Bullfrog Films presents

RISKY BUSINESS
Biotechnology & Agriculture

Discussion Guide

"Fills a long-standing need...for a clear, engaging introduction to the environmental and health risks of agricultural biotechnology."

— Gene Exchange

Science & Society • Biotechnology • Genetic Engineering
Environment • Sustainable Development • Agriculture
STS • Health • Animal Rights • Law • Ethics

RISKY BUSINESS
the 24 minute video
is available from Bullfrog Films.

Discussion Guide

high school • university • adult

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Thanks to Mark Dworkin, Phil Bereano, Bill Aal, Jane Rissler, Margaret Mellon, Ruth Hubbard, Wendy McGoodwin
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How to Use this guide:

The discussion guide is designed to provide material for thought provoking discussion for a variety of audiences. Depending on the viewers, you may want to select particular discussion questions, or adapt activities. We also provide resources for additional research.

- Introduction
- Discussion questions before and after viewing
- Essays on related topics
- Educational activities
- Resources for additional information
- Definitions of terms
- Books and videos for research

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Risky Business
Discussion Guide

Introduction

Risky Business *[24 minutes]* explores the engineering and marketing of new plants and animals. With genetic engineering researchers map, alter, and transfer genetic material (DNA), within and between species. A whole industry has grown up around genetic engineering which proponents claim will revolutionize agriculture, pharmaceuticals, and health care. But critics are concerned about effects of this new technology upon the environment, public health, and the food supply.

Genetic engineering is at a stage similar to DDT and nuclear power a few decades ago, when industry was full of optimism about limitless cheap energy from the atom and the promise of agricultural chemicals to reduce farm pests and boost crops. Potential risks were not discussed. Now we and succeeding generations must live with the devastating environmental consequences.

With recombinant DNA technology, the hazards may be even greater, since genetically engineered organisms are alive - they can migrate, mutate, and multiply. And they can never be recalled. There's a widespread and growing debate on these issues but it takes place out of the public eye. Nearly all published information comes from industry, very little from public interest organizations. News media are flooded with intriguing stories that promote the benefits of biotechnology and underplay its risks. While many prominent scientists and other observers see perils in genetic engineering, their views are seldom reported.

Risky Business is designed to raise awareness among consumers, environmentalists, farmers, students, teachers, policy-makers and scientists - all who may be concerned about the impacts of these new, little-tested technologies. The issues are complex and fundamental, ranging from the sustainability of our environment, to the integrity of our food supply. And today's biotechnical possibilities also raise basic ethical questions about the extent to which humans should attempt to control the natural world.

Specific issues raised by the video:

New plants and animals -

Genetic engineering is promoted as a powerful new means to feed the world in harmony with the environment. But most field tests for genetically engineered plants are for resistance to herbicides, permitting use of more poison chemicals which endanger farm workers, birds, small animals, and fish. Animal rights activists urge more humane treatment of livestock, but rather than clean up their act, companies are genetically engineering pigs and poultry to better tolerate the stressful, overcrowded and unsanitary conditions of industrial agriculture.

It shocks many people to learn about it, but transgenic animals are being developed which could someday provide hearts, livers, and kidneys for transplant into humans. Each of these applications may be profitable and effective in the short-run, but public discussion is needed about what genetic interventions are consistent with the values of our society.

Environmental considerations -

What alarms critics is that unlike poisonous chemicals, plants and animals mutate, migrate, and multiply. Because once released genetically altered plants can never be recalled, it is especially important to be sure they won't harm other plants, animals, and people.

In one example, a German lab engineered soil bacteria to turn crop wastes into ethanol. Scientists at Oregon State University demonstrated that as the bacteria continue producing ethanol in the soil, they have a devastating effect on nutrient processing by plants and animals. In the worst case scenario it could wipe out most agricultural crops.

Another problem is the genetic modification of plants to create herbicide resistance, which means crops could be sprayed with more poisonous chemicals. Not only is this a danger to farm workers and wildlife, but Danish research suggests that herbicide resistant crops will interbreed with related wild species resulting in super-weeds that could be impossible to control.

Genetically Altered Foods -

Scientists have put flounder genes into tomatoes, tobacco genes in lettuce, and chicken genes in potatoes. But the FDA does not require labeling of most genetically modified foods, a special concern to people with allergies and those who don't eat certain foods for religious reasons.

