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Role of Biotechnology in Agricultural Revolution

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Abstract – The consequences of the invention of DNA-based molecular techniques and their application to agriculture have been pervasive. This review examines the key consequences for farmers and the public. These include widespread commercial applications of agricultural biotechnology in a limited number of countries, a large private-sector investment in biotechnology research, significant economic contributions to farmers, continuing controversy over its environmental impacts, a proliferation of regulations (both national and international as a consequence of the technology and property rights), a wide range of changing public reaction, and relatively little contribution of the technology to increasing food production, nutrition, or farm incomes in less-developed countries.

The commercial applications of agricultural biotechnology, the state of research, and the economic and environmental impacts of applications to date; identify the main regulatory consequences; reviews the public reactions; and, in a final section, considers the implications for agriculture and food security in less-developed countries.

Keywords: Biosafety, Ethics, Food Safety, Intellectual Property, Molecular Markers, Public Acceptance Etc.

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INTRODUCTION

The term "biotechnology" has been used to refer to many biological methods that produce useful products, including some fairly ancient ones such as fermentation in beer, wine and cheese (1, 2). But most recurrently today the term is used to refer to information about the natural techniquesof DNA replication, breakage, ligation, and repair that has made possible a deeper understanding of the mechanics of cell biology and the geneticmethod (3). In this review, "biotechnology" refers to DNA-based molecular methods used to modify the genetic conformation of agriculturally beneficial plants and animals. Previous methods of modifying the genetic conformation of plants and animals, still widely used alone and in combination with DNA-based methods, which many agriculturalists call crop development or animal improvement, are mentioned to here as "conservative" plant or animal breeding. Organisms whose genetic conformation has been improved by moving DNA from one organism to other using DNA-based methods, i.e., not upbringing, are referred to in this review as transgenic, genetically engineered, or rDNA (recombinant DNA). These terms are preferred to genetically modified organisms (GMOs) because the genetic conformation of virtually all agricultural crops and animals have been improved by human performers over the past 200 or so years (4). Biotechnology has led to a number of powerful tools in addition to genetic engineering that are beneficial for changing the genetic composition of plants and animals, including those identified below and explained in manageable language elsewhere (5). The methods can be applied to plants, animals, and microorganisms of any kind, but this review will say nothing more about microorganisms and have the briefest references to animals. The major and most controversial social and regulatory significances of agricultural biotechnology develop from the ideas associated with genetic engineering and food made from transgenic crops, whereas varieties produced without genetic engineering isoverlooked. In any case they are more problematic to identify, few and little data about them exist (6). This review focuses largely on transgenic.

➢ **Applications of Agricultural Biotechnology:**

- Genetic engineering inserts fragments of DNA into chromosomes of cells and then uses tissue culture to regenerate the cells into a whole organism with a dissimilar genetic composition from the original cells. This is also recognized as rDNA technology; it produces transgenic organisms.

- Tissue culture manipulates cells, anthers, pollen grains, or other tissues; so they live for extended periods below laboratory conditions or become whole, living, growing organisms;

genetically engineered cells may be changed into genetically engineered organisms through tissue culture.

- Embryo rescue places embryos containing transferred genes into matter culture to complete their improvement into whole organisms. Embryo rescue is often used to facilitate "wide crossing" by producing whole plants from embryos that are the result of crossing two plants that would not generally produce offspring.

- Somatic hybridization removes the cell walls of cells from dissimilar organisms and persuades the direct mixing of DNA from the preserved cells, which are then redeveloped into whole organisms through material culture.

REVIEW OF LITERATURE:

Before 1980, there were comparatively few regulations on production or trade of crop seeds. Since then, there has been a proliferation of national regulations and international agreements that seem to have led to ever more regulations. The first transgenic organisms were unregulated laboratory formations with the first national standards outlined in 1976 by the National Institutes of Health (NIH). Those provided for regulations by committees of the institutions in which the research supported by NIH was done, and most researchers observed to them (7). With the improvement of transgenic seeds envisioned for farming, a technique to regulate their release into the environment was needed. In 1986, the country. Government developed a coordinated framework for transgenic crops built on the current constitutional authority of the Department of Agriculture (USDA), the Food and Drug Administration (FDA), and the Environmental Protection Agency (EPA) (8). Other countries have taken their own methods, and related international arrangements have increased.

1. Food Safety:

The responsibility for assuring that new foods from whatever source are safe for consumption is generally the accountability of the FDA. Its primary concerns are contamination by bacteria, mycotoxins, chemicals, and pesticides. For biotechnology-derived food, "FDA operates a voluntary premarket notification and consultation system that offers biotech companies an opportunity to demonstrate that foods produced from their biotech crops are as safe as their traditional counterparts" (9). The FDA assumes that before seeds from genetically engineered crops are grown commercially the USDA must be satisfied, that field tests show only necessary changes have been made in the crop, that "the plants look right, grow right, produce food that tastes right," and have nutrients similar to their no transgenic complements (10). This is the "substantial equivalence" method. The FDA can ban and force remembers of food ingredients and foods that do not meet these conditions (98).

