gender equality and new technologies

▸ agricultural biotechnology

This Fact Sheet highlights the importance of agricultural biotechnology for gender equality and development, focusing on genetic modification (GM). It illustrates some of its existing and potential uses in agriculture, explores some of the risks associated with GM, and identifies issues relevant to women's human rights.

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What is Agricultural Biotechnology?

Biotechnology refers to techniques that use living organisms or substances to make or modify a product for practical uses. Agricultural biotechnology includes both agricultural production and processing, using technological approaches such as plant breeding and genetic engineering or modification.

Of the agricultural biotechnologies, genetic modification (GM) has attracted the most attention. It is controversial because it allows scientists to transfer genetic material from one species to another. Traditional selective breeding — the way farmers have been doing it for thousands of years, — one generation at a time, can be hypothetically skipped or fast-forwarded with genetic modification.

What are the uses of Agricultural Biotechnology?

To date, agricultural biotechnology has been used all over the world. In fact, approximately 44 million hectares of GM crops, largely soy, cotton, canola (rapeseed), and corn (maize), were planted in 2000 in the four countries responsible for 99% of the worlds GM crops: Argentina, Canada, China, and the US.[1] GM trees have yet to be used commercially, and GM animals or fish have yet to be produced for human consumption.

Plants

GM agricultural products already in use are largely crops designed to resist insects and diseases, and to tolerate herbicides. A maize known as Bt corn, for example, is genetically engineered to resist a European corn borer (a common pest for maize). *Round Up Ready* canola, made by Monsanto, is engineered to be used with their herbicide, *Round Up*. Monsanto's business strategy is called 'vertical integration', where a company sells products that depend on one another for the end result. In order to get the benefit of the *Round Up Ready* seeds, a farmer has to use the *Round Up* herbicide — so Monsanto makes money selling both.

Current research aims to improve the nutritional quality and marketability of

Definitions:

Genetic modification (or 'genetic engineering'): direct manipulation by scientists of the DNA (genetic code) of an organism through laboratory processes of modern biotechnology. This can mean transferring a gene sequence from one organism to another.

Genetically modified organisms (GMOs): organisms that have been modified using genetic engineering techniques.

Selective breeding: developing a cultivated breed over time by controlling the mating of individuals with certain characteristics.

agricultural products. GM fruit, such as apples and melons, can have delayed ripening, extending their 'shelf life.' The most often-cited example of improving nutritional quality is the development of *Golden Rice* enriched with vitamin A, targeted at countries where diets are vitamin A-deficient. *Golden Rice* is very controversial — many don't believe it delivers the benefits it promises yet it is frequently publicized in the North as an example of GM technology doing 'good' in the South. Similar research efforts hope to add vitamin E, an anti-oxidant thought to prevent cancer, to vegetable oils. Other scientists are interested in reducing the allergenic properties of milk and wheat using GM.

Much of the current GM plant research focuses on making food production easier and increasing farmers' yields by eliminating potential environmental risks to their crops. GM plants are also being developed for other purposes. For example, Danish researchers are developing a plant that will change colour, from green to red, if the roots come in contact withnitrogen dioxide — identifying the presence of land mines.

GM products are also used for medicines, in the production of diagnostic tools and drugs. For example, GM insulin is available for diabetes sufferers so that they do not need to use insulin derived from pigs and cattle. In the 'agri-ceutical' industries, GM plants are being engineered to produce pharmaceuticals — like edible vaccines (in the form of fruit and medical compounds for use in humans), hormones, or blood.

Insects

Scientists are using GM to help fight malaria by developing a mosquito incapable of transmitting the malaria parasite. The idea here is to have GM mosquitoes breed with those in the wild, eventually replacing native mosquitoes with modified ones, eliminating mosquito transmission of the disease.

Other efforts to reduce environmental pests include GM techniques to make insects sterile or to develop insects that only eat weeds.

Animals

Animals are being genetically modified for use in biological and medical research, agriculture, and drug production or 'pharming'. Scientists are trying to genetically modify animals to produce human medical treatments and organs or tissues for transplantation into humans. Animal research focuses on producing products like spider silk (one of the strongest and most versatile naturally occurring materials in nature) by harvesting protein from the milk of goats engineered with a spider gene. The primary aims of GM animal research are increasing agricultural production by increasing growth, altering milk composition, or minimizing waste as with the *Enviro-Pig* (a GM pig that excretes less phosphorus than regular pigs).