Perhaps the most controversial biotech food is milk from cows injected with recombinant Bovine Growth Hormone, which makes cows give more milk. Despite reports of bone weakness, mastitis, and births of defective calves, rBGH is being marketed to hard-pressed farmers as a quick way to generate more income. RBGH is said to increase milk production an average of 12% per cow, but in today's climate of overproduction that means more milk on the market, a further drop in dairy prices, and continuing loss of family farms. Many consumers are concerned about drinking milk from rBGH injected cows, and school districts in over 100 major U.S. cities have passed "rBGH-free" resolutions. European Parliament has banned rBGH use in Europe until at least the year 2,000. But the FDA has certified milk from BGH cows and requires no special labeling.

Bioprospecting and Patenting of Plants and Animals -

Transgenic cotton has been patented by W.R. Grace which gives them rights over any future genetic alterations of cotton, no matter who develops them. Even farmers who keep their own seeds are legally liable to pay a fee to the patent holder. Leading universities and drug companies are "bio-prospecting" in the 3rd world, looking for plants with healing properties to develop patentable medicines they can sell. But knowledge of these plants often resides with indigenous people who have developed and cared for them for centuries. Who has what rights in this situation? According to Luis Macas, President of the Confederation of Indigenous Nations of Ecuador, bioprospecting "is robbery."

Rather than offering simple solutions, ***Risky Business*** provides a framework to evaluate new projects in biotechnology in terms of the common good. What are the benefits of this new technology and who will receive them? What are the potential dangers and who will face them? Who gets to decide?

Discussion questions before viewing

1. Have you heard about genetic engineering? What have you read in the papers/seen in the news about genetically engineered crops and animals?

2. Have you ever eaten genetically engineered food? How do you know?

3. Over the last 20 years the field of genetic engineering - like computer technology - has changed dramatically. This technology has a major impact on our lives which some find exciting and others find threatening. What do you think?

4. In the case of genetic engineering, we are altering living creatures. That's different than other kinds of inventions, like radio or television. In what way do you think we need to treat it differently than other technologies?

Discussion questions after viewing

[notes in parentheses may help lead the discussion]

1. How is genetic engineering different from traditional breeding? *[cross species, precision]*

2. In the film there are several examples of people conducting genetic engineering projects:
a) Pam Ronald- disease resistant rice;
b) Calgene - flav'r sav'r tomato, bromoxinyl resistant cotton;
c) Steve Strauss - BT trees.
What do they hope to accomplish?

3. Why is the potential impact of transgenic organisms different from other manufactured products, such as chemicals? *[migrate, mutate, multiply]*

4. Current usage of these technologies may be dangerous to the environment. What are the dangers?
[herbicide resistant crops mean more herbicides that affect fish and farmers]
[weediness - new plants may take over from native species like Kudzu did in U.S. South.]
[talapia in Philippines eating native fish]

5. In the short term, genetically engineered crops may reduce the use of toxic sprays. What are the longer term effects of these new products on farmers and the food supply? The video discusses several cases:
a) Elaine Ingham and Michael Holmes at the Univ. of Oregon - effects on soil micro-organisms necessary to crop production.
b) Vandana Shiva and Elizabeth Bravo - effect on centers of diversity, the source of future desirable genes for food crops.
c) BT plants and their effect on insect pests and organic farmers.
d) Engineered plants may lead to future problems with weediness.

6. Why would Monsanto develop a product to increase milk production when we already have an over supply of milk on the U.S. market? Why do farmers in the film decide to use it or not?

7. Do you read labels on food in the supermarket? Can you tell if

food has been genetically engineered? If genetically altered foods were labeled, would that affect your choice of which products to buy? Why?
[allergies, religious reasons, vegetarianism]

8. Do you think the U.S. government should make sure these altered plants and animals are safe for people and the environment?

9. How do you feel about putting human genes in pigs to decrease rejection when their organs are transplanted into people? Is raising pigs for this purpose different from raising pigs for ham or bacon?

10. Many famous inventors have patented their inventions, e.g. Thomas Edison and the light bulb, Alexander Graham Bell and the telephone. Do you think people should be able to patent genetically engineered plants and animals? Why? Why do people object to this patenting?
[Life shouldn't be owned by individuals for spiritual reasons. Patents may give a limited number of people too much power over basic necessities like food and medicine.]

