

Agricultural Biotechnology, Poverty Reduction and Food Security in Ghana

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In recent weeks one aspect of science that has echoed through the media is biotechnology. To the non-scientist it all looks very confusing. The misconception of biotechnology is a problem the whole world over. Although biotechnology as a discipline has been in existence for many years, in Africa, perhaps with the exception of South Africa and Kenya, we are now fully awakening to the brave new world of biotechnology. To date, South Africa continues to be the only African country that has approved transgenic crops for commercial purposes and is the leader in agricultural biotechnology research and development on the continent.

Biotechnology

Biotechnology in broad terms covers all studies and techniques that combine the ideas and needs of biology and medicine with engineering. It is also referred to as molecular biology or genetic engineering. In traditional forms of breeding, variety has been achieved by selecting from the multitude of genetic traits that already exist within a species' gene pool. In nature, genetic diversity is created within certain limits. A rose can cross with a different kind of rose, but a rose will never cross with a mouse. Even when species that may seem to be closely related do succeed in breeding, the offspring are usually infertile. For example, a horse can mate with an ass, but the offspring, a mule, is sterile. These boundaries are essential to the integrity of any species.

In contrast to traditional breeding, biotechnology involves taking genes from one species and inserting them into another in an attempt to transfer a desired trait or character. For example, you could select a gene, which leads to the production of a chemical with antifreeze properties from a fish and putting it into a tomato to make it frost-resistant. It is now possible for scientists to introduce genes taken from bacteria, viruses, insects, animals or even humans, into plants.

It has been suggested that, because we have been modifying the genes of plants and animals for thousands of years, biotechnology is simply an extension of traditional breeding practices. While it is true that the food crops we are eating today bear little resemblance to the wild plants from which they originated, it is clear that through this new technology, organisms are being manipulated in a fundamentally different way. However, if current trends continue, within a few years most of the foods we eat could be genetically engineered (GE).

Moral Dilemmas

The moral dilemmas now enveloping biotechnology would not be so hotly debated if the technology itself were not so remarkable and effective. Thanks to its successes so far; in making possible, for instance, the cheap and plentiful production of such disease-fighting agents as insulin and interferon; numerous people have been able to live longer and healthier lives. Its promise in improved agricultural production is exciting. And even without considering the practical consequences, we have the prospect of a new world of knowledge about life itself and the essential components of our own humanity, our own individuality, as revealed in our distinctive genetic codes.

Poverty Reduction

Agricultural biotechnology will contribute to poverty reduction and food security if scientists can develop technologies to increase quality and yields of food crops and the technologies are adopted by small farmers. For this to happen, biotechnology R&D will have to meet four conditions:

1. It must address both the problems of small farmers in rainfed areas where most of the poor live, and those farmers in irrigated areas, who provide the bulk of food grain supply in the country.
2. It must focus on crops, livestock, and fish commonly grown by small farmers. Major crops are rice, maize, sorghum, millet, plantain, cassava, groundnut, yam, and sweetpotato. Biotechnology R&D should also focus on high value cash crops (e.g., cotton, soybean, and vegetables) that can increase the incomes of small farmers through crop diversification. The prospect for improving these crops is bright due to the large demand for them in urban areas and in international markets. Fish and livestock (cattle, sheep, goats, pigs, and poultry) are also important.
3. The technology to be developed and delivered to small farmers must be simple, low cost, and carry little or no risks to human health and the environment. The most effective strategy to increase food production is through improved seeds that possess high yield potential, fertilizer responsiveness, resistance to pests and diseases, good agronomic characteristics, and good nutritional quality.
4. Biotechnology development should be accompanied by favourable policy environment; good governance; investments in rural infrastructure; agricultural research and extension; and credit and marketing.

Investing

In much of Africa yields of major food grains are stagnant or declining in the face of population increases. Pests and diseases cause substantial preharvest and postharvest losses of crops, livestock, and fish. Solutions to many of these problems may lie in the various applications of modern biotechnology. The use of molecular markers to tag specific traits is accelerating the breeding of new varieties of plants and animals. New understanding of plant and animal genes may offer ways of increasing crop yields. These new developments when used in conjunction with developments in the physical and social sciences, offer more sustainable means for obtaining necessary productivity increases that are less dependent on environmentally damaging inputs of chemical fertilizers and pesticides.

Policies

Given appropriate policies and necessary human and financial resources, modern biotechnology could make an extremely important contribution to future agricultural growth in the country. Modern biotechnology (genetic engineering) is not a magic bullet for achieving food security, but used in conjunction with other techniques it may be a powerful tool in the fight against poverty and food insecurity.

Other approaches are available and should be used. Narrowing the yield gap between those obtained from farmers' fields and those from experiment stations using the current technologies is just one example. However, there is concern that some conventional alternatives will not be able to produce the desired results within a limited time. The advantage of modern biotechnology rests on the speed at which desired crop varieties are produced. In some cases, the desirable genetic combination of traits is simply not possible through common breeding methods, and can be done only through genetic engineering.

Technological Frontier

For Ghana to increase food production and become food sufficient we do not only have to move toward the best technological frontier (to push farmers' yields to the optimum level), but keep moving the technological frontier itself. As long as product safety, environmental and ethical concerns, and Intellectual Property issues are adequately addressed, modern agricultural biotechnology has the potential to significantly increase the quantity and quality of the food supply for the country.

Ghana

Ghana stands to gain a lot by adopting this technology and accepting the consumption of GM foods. New plant varieties created with these techniques in our own laboratories will offer foods with better taste, more nutrition, and longer shelf-life, and farmers will also be able to grow these improved varieties more efficiently, leading to lower costs for consumers and greater environmental protection. In fact, modern biotechnology is so precise, and so much more is known about the changes being made, that plants produced using this technology may be even safer than

traditionally-bred plants. Having said this, I must also say that we cannot ignore the biosafety aspect of biotechnology.

The Cartagena Protocol

As the world's attention was focused firmly on the Cancún World Trade Organisation summit in September, an important international agreement quietly made its entry on the world stage, holding out immense implications for developing countries. The Cartagena Protocol on Biosafety, which aims to regulate trade in genetically modified organisms (GMOs), came into force on 11 September after five-year-long negotiations over trade advantages and disadvantages - intractable North-South issues that are set to continue to bedevil the Protocol's implementation.

The poverty of developing countries, especially the least developed among them, mostly in Africa, remains a crucial handicap: they are simply too poor to allocate adequate resources for biosafety. Even more worrying is the fact that, should a risk occur, these countries will find it hard to muster the financial and technical capacity needed to combat it.

One would have thought that, given this situation, socio-economic considerations would constitute a very important component in decisions over whether to import a GMO. But the relevant provision of the Protocol is very weak. However, neither this weakness nor any other international law prevents our country from adhering to the precautionary principle and making a rigorous socio-economic assessment before importing a GMO. However from a personal position I still would maintain that Ghana would benefit a lot as a Nation in our fight against poverty by adopting the use of GMO and the consumption of Genetically Modified Foods.

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