Where is the money?

- The U.S. Department of Agriculture (USDA) alone is expected to spend USD 2.3 billion on agricultural biotechnology research in 2004.[3]
- Global demand for genetically modified seeds will reach USD 3.8 billion in 2006 as land devoted for GM crops is expected to increase 7.2 % per year over this same period.[4]
- Very few companies in the world control the agricultural biotechnology market and consolidation is perceived as a crucial strategy for securing market share in the genetically modified seed and crop industry. The major competitors: Bayer CropScience, Delta and Pine Land, DuPont, Monsanto and Syngenta have all been actively engaged in merger, acquisition and/or spin off activities in recent years.[5]

Trees

Biotech research on forestry looks at enhancing production capacity for trees, by getting them to grow more quickly or to be disease resistant. For example, researchers are trying to genetically modify the amount of lignin — which provides rigidity — in a tree. Less lignin could improve the ease and efficiency of processing trees into paper. Increasing lignin could make stronger lumber and possibly increase the energy produced when wood is burned as fuel.

Fish

One company in Canada has developed a GM or 'aqua-advantage' salmon that grows four times as fast as its non-GM equivalent. Engineered with a gene from another fish, they grow in winter. Currently they are grown in secure in-land tanks, but the firm is seeking permission to bring the fish to market, raising concerns about the potential impact if the salmon escape from their pens and breed with wild varieties.[2]

In 2003, a Taiwanese GM ornamental fish came to market in Europe and North America. The *Night Pearl* is a GM fish that has been engineered to glow in the dark. DNA from a jellyfish was inserted into a zebra fish creating the first GM house pet.

A magic bullet for hunger?

As agricultural biotechnology is seen as a tool for economic development in much of the world, new questions arise about the potential implications of using GM products to meet the needs of the poor.

In terms of access and appropriateness of the technologies, agricultural biotechnology is dominated by the private sector in developed countries. Developing countries' dependence on corporations for this technology along with existing intellectual property regimes make access to GM products difficult. Moreover, because the technology is dominated by a few multi-national corporations, the application of agricultural biotechnology is focused on the needs of the market and the client in the North rather than on the specific needs or traits that might be important for farmers in the South.

The Kenyan example of the virus-resistant GM sweet potato is a telling illustration of this problem. This sweet potato, originally developed by Monsanto in the North to resist an American strain of the virus, was given to Kenyan researchers. Because it was not developed for the local strain of the virus, it proved to be ineffective in Kenya. This decade-long project cost Monsanto, the World Bank, and the US government about USD 6 million US and was hyped as an example of how GM crops could improve farming in Africa and reduce hunger.[6]

In terms of persistent poverty and underdevelopment, agricultural biotechnology is touted as a 'magic bullet'. This is problematic because first, this notion implies that social and political problems like hunger and poverty can be fixed by the right technological tools without addressing inequalities. Secondly, there is little need for magic bullets in the South when many of the so-called beneficiary countries lack the basic infrastructure to implement them. If GMOs have a negative environmental impact, developing countries have fewer resources to remedy the situation. Very scarce resources in agricultural research are focused on biotechnology, prioritizing tools over local needs. The importance of justice and equality for development is obscured by the focus on technological fixes.

Why does agricultural biotechnology ring alarm bells?

Agricultural biotechnology has enormous potential to change the way crops are grown and harvested. The debates about biotechnology have become polarized; some say GM crops are risky while others claim that the benefits outweigh the risks.

Farming

The reported benefits of GM crops for farmers include more effective crop management, better soil conservation practices and better insect and virus control. However, now that GM products have been in use for approximately 10 years, we see that these anticipated benefits are not necessarily translating into real advantages for farmers. The results are mixed and much of the available data is anecdotal.

Environment

Concerns regarding the environmental safety of GM crops centre on their effects in the 'wild', including the impact on insects, other living organisms, and non-engineered varieties of the crops, and an increasing dependency on chemicals. Biodiversity could be threatened — what happens when the GM gene is transferred to wild or native varieties of the same crop?