11. Do you think there are ethical or spiritual reasons for opposing genetic engineering?
12. Technologies are developed based on and can be used for good or bad purposes. Since they have such a big effect on our lives, how can the public *[consumer]* have a say in what technologies are developed or pursued?

13. The video shows one case of direct action *[milk dumping]* by consumers. Other actions have been conducted by Greenpeace International to block shipments of genetically altered soybeans to Europe. Activists in Great Britain are conducting a campaign to uproot genetically altered crops. What do you think of tactics such as these?

Essays on related topics

1. Industrial versus sustainable agriculture

Genetic engineering of crops is being promoted by researchers and companies that wish to retain the system of industrial agriculture in the United States. What follows is a comparison of industrial and sustainable approaches to agriculture.

Industrial agriculture views the farm as a factory with "inputs" (such as pesticides, feed, fertilizer, and fuel) and "outputs" (corn, chickens, and so forth). The goal is to increase yield (such as bushels per acre) and decrease costs of production, usually by exploiting economies of scale. For example, the cost per unit of growing 1000 chickens is generally less than the unit cost of growing 10 chickens. The features of the agricultural factory that produce these economies of scale include large farms, a focus on a few commercial crops such as corn and cotton, use of only a few prized varieties of those crops, and heavy reliance on chemical pesticides and fertilizers.

Among the benefits of industrial agriculture have been:
1) cheap food [in 1992, people in the U.S. spent an average of about 11% of their income on food;
2) a release of labor from agricultural activities for employment in other sectors;
3) large, profitable chemical and agricultural industries; and
4) increased export markets.
Although the production gains attributed to industrial agriculture are impressive, they have not come without costs to the environment, the economy and our social fabric.

Industrial agriculture uses huge amounts of water, energy, and chemicals, often with little regard to long term adverse effects such as over use of water resources, loss of soil, and polluting the water supply. It is difficult to assess the full cost of industrial farming because of government subsidies for farmers and water, pollution effects far downstream, etc.

The social effect of decreasing the number of farmers is to deprive rural America of its population and base of economic activity.

Currently the Great Plains states are facing rapidly declining populations as a result of changes in agriculture.

Another effect of industrial agriculture has been to create a new class of farmers highly dependent on large corporations, for example poultry farming. Overall, the share of the food profits going to farmers, rather than to the agricultural input, food-processing and marketing sectors has been steadily declining.

By contrast, sustainable agriculture can provide high yields without destroying the environment or undermining current or future productivity. Farmers who take a sustainable approach have substitutes for pesticides and fertilizers.

Crop rotation - growing different crops in succession in the same field - is one of the most powerful techniques of sustainable agriculture. Many pests have preferences for specific crops and growing different ones interrupts pest life cycles and keeps their populations in check. Legumes, like soybeans, may be planted in rotation to replenish plant nutrients, thereby reducing the need for chemical fertilizers. Cover crops like vetch, clover or oats planted between cropping periods prevent soil erosion, suppress weeds, and enhance soil quality.

Sustainable farmers enrich soil in many ways, including incorporation of animal waste (manure), living plants, or plant debris (compost.) Sustainable farmers manage farms so that they harbor populations of pest predators like birds, insects, spiders and bats, rather than use synthetic pesticides that kill many natural predators of crop pests.

Integrated pest management relies to the greatest possible extent on biological rather than chemical measures, emphasizing the prevention of pest problems with crop rotation, microbial control of root pathogens, and release of beneficial organisms that prey on the pests. With a sustainable approach, soil enrichment produces healthy plants that resist disease, cover crops retard erosion and control weeds, and natural predators help control pests. The result is that farmers are able to minimize their use of pesticides and fertilizers, thereby saving money and protecting the environment.
— adapted from Union of Concerned Scientists website materials

2. Patenting of Life Forms

Patents were developed historically to insure that inventors could share in the financial returns and benefits deriving from the use of their inventions. Once a patent has been granted, others must apply to the patent holder, and often pay a licensing fee, to utilize the patented invention. With the development of the modern corporation, patent rights are almost always assigned to the company rather than an individual. This gives the patent holder a form of monopoly control for 20 years from the filing of the patent, and creates a legal means of limiting competition.

