



Biotechnology in society - Boon or Bane: A Case Study

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ABSTRACT: Biotechnology, with its knowledge-intensive nature and tremendous economic potential, has emerged as one of the rapidly-growing sectors of the Indian knowledge economy today. Focusing on the practical use of biological systems to produce goods and services, biotechnology has made significant achievements in the growth and its application in the areas of agriculture, healthcare, environment, etc through R & D projects and infrastructure creation. Biotechnology seemed to have improved the conditions of Living but the way information has been communicated and the way decisions are made; affect perception and public support or opposition to a new technology. Biotechnology is not a system of farming; It reflects no specific philosophy nor is it guided by a set of principles or performance criteria. It is a bag of tools than can be used for good or evil, and lots in between. Hence, the debate over the value of biotechnology in the society is polarized and impassioned. This paper clearly evaluates the rewards of this field into the society and its disfavours from the public.

Keywords: Biotechnology, Society, genetic modification, Friend, Foe.

INTRODUCTION

India has a wealth of natural resources with the potential to drive economic growth and social development: land, minerals, biological diversity, wildlife, forests, fisheries and water, although these are unevenly distributed. India's economy and people are vulnerable to environmental hazards such as droughts and floods, the frequency and extremity of which is likely to be increased by climate change. It is experiencing faster degradation of many environmental resources. Problems include land degradation, desertification, and biodiversity loss, deforestation, declining soil productivity, pollution and depletion of freshwater. One of the central messages emerging from the assessment of India's status in the global economy is the need for India to emphasize building its capacity to solve its own problems. Every problem enumerated above has one or more solutions in the application of science, technology and innovation. Application of science and technology has contributed significantly to defining an economic divide between rich and poor nations. It follows, therefore, that the rate of scientific and technological development largely determines the pace of socio-economic development. To close the gap between rich and poor nations it will require deliberate measures to build scientific and technological capabilities of the poor countries.

Biotechnology- A scientific term formed when two words are put together: 'Bio', which stands for biology, the science of life; and 'Technology', the tools and techniques used to achieve a particular purpose. The term Biotechnology was coined by Karoly Ereky, a Hungarian agricultural economist who, in 1917, foresaw the inevitability of a biology-technology merger. He is regarded by some as the "father" of biotechnology. The entrance of this new field into the lexicon of environmental controversies coincided with increasing awareness of the nefarious effects of industrialization, and with the greater scrutiny of our faith in science and technological progress. Mapping the discourse of biotechnology finds franken- foods, golden rice, monarch butterflies, miracle drugs, and counterclaims about food safety and security, ecological stewardship, medical progress, and social justice.

Purpose of this study: Biotechnology is now bringing to agriculture novel varieties of crops, animals, and microorganisms. It offers many potential benefits in medicine, industry and agriculture. Genetic modification of food is the most radical transformation in our diet since the invention of agriculture 10,000 years ago. During these thousands of years, people have used the naturally occurring processes of genetics to gradually shape wild plants into tastier, more nutritious, and more attractive food for all of humanity. Until very recently, these evolved food plants were part of the common heritage of humankind. The biotechnology industry touts these products as a major contribution toward sustainable agriculture, but it is not clear whether agriculture will in fact benefit. In fact, selective plant breeding has brought food security, greater nutrition, and increased biodiversity, while at the same time protecting food systems against hard times, like natural or economic disasters. This paper therefore looks into the risks as well as benefits of biotechnology.

Background: Biotechnology has been around for a long time. Our ancestors have been making use of biotechnology for many things, such as the baking of bread using yeast. Biotechnology, as the word suggests, is the “fusion of biology and technology” using biological techniques for product research and development. Albeit useful, there have been concerns that Biotechnology is being drag to the environment. It is not new that the environment is degrading. So the question now is: Is Biotechnology a friend or foe of the Environment? Biotechnology’s positive impacts to the environment should outweigh the negative impacts to be considered a Friend of the environment. Conversely, if Biotechnology results in more harm than benefits to the environment it would be considered a Foe. While there are no doubts that Biotechnology has some downsides, I feel that Biotechnology is definitely a friend to the environment.

(Biotechnology has the power to increase human health, environmental sustainability and the well- being of consumers and farm communities globally.)

Impact on Society: We are in the early stages of a major revolution in life sciences and biotechnology that will impact every aspect of our society. The major benefits on the horizon will only be realized if society accepts biotechnology and resulting products as ethical and safe.

