

THE SOCIETAL IMPLICATIONS OF BIOTECHNOLOGICAL RESEARCH AND DEVELOPMENT

The field of biotechnology has had formidable beneficial contributions in the area of health care, food production and agriculture, industrial production, environmental management and so on. Of course, the arrays of its applicability seem limitless within the evolving civilization. Essentially, such usefulness have had notable practical manifestations mostly in developed countries where there are functional regulations guiding their development and applications, and not in such third world countries like Nigeria. However, this considerable advancement already achieved in this field has equally caused some concerns and controversies from interested individuals and institutions across the globe. Such have included fear for bio-safety, unnaturalness of genetically modified (GM) foods and the increasing tendency for biological warfare. Nevertheless, biotechnologies have come to be seen as an emerging industry, enabling the development of new products or the set-up of new methods for the production of already existing, but scarcely available products, such as human proteins or other complex molecules.

Thus, biotechnologies entail a viable instrument that can offer the productive system the results and outcomes of a more targeted and rational organization of those factors underlying the innovation process, that is, research activity, technology transfer, training, access to funding and capital, in order to stimulate the creation of new industrial sectors. Confirmation of this potentiality is reflective in the global sales of biotechnological products, which in the last few years have experienced an overwhelming growth. However, it is believed that considerable increases would still be attained in the years ahead when many societies, especially in the developing world are expected to have become more stable in the incorporation of biotechnology.

In the area of food production and agriculture, today, less time is being spent on the production and preparation of food than our forefathers did, and we now eat a much greater variety. Over time, we have learnt more about the human body and this has changed the kinds of foods we eat. For example, in 1959, Australians are reported to have consumed about 117 kg of vegetables per person. In 1989, it had risen to 162 kg. Each year, Australians eat an estimated 35 kg of beef per person. Worldwide, it has been estimated that the demand for cereals will increase to 2,466 million tonnes by 2020. Meat demand will increase to 313 million tonnes, and roots and tubers demand will increase to 864 million tonnes (www.dfat.gov.au). As well as changing the food we eat, more land and resources have been used to produce it. Producers want food crops and animal varieties to work harder, and more efficiently. Mostly, this is achieved through new agricultural methods as offered by vagaries of biotechnological innovation.

Aside from its application in attaining food sufficiency, biotechnology is leading the way to a new dispensation in health care delivery for societies, with the development of more-result oriented methods for detecting, preventing and treating diseases. Biotechnology has, for instance, made it possible to detect, and in some cases treat, diseases such as cystic fibrosis, sickle-cell anaemia and diabetes. Biotechnological techniques, such as DNA profiling, are also proving enormously useful in

other areas of human life, e.g. forensic science and identification. Improved genetic tests based on biotechnological advances can be used to track down criminals in assault cases based on the uniqueness of their DNA and also in apprehending electoral manipulators. Genetic counselling can provide advice on heritable diseases, and genetic screening of workers in possible risk industries is being considered. DNA probes are providing breakthroughs in early diagnosis of diseases. As detection of genetic predispositions becomes more predictable, a great deal may be known at birth of an individual's prospects in life. The moral question then arises as to who has access to this information and how this will affect the individual's quality of life (Gerald and Robin, 2007). Other seemingly controversial applications of biotechnology, such as, cloning and stem cell research are scientifically considered parts of human use of the innovation.

At another existential realm, biotechnology is being used to address some environmental issues. Biotechnology has the potential for many positive impacts on the environment. For example, it can be used to:

- support work on recovering threatened species;
- control or even eradicate introduced predators and pests;
- remove wastes and pollution from the environment.

It is, however, important to consider the fact that scientific decisions are never devoid of some measure of variation. They can also be coloured by the particular worldview of the researchers trying to solve the problem. For example, a palaeontologist, who studies the history of the earth over millions of years, brings a very different understanding of species extinction to an environmental debate than an environmental biologist. So also, the views of an environmental sociologist studying the implications of scientific inventions on social life and the larger social super-structures would likely be different from those espoused by the palaeontologist and the environmental biologist.

It is equally important to think about actions taken based on conflicting advice and how they are weighed up. These decisions may have the potential to deprive future generations of their right to determine some aspects of their lives. Biotechnology, as it relates to the environment, usually means introducing a new organism into an existing situation. Essentially, understanding the potential environmental impact of releasing these organisms, such as, genetically modified (GM) organisms on the human societies has become imperative so as to prevent environmental damage and to preserve our biodiversity.

Directly linked to the productive and social development potential of biotechnologies are its employment opportunities. Most of the professionals operating in the field, be they technicians, researchers or exporters, will require targeted measures of continuing education and training, biotechnologies being a rapidly developing, science-based discipline. Managers, too, must be contemplated, as professional figures will be needed to link research breakthroughs with technological innovation and industrial development, in order to foster exploitation of research results, also through the detailed knowledge of markets and their demands. As such, biotechnologies do serve as potential employment creators.