For over 200 years living organisms were excluded from U.S. patent laws. Life forms were considered a "product of nature" and not a human invention. The non-patentable status of living organisms changed with a 1980 Supreme Court case Diamond V. Chakrabarty. The court decided in a 5-4 decision that a strain of bacteria that had been modified by the insertion of new genes was patentable because it was not naturally occurring. The foreign genes gave the bacteria the ability to break down hydrocarbons, and its "inventors" hoped it might be useful for cleaning up oil spills.

Many societies have long permitted ownership of individual animals. However, until recently no corporation, institution or individual could own the right to an entire strain or species of organism, nor could they patent components of organisms such as cells, genes or proteins. All of these are part of our global living heritage.

The granting of patents on microorganisms and increased pressure from the biotechnology industries began a progression toward the patenting of more complex life forms. In 1988, a Harvard University biologist was granted a patent for a mouse that had been engineered for increased susceptibility of cancer. The Oncomouse became the first animal to be considered an invention by the U.S. Patent and Trademark Office. It established a precedent within patent procedures for patenting genetically modified animals.

Although this research was intended to benefit human health, the question remains about the ethics of patenting complex living beings. The U.S. Congress has never explicitly addressed the question of whether animal genes and cells can be corporate property.

Included in this new ability to patent life forms is the patentability of human genes, cell lines and tissues. Patent attorneys argue that these products of nature are patentable once they have been isolated to produce a form not found outside of a laboratory. A cell line developed from the spleen of a man named John Moore was patented, and valued millions of dollars. A court ruled John Moore could not recover his body parts, nor could he share in the profits of the cell line developed from his spleen.

Indigenous groups have also been targeted for gene collection, especially those that are disappearing. Many indigenous groups are outraged that researchers want to collect their genetic material and preserve it, rather than assisting them in cultural preservation of their group. Chief Leon Shenandoah of the Onondaga Council of Chiefs wrote, "If there is a concern for our demise, then help us survive on our terms."

U.S. farmers and consumers have fought throughout the 20th century to prevent the inclusion of food crops under patent laws. Patenting plant life will also intensify the inequality between the developing and industrialized nations. Through the open exchange of plants and seeds, the U.S. and Europe gained potatoes, corn and tomatoes from Latin America, soybeans from China, and wheat, rye and barley from the Middle East. The people who domesticated and improved these plants did not receive compensation, but the tinkering by agribusiness companies today entitles them to claim a plant as their own invention, and receive all profits from its use.

The hunt for new genes to exploit for profit is regarded as a vast new frontier in science and industry. "Bioprospectors" are mining the rich genetic resources of the Third World for pharmaceutical compounds and other products, often using indigenous knowledge as their guide.

A good example is the Neem tree, a native of the Indian subcontinent, that has many applications in traditional Indian and Tibetan medicine, agriculture, and household use. The Latin name, Azadirachta indica, is derived from the Persian for "free tree," as even the poorest families have access to its beneficial properties.

However, it is possible that Indian citizens will soon be required to pay for products produced from the neem, since a patent has been granted to the U.S. company W.R. Grace on a compound in the tree for the production of a biopesticide. In 1993, over five hundred thousand South Indian farmers rallied to protest foreign patents on plants such as the neem, and launched a nationwide resistance movement.

Under free trade agreements such as GATT *[General Agreement on Tariffs and Trade]*, countries of the developing world will feel strong pressures to implement U.S. style patent systems. Multinational corporations can make large profits on their "discoveries," while depriving the communities that have developed this knowledge over centuries of the choice of how they would like to use their own knowledge and native species. The companies argue that patenting is necessary in order to recoup the enormous investments involved in genetic research.
— adapted from "No Patents on Life!", Council for Responsible Genetics.

3. The case of BT.

Farmers constantly battle with weeds, diseases, and insect pests that reduce crop yield or spoil the quality of their crops. The many varieties of chemical pesticides were developed, especially since the 1940's, to reduce the impact of weeds and pests on crops.

Pests evolve constantly in response to pesticides. The most vulnerable die, while the resistant ones survive to reproduce, and gradually the pesticide becomes less effective. This has led to more frequent applications and a greater variety of pesticides—many of which poison our soil and water.

The BT toxins are produced by a bacterium, *bacillus thuringensis*, in the soil, and have been used, by organic farmers and others, in sprays for more than 50 years as a natural way to control insects that prey on crops. Because they require more careful oversight and timing than chemicals for maximum effect, BT sprays have not been used extensively by mainstream industrial farmers. Now many crops are being genetically engineered to produce

the BT toxin by combining plant and bacteria genes to produce a transgenic form of the crop. During the 1997 growing season, 9 million acres were planted with BT corn, cotton and potatoes in the U.S. This contrasts with 2 million acres of crops treated with BT sprays in 1992. And 15 other BT crops have been approved by the U.S. Department of Agriculture for field testing.