Impact on the global community: Agricultural biotechnology can help solve the global food crisis and make a positive impact on world hunger. Crops improved through agricultural biotechnology have been grown commercially on a commodity scale for over 12 years. These crops have been adopted worldwide at rates exceeding any other advances in the history of agriculture. This paper assesses the impact of biotechnology is having on the global agriculture system from a community, health and environmental perspective. According to the United Nations, food production will have to rise by 50 percent by the year 2030 to meet the demands of a growing population. Agricultural biotechnology has been shown to multiply crop production by seven- to tenfold in some developing countries, far beyond the production capabilities of traditional agriculture, and the global community is taking notice. Farmers earn higher incomes in every country where biotech crops are grown. When farmers benefit, their communities benefit as well.

Impact on the environment: Arguably, the biggest environmental impact of biotech crops has been the adoption of no-till farming,. Herbicide-tolerant crops like biotech soybeans allowed farmers to almost completely eliminate plowing on their fields, resulting in better soil health and conservation, improved water retention/ decreased soil erosion and decreased herbicide runoff. In fact, no-till farming has led to a global reduction of 14.76 billion kg of carbon dioxide (CO₂) in 2006, the equivalent of removing 6.56 million cars from the roads for one year. Global pesticide applications decreased six percent in the 10 years after biotechnology derived crops were first introduced, eliminating 379 million pounds of pesticide applications. Biotechnology derived crops are improving water quality both through less herbicide and pesticide in runoff from fields, and in the future also through reducing phosphorus excretion in livestock by using biotech derived feed that contains reduced levels of phytate.

(Many scientists would agree that biotechnology is an important contributor to a sustainable agriculture system because it can produce more food with a lesser environmental impact as compared to conventional agriculture.)

Boon or Bane - The Spectrum of Opinions: Claims about new technologies have rarely been divided across such a wide spectrum. Many of the world's leading molecular biologists largely support advances in biotechnologies as critically needed approaches to end hunger, cure disease, prolong lives and perfect human beings. Biotechnology in agriculture was initially billed as the next Green Revolution, a technology that would end world hunger and prevent environmental degradation. Norman Borlaug, who won the Nobel Prize for his founding role in the Green Revolution, says that in its first twenty years biotechnology developed invaluable applications with the greatest impact in medicine and public health. Proposed benefits include increased yields and improved nutritional value. Some even argued that reduced use of chemical input means that transgenic crops are better for biodiversity than non-transgenic crops.

"Improvement" of human genetics is a radical proposition. While transgenic crops involve ethical questions of how we affect our environment, human germ line engineering raises deep and very challenging ethical concerns about our very humanity and fundamental identity. Advocates claim that what they openly call a "new eugenics" is inevitable and good. The new technologies, according to critics, will not only degrade the environment, they will also pose several major new environmental problems, perhaps on an unprecedented scale, as well as exacerbate wealth divides and create some of our most difficult new social problems.

Understanding biotechnologies is a complex and lengthy process given their novelty and unpredictability. Applications in medicine may bring about great advances and industrial applications may allow for more environmentally friendly processes. Yet, any benefits must be considered alongside ecological and health risks, as some of them may be costly, some catastrophic, and many irreversible. Moreover, the biotechnology industry has created serious problems by privatizing the foundations of our living systems.

Distinguishing products from Biotechnology: Three features distinguish as follows: First and most important, the product is altered at the genetic level in ways that could never occur naturally. As genes from plants, animals, viruses, and bacteria are merged in novel ways, the normal checks and balances that nature provides to keep biology from running out of control are nullified. Exactly how genes work is a topic of some controversy, so it is difficult if not impossible to predict what will happen when individual combinations of genes are created in ways that have never been seen before and then released into the environment.

The second novel feature of the revolution is that the product is owned. Not individual sacks of rice, dal or atta, but entire varieties of plants and even microorganisms are now corporate products. In some cases, entire species are owned. The term "monopoly" takes on new power when one imagines a company owning major portions of our product supply, the one thing that every single person now and into the future will always need to buy.

Finally, this new technology is "globalised." This means that local agriculture, carefully adapted to local ecology and tastes over hundreds and thousands of years, must yield to a planetary monoculture enforced by intricate trade agreements and laws. According to these trade treaties, local laws that we have come to rely on for protection must take a back seat to decisions made far away by anonymous officials working in secret.

