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The Unexplored Potential of Organic-Biotech Production

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Report Highlights:

The organic movement rejects biotechnology as inherently contradictory to its fundamental goal of promoting environmental protection in agriculture. European organic promoters in particular stress respect for nature over yield maximization, campaigning for a return to traditional production methods and inputs. [1] In reality, the divide between organics and biotechnology is an artificial construction maintained by ideology rather than science. A governmental decision to change organic regulations to permit the use of biotechnology could have far-reaching policy implications for global agriculture. Allowing producers to gain organic certification for biotech crops could encourage the development of a new type of environmentally sustainable agricultural production with greater benefits for the consumer.

^[1] Isabel Rosa, GAIN Report: Organic Agriculture in Italy, 2008 (Foreign Agricultural Service: Rome, 2008) 5.

General Information:

The Debate over Biotechnology

Organic promoters are primarily concerned that incorporating biotechnology into agriculture will create unpredictable long-term problems for consumers and the environment. Greenpeace, a leader among non-governmental organizations committed to environmental protection, describes its global campaign against biotechnology as a fight “to protect the public’s health and prevent the contamination of the environment.” [1] The International Federation of Organic Agriculture Movements (IFOAM), the leading umbrella organization for organic organizations worldwide, rejects biotechnology on grounds of uncertainty. In laying out organic agriculture’s fundamental principles, IFOAM states that “Organic agriculture should prevent significant risks by adopting appropriate technologies and rejecting unpredictable ones, such as genetic engineering.” [2] Due to such concerns, organic lobbies in the United States, the European Union, and elsewhere have successfully outlawed biotechnology in organic certification standards.

The scientific community consistently responds that biotechnology has not created new ills for humanity or the environment. Agricultural biotechnologists contend that health and environmental concerns are unfounded worries based on unjustified fears. Independent EU food safety panels unanimously report that *Bt*-corn, a biotech crop including an insecticide gene derived from the bacterium *Bacillus thuringiensis*, is equivalent in safety to conventional corn. [3] After six years of scientific examination, an EU commission declared in 2002 that there was no scientific basis for the EU’s ban on new biotechnology. [4] The commission reported that the primary difference between conventional plant breeding and biotechnology is the higher precision inherent in the latter. The National Research Council argues that the accuracy with which plant biotechnologists alter a plant’s genes makes the process even safer than conventional breeding. [5]

Biotechnology supporters argue that biotech crops are not only safe, but potentially more nutritionally beneficial to the consumer than conventional varieties. For example, Golden Rice is a variety of rice fortified with vitamin A. Its widespread adoption could supplement the nutrition of the 120 million children deficient in vitamin A and prevent 1 to 2 million deaths annually. [6] There is a significant variety of health additives that could improve the nutritional quality of crops, ranging from fatty acid omega-3 in canola for cardiovascular and mental health, to the antioxidant lycopene in tomatoes. [7] Proponents of biotechnology also contend that such crops are better for the environment than conventional varieties. Some biotech crops are pest resistant, thereby reducing the amount of pesticides

farmers require. *Bt*-corn, for example, repels insects that would normally feed on the crop. Farmers who grow *Bt*-corn on a single hectare use 75 percent less pesticides, essentially receiving the benefits of chemicals without releasing them into the environment or leaving residue on the final product. [8] Similarly, Roundup Ready soybean farmers in the U.S. spent \$753 million less on herbicide in 2001. [9] The Economic Research Service of the USDA compared pesticide use for *Bt* maize, *Bt* soybean, and *Bt* cotton to pesticide use for conventional varieties, and the biotech group used 7.6 million fewer acre-treatments in 1997. By 1998, savings were 17 million acre treatments, and *Bt* protection reduced mycotoxin contamination by 92 percent. [10] By 2002, 40 case studies of 27 biotech crops revealed pesticide use had fallen by 163 million pounds. [11]

Biotechnology also contributes to the fight against deforestation, as most unused potential farmland today is under tropical forest. From 1800 to 1950, farmers increased production by ploughing new land, razing forests, and clearing virgin pastures. With the advent of the Green Revolution, farmers adopted new technologies that increased yields 300 percent without expanding agricultural land use. Proponents argue that biotechnology would allow producers to increase yields on existing farms as well as cultivate suboptimal land. Salinity has rendered 40 percent of global irrigated land non-arable, but researchers Zhang and Blumwald developed technology that would allow farmers to grow plants in soil with 50 times more salt than normal water. [12] New plant varieties are also able to produce citric acid in the roots which enables growth in soil with a high aluminum content. [13]

The Potential of a New Organic-Biotech Movement

Organic regulations do not yet allow for organic-biotech production. In 2007 the EU adopted new organic legislation, Council Regulation 834/2007, that created a ceiling of five percent for the unintentional mixing of conventionally produced ingredients in organic products. In contrast, the EU will only tolerate biotech ingredients if they compose less than 0.9 percent of the final organic product. By indicating that biotech crops hold a different and greater danger than conventional varieties, the EU organic legislation seeks to make a pariah out of this technology. There is no scientific reason to stigmatize biotechnology, and doing so threatens to cripple an agricultural movement that could help the environment, increase yields, and improve nutrition worldwide.