The rationale given by promoters of these BT crops is that they will reduce the need for toxic chemicals. However, in contrast to the rapid deterioration of BT sprays, BT crops produce the toxins all season. Thus, in addition to many times the number of acres affected, the exposure to insects will be much longer. Some have estimated that BT sprays - and BT crops - could become ineffective in two to four years without special management procedures, such as intercropping with non-BT varieties. While the BT spray deteriorates rapidly and thus does not tend to promote pest resistance, widespread planting of BT crops is likely to lead to rapid development of resistance in the insects, and loss of a valuable tool for organic farmers.
—information from Now or Never: Serous New Plans to Save a Natural Pest Control ed. by Margaret Mellon and Jane Rissler, Union of Concerned Scientists, 1998

Educational projects

1. GE crops.

If you live in an agricultural region, find out if there are genetically engineered crops grown in your area [corn, soybeans, potatoes, cotton, trees, rape seed, tomatoes], or dairies using rBGH on their cows by checking with agricultural extension agents or local farmers' organizations. Visit a farm that has experimented with these products and a similar one that has not. Why did the farmer choose to use the product, or not, and for those who did use them, what results have they seen? [e.g. better/poorer yield, costs higher/lower]. What do they anticipate for long term effects? Ask the farmers who chose not to use the product why and what other approaches they utilize to enhance yield/cut costs. Compare the farmers' opinions for the class.

2. GE foods.

Make a list of foods that have been genetically engineered to date. The Union of Concerned Scientists is a good source - the list is growing. Pick soybeans [remember lecithin is a soy product], corn or tomatoes, and conduct a survey in a supermarket of how many products contain these foods that may have been altered, but not labeled. Ask your grocer if he/she knows if products they carry contain genetically altered foods.

3. Xenotransplantation.

More than 30 years ago the first cross-species transplant was attempted. This field of research has expanded rapidly as the thousands of people awaiting organ transplants far outnumbers the available organs from humans. Aside from the difficulties in performing xenotransplants successfully [no transfer of animal organs into humans has been successful as yet], many fear the possibility of transmitting animal viruses into humans along with the organs.

Recently the U.S. Food and Drug Administration put a temporary halt to some of the xenotransplantation research based on evidence that pig viruses could infect human cells. For years,

doctors have used animal products such as pig heart valves or insulin from cows in people, after treating the products to prevent transmission of disease. Transplanting a living organ may pose a greater risk than utilizing other animal tissues and cells.

There is controversy among those conducting the research. Some argue that animal organs are safe, and that we should implement animal to human transplants as rapidly as possible. Others think that the risks of disease transfer have not yet been adequately assessed.

Some criticize this research because the costs of any transplant operation would be high in a country where many don't have even basic health care. They say the drive is money, not humanitarianism. Animal rights advocates don't think animals should be raised and slaughtered for these purposes.

Form four teams of students and assign research, class presentations, and finally a class vote on whether this research should go forward or not. Possible positions include:

Promoters:
Contact local hospitals that do transplants, the national Xenotransplantation Congress, the Heart or Lung Society. Suggested questions: - What is the demand for organ transplants relative to the supply? - How successful are current transplant operations? What is the length and quality of life for transplant patients? - What are the costs of organs and transplant operations? - How are donor animals raised and treated? - Are there health risks in xenotransplantation?

Consumers:
Contact the Heart, Lung, or Kidney Society to find people with direct experience with organ transplants. Suggested questions: - How long did you wait/have you been waiting/do people wait for organ transplants? - What has been your quality of life since the transplant? - Would you consider an animal as an organ donor? Why or why not?

Animal rights:
Contact the Society for Prevention of Cruelty to Animals, Humane Society USA. Suggested questions: - What is your view of raising animals for this purpose? How is it different from raising animals for food? - Advocates say xenotransplants will alleviate human suffering. Are you opposed to that? - Are there any health risks?

Medical priorities:
Contact your local public health department, health maintenance organization, and/or your family doctor.
[for an international perspective the World Health Organization.]