[1] Clive James, "Global Review of Commercialized Transgenic Crops", ISAAA Briefs No. 21, 2000. Available at: <http://www.isaaa.org/kc/Publications/pdfs/isaaabriefs/Briefs%2021.pdf >
[2] Richard Black, "Push to have GM salmon approved", BBC News, 24 March 2004. Concerned scientists suggest this could completely deplete natural populations, at <http://www.news.bbc.co.uk/1/hi/sci/tech/3565041.stm>
[3] Kathryn McConnell, "U.S. Farmers Continue to adopt biotech, study shows", 11 December 2003. Available at: <http://www.usembassy.it/file2003_12/alia/a3121207.htm>
[4] "World Agricultural Biotechnology", 1 March 2002. Found on <http://www.marketresearch.com>
[5] Ibid.
[6] "Monsanto's showcase project in Africa fails", New Scientist, Vol. 181, No. 2433, 7 February 2004.
[7] Genetically Modified Crops: A decade of failure (1994-2004), Friends of the Earth International, February 2004.
[8] A synthesis report of the Africa Region - Women, agriculture and rural development, FAO, 1995. <http://www.fao.org/docrep/x0250e/x0250e00.htm>
[9] ILO estimates that in the mid-1980s approximately 98% of rural women classified as economically active are engaged in agriculture. Fact sheet: Women, Agriculture and Rural Development, SD Dimensions, Sustainable Development Department (FAO), 1996.
[10] Dymphina Andima, et al, "An Ex-Ante Evaluation of Improved Casava Varieties on Gender Relations in Migori District, Kenya." Available at <http://www.gdnet.org/fulltext/andima.pdf>
[11] SD dimensions, 1996.

Insects may develop resistance to GM crops, reducing the efficacy of the engineered 'improvements' to the crops and compromising the effectiveness of existing insecticides. Impacts on other organisms including beneficial insects and other invertebrates are also a concern. Pollen from Bt corn, a GMO, has been found to be harmful to monarch butterflies, for example. There are also claims that 'superweeds', where herbicide resistant plants crossbreed and become resistant to many herbicides, are difficult and expensive to eradicate. According to Friends of the Earth International, GM crops actually increase farmers' dependence on chemical pesticides and herbicides rather than decreasing them.[7]

> **"Biotech companies promised that GM crops were safe, that they would provide better quality and cheaper food, that they were environmentally sustainable, that they would improve agricultural production, and that they would feed the developing world… After ten years, none of these promises have materialized."**
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> - Friends of the Earth International

Human Health

Unfortunately, there has been very little research on the impact of GM crops (as opposed to non-GM) on human health. Because genetic engineering can transfer genes from different species, it is possible that GM crops could add new, unknown allergens into foods. Some GM crops are designed to be resistant to antibiotics (in fact, researchers often use this as a 'marker' when identifying a new trait in the product). This resistance could be transmitted to humans, compromising the effectiveness of widely-used antibiotics.

Agricultural biotechnology IS gendered

Globally, women contribute between 60-80% of the labour to food production.[8] In rural areas, nearly all women are engaged in agriculture.[9] Women are predominantly involved in planting, weeding, harvesting, and processing; currently, these are the agricultural areas most affected by agricultural biotechnology. Rather than easing burdens, some evidence has shown the introduction of new seed technologies has tended to increase labour burdens for women and has decreased their control over their work.[10]

If pesticide and herbicide use is increasing, as some research suggests, women are the most exposed to the increase in these chemicals. If yields are not increasing as promised, women must work harder to feed their families. Moreover, the pressure to grow cash-crops is affecting agriculture in many parts of the world and attracting men to commercial food crops such as maize, beans, horticulture, and dairy products, traditionally controlled by women.[11] As these technologies shift women's agricultural work, their livelihoods and roles are threatened. Women as consumers are also affected by the increased use of these technologies — in terms of their health and safety but also their rights to food and work.

As agricultural biotechnologies become more common, despite the widespread popular rejection of them, gender equality advocates must ask:

- What regulations are needed to ensure women's rights and gender equality are promoted? What regulations already exist?
- What are the real health concerns associated with GM?
- Can agricultural biotechnologies be harnessed for economic development and gender equality?
- Do agricultural biotechnologies impact on the quality of life, environment, health and safety, equality and rights of women in farming?

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The Association for Women's Rights in Development is an international membership organization connecting, informing and mobilizing people and organizations committed to achieving gender equality, sustainable development and women's human rights. A dynamic network of women and men, AWID members are researchers, academics, students, educators, activists, business people, policy-makers, development practitioners, funders and others, half of whom are located in the global South and Eastern Europe.

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