's views: those with a science background agree more often than those without such an education (67% vs. 59%).

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Further Results

Source: older research

- There is a positive correlation between the rejection of genetic technology and vegetarian/vegan eating habits or lifestyle
- Acceptance of genetic technology is smaller among people with health conscious, environmentally aware or generally careful lifestyles

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Conclusion

Why the Lack of Acceptance in Consumer Opinion?

- Absence of active communication about the benefits of green biotechnology towards end consumers by the industry and its federations
- Green biotech companies in general react with defensive arguments if they are criticised (see e.g. Monsanto website)
- In comparison to red and white biotechnology, the benefits are not clear. Clear in consumers' minds is only that there are risks, so they feel uneasy
- In public newspapers or magazines, at first glance you find a majority of articles released by GMO opponents. Behind this: Editors should be informed actively by the industry so that they are able to write articles from another point of view and explore new arguments objectively as professional journalists
- Advances in genetic technology are discussed and release too much at conferences such as this, but not much is done towards the public, consumers or schools and students.
- At first glance, internet research lead consumers firstly to the arguments of opponents.

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The Future of Green Biotechnology

- Products processed with green bio or genetic technology will only succeed in the long term, if consumers can be convinced to buy such products by their benefits.
- The task may differ from market to market, depending on needs and habits.
- The fact remains: Products will always fail if they are not “most wanted”.

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