Suggested questions:
a) Are there other ways than transplants to address or prevent diseases and conditions that require transplants?
b) What are the costs of research, organs and transplants and who pays? Are they available to all?
c) What other preventive or treatment programs to improve public health could be done for this money? How many people would they affect?
d) How do you set priorities for health dollars?

Definitions of terms

Biodiversity: The vast array of the earth's organisms and their genes. Embedded in the concept is the interrelatedness and interdependence of genes, organisms, communities and ecosystems.

Biotechnology: Use of living organisms for human purposes. Genetic engineering methods are one set of techniques used in modern biotechnology.

Centers of diversity: Places in the world where crops have the greatest genetic diversity in the form of traditional crop varieties and/or wild relatives. Often but not always, the same locations as the centers of origin of the crop. E.g. Maize in mesoamerica.

Chromosome: Microscopic structures in the nucleus of cells composed of DNA and proteins. They duplicate themselves each time a cell divides.

DNA [Deoxyribonucleic acid]: The molecule in the chromosomes that specifies the composition of proteins, and thus certain characteristics of the organism that it is a part of.

Gene: A functional unit of DNA that specifies the composition of a protein, and can be passed on to the plant or animal *[or human's]* offspring.

Genetic engineering: Modifying the genetic make up of living organisms using modern molecular biology techniques that can combine genes from widely dissimilar organisms.

Patent: A document granting exclusive right to the production, use, sale, and profit of an invention or process. U.S. patents last for 20 years.

rBGH or BST [recombinant Bovine Growth Hormone or Bovine Somatotropin]: A synthetically produced hormone that stimulates milk production in dairy cattle.

Resistance: Phenomenon where insects, fungi, bacteria treated

with a particular substance evolve the ability to survive that substance.
[We currently have antibiotic resistant bacteria from the use of antibiotics, and pesticide resistant insects from the use of pesticides.]

Transgenic: Plant or animal that has been genetically engineered using gene splicing methods. Typically contains genetic material from at least one unrelated organism.

Xenotransplantation: Transfer of organs from one species to another.

Additional Resources

Accion Ecologica: Quito, Ecuador http://www.accionecologica.org/

Australian Gen-Ethics Network: Australian Conservation Fndn., 340 Gore Street, Fitzroy 3065, Australia

Canadian Environmental Law Association, 517 College St., Suite 401, Toronto, ON M6G 4A2, 416-960-2284
http://www.cela.ca/

Consumers Policy Institute, 101 Truman Avenue, Yonkers, NY 10703, 914-378-2000
http://www.consumersunion.org

Council for Responsible Genetics, 5 Upland Rd., Suite 3, Cambridge, MA 02140, 617-868-0870, http://www.gene-watch.org *National nonprofit organization of scientists, public health advocates and others which promotes a comprehensive public interest agenda for biotechnology. Position papers on* "Genetic Discrimination", "G.E. Foods", *etc. Subscribe to* ***GeneWATCH*** *quarterly.*

Edmonds Institute, 20319 92nd AV W., Edmonds, WA 98020, 206-775-5383 http://www.edmonds-institute.org/

Environmental Defense Fund, 257 Park Av S, New York, NY 10010, 212-505-2100 http://www.edf.org/home.cfm

Foundation for Economic Trends, 1660 L St NW, Washington, DC 20036-5603, 202-775-1132 http://www.foet.org/

Greenpeace International
http://www.greenpeace.org/international/

Humane Society of the U.S., 2100 L St., NW, Washington, D.C. 20037, 301-258-3110 http://www.hsus.org/

Indigenous People's Council on Biocolonialism
http://www.ipcb.org/

Institute for Agriculture and Trade Policies, 1313 - 5th St. SE, Suite 303, Minneapolis, MN 55414, 612-379-5980. http://www.iatp.org/

Monsanto Company, http://www.monsanto.com
Industry view of benefits of modern biotechnology. History of Monsanto's role - the industry leader of agricultural biotech products - and enormous product description list of agrochemicals, and genetically altered crops.

Pesticide Action Network, 116 New Montgomery St., # 810, San Francisco, CA 94015, 415-541-9140, panna@panna.org, http://www.panna.org
International information on the use of pesticides.