2. Biosafety:

The EPA's role is focused on plants, like BT cotton, that have been genetically engineered to produce ainsecticide under the same laws it uses to regulate conventional pesticides. EPA is charged to confirm that a transgenic plant does not pose adifficult chance of harm to human fitness or the environment (11). Pesticides whether from plants or chemical factories, that pass the EPA's evaluation are decided "registration" and may be sold under recognized conditions (11). For transgenic events unconnected to pesticides, for example, drought confrontation, EPA has no authority. It establishes procedures for improvement notification of international shipments of transgenic organisms to empower countries to make informed decisions before such organisms come into their territory and delivers information to assist countries in the implementation of the Protocol.

3. International Crop Genetics Undertaking:

The first comprehensive international agreement dealing with plant genetic resources for food and agriculture was the International Undertaking on Plant Genetic Resources, adopted by the FAO conference in 1983. Monitored by the Commission on Genetic Resources for Food and Agriculture within the FAO, the Undertaking seeks to confirm that plant genetic resources of economic and/or social interest, particularly for agriculture, will be explored, preserved, evaluated, and made available for plant breeding and scientific purposes and "to promote international harmony in matters regarding access to plant genetic resources for food and agriculture" (10). The international agricultural research centers of the Consultative Group on International Agricultural Research pledged adherence to the principles of the Undertaking and continue to emphasize the concept that crop germ plasm is the common heritage of all humanity.

4. Public Reactions to Transgenic Foods:

There is relatively high acceptance of foods from transgenic crops, although some Americans remain opposed to them, while in Europe, opposition is strong (11-13). Facts about the scientific and economic questions can be established, but views based in beliefs and no quantifiable values seem unlikely to change with further scientific information. Advocacy groups opposing transgenic may be reflecting these ethical positions as much as determining them, although some opposition does not marshal a consistent, measured, rational argument that is the mark of an ethical position but rather appeals through emotive terms like "Franken food" and "terminator".

➢ The Safety of Transgenic Food:

The greatest food safety threat resulting from genetic engineering is likely from DNA that generates unknown toxins or allergens, and consequently, transgenic foods are screened for all known allergins and toxins using highly accurate analytical methods (12). That procedure seems to have been effective in the Country, where genetically engineered foods have been consumed since 1996, and “no adverse health effects attributed to genetic engineering have been documented in the human population”.

➢ The Acceptability of Transgenic Foods:

Biotechnology is not a leading preoccupation of country. consumers. Handling, contamination, nutrition, ingredients, packaging, antibiotics, and chemical residues all seem to worry people more than transgenic, at least when they are asked to name their concerns (11–13). However, this may be because 60% to 70% of people in the Country are not aware that currently available food contains ingredients from transgenic crops about 70% are generally “supportive” of food from transgenic crops (15). Industry groups report that a majority of people support current. Policies of not requiring approval for genetically engineered foods However, that is a small majority (55%), and the proportion supporting no approval has fallen at a steady pace from nearly 80% in the late 1990s. A less self-interested source reports that a significant majority of country. consumers wants government to certify the safety of food from transgenic. An underlying cause of this public wariness about transgenic foods may be that neither nations nor individual consumers perceive significant benefits to themselves while fearing possible risks, however small. The ubiquitous role of food and the increasing distance between production and consumption may lead consumers to be concerned not only about cost and measurable attributes of food but also “the technology and methods used in food production and processing”.

CONCLUSION:

Over a mere 25 years, biotechnology went from a scientific curiosity to one of the most divisive issues in society. The discovery of DNA generated a continuing stream of related discoveries for describing and locating nucleotide sequences and irregularities as well as the genes they comprise. In the early 1980s, a few scientist-entrepreneurs saw a potential for applications to crop variety development and started their own biotechnology companies to exploit that potential. Financiers promoted biotechnology as a radically new technology and hyped it to investors as a road to easy wealth. Questions of intellectual property were resolved at the highest level in the Country. Large corporations came to believe that agricultural biotechnology offered potential for dramatic business growth and began acquiring biotechnology start-ups and seed companies. Some observers raised ethical issues about the transfer of genetic material across species, and social justice advocates became concerned about the concentration of seed production in the hands of a few companies; substantial opposition arose to genetically engineered crops as food sources. Corporations, scientists, and advocates favoring transgenic fought back with their own public campaigns. International agreements proliferated, responding to calls for biodiversity preservation, biosafety, intellectual property protection, and international trade.

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