The policy implications of changing governmental organic regulations to permit the organic cultivation of biotech crops would benefit consumers and the environment while reducing the stigma currently attached to biotechnology. The two systems have compatible nutritional and environmental goals, and

together they could create a new form of sustainable production agriculture. Large-scale organic-biotech production would give organic consumers a more affordable product that is better for their health and the environment. Introducing biotechnology into organic agriculture would increase organic yields and contribute positively to the global food supply.

Combining biotechnology and organic methods would allow producers to maintain high yields while still catering to consumers who demand organic products. Pests, diseases, and spoilage – problems that biotechnology can counter – destroy almost 40 percent of global food crops annually. [14] For example, African maize is susceptible to stem borer beetles that destroy 15 to 40 percent of the crop each year, and a new biotech variety is resistant. [15] The disparity between American and European agriculture demonstrates the potential impact of biotechnology on yields. In 1996 when biotech crops were first introduced into commercial agriculture, grain yields in Europe equaled those in the United States. European grain production has since fallen behind the U.S. by 1 to 2 percent annually, implying that Europe could grow 15 percent more grain if it lifted its ban on biotechnology. [16]

High yields should not be dismissed as only for the benefit of growers. The current system of organic production discourages attention to productivity, and as more land comes under organic cultivation, doing so may encourage deforestation. In 2007, 32.3 million hectares globally were certified organic, a 1.5 million hectare increase from 2006. [17] Organic farmers, like conventional farmers, could use biotechnology to increase yields on existing farms or cultivate land that salinity previously rendered unsuitable for production. A rejection of modern technology represents a return to pre-1950, wherein further production will necessitate deforestation to satisfy the growing demand for organics.

Diverting agricultural land to organic production could also have dangerous implications for the world food supply if growers reject yield-enhancing biotechnology. World food prices rose 83 percent from 2005 to 2008. [18] They have recently crashed along with the world economy but are unlikely to remain low. A rising global population requires increasingly more food, and the UN's Food and Agriculture Organization estimates that global food demand will at least double from 1990 to 2030. [19] High yields will ultimately benefit the hungry poor who need a larger global food supply to keep prices down.

Currently, drought threatens the yields of global leaders in both conventional and organic production. As global climate change alters rainfall patterns across much of the world, farmers will need to use biotechnology to combat drought. Australia is the leading producer of organics, with 10 million hectares and 39% of total organic surface area in 2005. [20] It is currently afflicted by historic drought. Latin America, one of the fastest growing organic producers, had 19% of organic surface area in 2005. [21]

Argentina is the second largest organic producer with 3 million hectares, [22] and its total food production is forecast to fall 50 percent in 2009. [23] Drought has led Brazil, the 5th largest organic producer [24] and the world's third-largest corn exporter, to forecast a drop in its corn harvest from 58.7 million tons in 2008 to 50.3 million tons in 2009. [25] Monsanto has developed a drought-tolerant variety of maize to help producers better combat the effects of drought. The new variety can survive in conditions of drought for eight to twelve days, and it will enter the North American market next year. Organic-biotech production could also help organic farmers meet their goal of creating the healthiest food possible. Eliminating pesticide use is beneficial to the environment, but doing so allows pests to flourish. Poor pest control has led to measurably higher levels of aflatoxin in organic grains than in conventional varieties, and this poses a health threat to consumers. *Bt* crops have lower aflatoxin levels than organic or conventionally grown varieties, because they carry a gene that inherently repels pests. Utilizing biotechnology could thereby allow organic farmers to abandon pesticides not from ideology but from obsolescence. The final product would be healthier for consumers without harming the environment.

There are some problems inherent to organic production that biotechnology cannot yet fix. Manure is the largest source of organic fertilizer, and the Institute of Food Science and Technology published a 2002 report highlighting the danger of disease-causing microorganisms, such as *e. coli*, that manure may transfer to the crop. [26] Weed control is another problem. Farmers in the United Kingdom find that weeds increase 300% when they convert from conventional to organic, thereby necessitating the plough. [27] By mechanically weeding their fields, they use fossil fuels, increase runoff, decrease soil carbon, and damage nesting birds, worms, and invertebrates. [28] There are organic mulches that can suppress weed emergence, such as winter annual legume hairy vetch, but these require herbicides – 0.5 pound of metribuzin per acre – to be effective. [29]

Governments should change their regulations to allow producers to gain organic certification for biotech crops grown with organic methods. Such a system would better achieve the organic movement's stated goals of environmental sustainability and the promotion of human health. At the very least, regulations should not include different standards for the unintentional addition of conventional and biotech ingredients in organic products. Doing so unnecessarily increases the stigma of biotechnology, stifling global technological development without scientific justification.

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[5] Ibid., 921.

[6] Ibid., 931.

[7] Ibid., 924.

[8] Ibid., 932.

[9] Ibid., 932.

[10] Ibid., 932.

[11] Ibid., 932.

[12] Ibid., 919, 931.

[13] Ibid., 931.

[14] Ibid., 932.

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