Pure Food Campaign, 860 Highway 61, Little Marais, MN 55614, 218-226-4164, purefood@aol.com
http://www.organicconsumers.org/Organic/
*Subscribe to **Food Bytes** - latest information on consumer activisim about genetically altered food.*

Rural Advancement Foundation International, P.O. Box 655, Pittsboro, NC 27312, 919-542-1396, http://www.rafi.org/
*Group that first publicized the attempt to gather and patent genetic material from indigenous people. Subscribe to **Rafi Communique.** Articles about bioprospecting, patents, impacts on farmers. Info in English, French, Spanish*

Sustainable Agriculture Research and Education Program, University of California, Davis, CA 95616-8716, 916-752-7556, http://www.sarep.ucdavis.edu/

Sustainable Agriculture Network, U.S.D.A., 10301 Baltimore Blvd, Room 304, Beltsville, MD 20705, 301-504-6425, san@nal.usda.gov

Third World Network, 228 Macalister Rd., Penang, Malaysia, +60-4-2266-159, http://www.twnside.org.sg/

Union of Concerned Scientists, 1616 P Street, N.W., Suite 310, Washington, D.C. 20036, 202-332-0900
http://www.ucsusa.org/food_and_environment/
Click on Agriculture. Clear, basic information about modern biotechnology in the field of agriculture. Promotes "sustainable agriculture." You can subscribe to ***The Gene Exchange*** *newsletter.*

United States Department of Agriculture
http://www.usda.gov *Click on Biotech Information Center.*

Books for further research

Biopiracy: The Plunder of Nature and Knowledge Vandana Shiva, South End Press, 1997

The Dairy Debate: Consequences of BGH and Rotational Grazing Technologies ed. by William C. Liebhardt Univ. Of CA Sustainable Agriculture Research and Ed. Program, 1993

Ecological Risks of Genetically Engineered Crops Jane Rissler & Margaret Mellon, MIT Press, 1996

Overcoming Illusions about Biotechnology Nicanor Perlas, Third World Network & Zed Press

Shattering: Food, Politics, and the Loss of Genetic Diversity by Cary Fowler and Pat Mooney, Univ. of Arizona Press, Tucson, 1990

Magazines

Cultural Survival Quarterly, issue on Genes, People and Property, Volume 20, Issue 2, Summer, 1996. 46 Brattle St., Cambridge MA 02138

Nature, international weekly journal of science, 968 National Press Bldg, 529 - 14th St. NW, Washington, D.C. 20045.

Science, weekly magazine published by American Association for the Advancement of Science, 1200 New York Avenue NW, Washington, D.C. 20005

Scientific American, monthly magazine of physical, life and social sciences and their application to industry, professions and public policy, 415 Madison Ave, New York, NY 10017.

Videos from Bullfrog Films on related topics

GENE BLUES: Dilemmas of DNA Testing. *30 minutes*
A video by Mark Dworkin and Melissa Young, Moving Images.
http://www.bullfrogfilms.com/catalog/gene.html
While there's no doubt that continuing advances in genetic knowledge hold promise for alleviating human suffering, what are the risks? This outstanding video, from the producers of RISKY BUSINESS: Biotechnology and Agriculture, looks at the problem areas and sets the stage for a national debate on the ramifications of gene technology. Issues include: genetic discrimination in employment and insurance; DNA data banks and issues of privacy and forensics; prenatal genetic testing and the implications of the new eugenics for people with disabilities; genetic indicators being sought to explain everything from obesity to homosexuality.

"A brilliant look at the social implications of genetic knowledge"
Sheldon Krimsky, Ph.D., Professor of Urban and Environmental Policy, Tufts University

FIELD OF GENES *45 minutes, Produced by CBC*
http://www.bullfrogfilms.com/catalog/fog.html
Technology has quietly slipped into the food chain, shifting genes from one life form to another. But are these high tech foods safe for us and the environment? What are the long-term consequences for the farming industry? This documentary deals with the reality that more and more engineered food is arriving in stores daily, and consumers don't know what's been genetically altered and what's not. The issue of control is a key factor for all parties concerned.

MY FATHER'S GARDEN *57 minutes A video by Miranda Smith*
http://www.bullfrogfilms.com/catalog/mfg.html
An emotionally charged documentary about the use and misuse of technology on the American farm. In less than fifty years the face of agriculture has been utterly transformed by synthetic chemicals which have had a serous impact on the environment and on the health of farm families. The video features North Dakota farmer Fred Kirschenmann who steered his land through the transition to organic farming proving that sustainable agriculture is a viable alternative on any sized farm