The flip side of genetically modified products: The opponents of genetic modification of the products argue otherwise. It is their contention that normally, the boundaries between species are set by nature. Until recently, those biological barriers had never been crossed. Genetic engineering allows these barriers to be crossed with results that no one can predict. It may seem bizarre or even offensive, if you are a vegetarian to think that the tomatoes you buy and eat, could have fish genes in them. Some of these combinations might be not only peculiar but downright dangerous to our environment or even our own health. Even some geneticists feel that though the artificial nature of genetic modification does not make it dangerous, the imprecise way in which genes are combined and the unpredictability in how the foreign gene will behave in its new host results in uncertainty. From a basic genetics perspective, GM products possess an unpredictable component that is far greater than the intended change.

Genetic engineering of food crops is a new technique that is still in its infancy. Traditional plant breeding and agricultural practices have a history that stretches back 10,000 years, and the biotechnology industry tries to tell the public that genetically engineered foods are just a natural extension of this process nothing to be alarmed about. But genetic engineering is a radical departure from traditional plant breeding. Plant genetic engineering is a hit-or-miss process. Farmers and plant breeders know that genes are mutable, and many factors, including the environment, play a major role in the expression or adaptation of a gene or genetic trait.

Whatever the case may be the debate rages. While it is certain that like any new technology, genetic modification of food too has its uses and pitfalls. What makes this particular technology different is that it concerns something which forms the very essence of our life – food. If it succeeds, it will be a Revolution unlike any seen in human history. If it backfires, the consequences may turn out to be anything but welcome.

RESULTS AND DISCUSSION

Decision Making: *The Key is Safety:* Safety is determined by asking the right questions. It has traditionally been left to regulators to develop and set up systems to ask the right questions, review the information, and examine the results of the use of a technology. Regulators have been grappling for the past decade or so with what questions to ask regarding safety considerations for biotechnology-questions based on science: about the organism and how it interacts with the environment or with humans. Farmers have traditionally, perhaps wrongly in some cases, relied on and trusted scientists to judge whether a product should be on the market and whether it is safe. Farmers have the option to choose and use an approved and available product as they see fit, bearing in mind the rules for operation and the limitations of the product itself. Farmers are frankly confused about the breakdown in trust surrounding the regulation of biotechnology products. People who mistrust the process or the questions being asked have the option to get to know the regulatory groups, tell them about the uncertainty and concerns about the questions being asked, and get involved. They are willing to listen.

This leads us to the issue of the right to know, another hotly contested subject in biotechnology being discussed internationally as a labeling issue. Some questions are in order. Do we know everything about what we consume? Are we aware of the ingredients in the products we use to wash with and apply to our skin? We do not know what pesticides were used on imported goods, only that limits are set via international guidelines. Clothes are labeled, less for allergen city and more for washing instructions. We don't know the recycled content of newspapers, plastic toys, and other goods or whether an animal has been treated with antibiotics. Or is biotechnology, carefully weighed for risks and concerns, an important tool to feed the world? We need to ponder this.

Outcomes:

- a) It is time that we were all more honest. We need to examine our hearts for what we say and do and be careful that they are honest and from good intentions, not selfish or self-righteous.
- b) We need to cut the rhetoric. Stop dragging out old stories that are unsubstantiated and examine facts carefully. Bust the myths. Stop using folk stories to illustrate opinions. Check the facts and get the right message out. Stop using only bad things to illustrate a negative point about technology and industry development. Tell the good stories as well. But if a story is bad and the public needs to know, then we all should take on the role of being a whistle blower.
- c) Check your motives. When objecting to a new solution for an urgent problem, remember that omission is also an ethical choice and can be considered ethically unacceptable. Are your goals noble? Are objections or support based on fact or fiction? Are you blocking or upholding something for no good reason (greed is not a good reason)?
- d) Weigh the risks and benefits in as wide a way as possible. Farmers are realizing the need to look at the big picture of sustainable agriculture, which includes social, economic, and environmental issues where practical and possible.

CONCLUSION

Be Agents of Change: Biotechnology is a complement - not a substitute - for many areas of conventional agricultural research. It offers a range of tools to improve our understanding and management of genetic resources for food and agriculture. These tools are already making a contribution to breeding and conservation programmes and to facilitate the diagnosis, treatment and prevention of plant and animal diseases. The application of biotechnology provides the researcher with new knowledge and tools that make the job more efficient and effective. We need to be agents of change if we understand the needs, concerns, and desires of all. We all need some perspective on what we do. Consider the results of a survey of people over 90 years old who were asked, if you could do it (your life) all over again what would you do more of? They replied: reflect more, risk more, do more things that would live on. We have to live, love, learn, and leave a legacy. Let's challenge us with these watchwords today, for the rest of the day and for the rest of our life.

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