ARE BIOTECHNOLOGIES REAL AND SAFE IN NIGERIA?

As obtainable in every sector of Nigerian society, investments in research and development (R & D) has been quite discouraging. In fact, over the years negligible attention has been given to such investments in the country. Hence, the case with biotechnologies has not been an exception. Researches in biotechnological development, aside from the imperative requisite training, entail the prevalence of high level of regulatory and ethical standards, which usually guide their applications as a result of their sensitive nature. Biotechnology, more than other scientific disciplines, demands a detail and painstaking evaluation and management of probable implications resulting from the modification of the generic heritage of living organisms or parts of them. Programmatically, the absence of such attributes has been an integral unit of the qualities that actually made a third world country like Nigeria an undeveloped nation.

Although, cogent researches in developed countries have recently indicated that the chances of constructing a disease-producing organism by accident are very remote because such pathogens require an extremely complex set of distinct characteristics, and are effective only when all are present. Indeed, a special committee of the National Academy of Science (NAS) specifically reviewed the issues generated on the introduction into the environment of organisms genetically engineered using recombinant DNA technology. It concluded that "there is no evidence that unique hazards exist either in the use of Recombinant-DNA (R-DNA) technique or in the transfer of genes between unrelated organisms," and that "the risks associated with the introduction of R-DNA engineered organisms are the same kind as those associated with the introduction of unmodified organisms". The committee affirmed that R-DNA techniques constitute a powerful and safe; new means for the modification of organisms for the benefit of animals and humans. They also stated that there is adequate scientific knowledge to guide the safe and prudent use of such organisms outside research laboratories. Emphasis has just been on containment of experiments being the key to safety.

Meanwhile, an estimate of 92% of the respondents to my question on safety of biotechnologies as observed above were quick to point out that whatever measure of safety that could be tenable in the processes of application of the technology would be limited to the advanced world, and not in such country like Nigeria. Ostensibly, an estimated 89% of them strongly refuted the presence or application of anything biotechnology in Nigeria either at the individual/corporate level or at the level of policy advancement by the government. However, 75% of the respondents were quick to affirm that such technology can neither become realistic nor safe whenever it is transferred into the country in view of the prevalent ineptitude on the part of the political leadership and, of course, the discouraging dispositional attribute towards governmental policies; often perceived and proven rhetorical by the citizenry.

Ironically however, available facts and data from the Nigerian government on biotechnological research, development, application, regulation and control are so scanty as to re-affirm the unreality of the technology in Nigeria as presented by the study's field findings. Though, the federal government has put in place a regulatory body – the National Biotechnology Development Agency (NABDA) –

saddled with implementing the Nigerian Biotechnology Policy, its impact is yet to be felt in the country. Nevertheless, the functioning of the agency has taken the pattern of usual non-performing 'Nigerian civil service' and as such, cosmetic in orientation.

Ethics, being set of rules or standards that govern the way people behave and their decisions on the 'right' thing to do; demand basic questions about what is right and wrong, how we should act and what we should do in specific situations. It is important to note that ethics relating to biotechnology and its applications are not fundamentally different from other situations. Ethics are practiced and not rhetorized. As is the case with every sector in Nigeria, the ethical question is yet to be answered due to unhealthy corruption, nepotism, sycophancy and bureaucratic impediments in governmental functioning. Therefore, the reality and safety of biotechnologies are still being negated within the Nigerian configuration. One common and global denominator of biotechnology products has often been that they must be safe for humans and the environment.

Many new technologies often raise ethical concerns that might not be part of the world view held by those who develop the technologies in the first place. When it comes to developing products for commercial use, the goal is usually to increase sales and enable profitability. The decision for developing products can be seen as good for industry development, but perhaps not as good for individuals who do not have products developed to suit their needs when there is not enough profit to be made. For example, some products may be of obvious social benefit, such as, a drug that treats cancer. Also, in some areas of biotechnological development, the money needed to fund research projects is most time out of the range of individuals or small groups; it can only be undertaken by multinational/overseas companies. Some perceive this as acceptable, because it helps local researchers form links with wealthy larger companies. But others do not think it is not acceptable, because local research and development leave the community and are then controlled by international corporations. Whatever the view one holds on this, a general consensus is that a re-production of neo-imperialist tendency could be facilitated through this platform, which would eventually lead to further underdevelopment of a country like Nigeria due to the prevalent ineptitude on the part of the policy planners.

SPECIFIC FINDINGS

This study has been able to reveal that biotechnologies are yet a reality within the Nigerian society in terms of incorporation and applications. As such, related extent and measures of their safety in humans and the environment cannot in any way be a subject of discussion, at least for now.

Nevertheless, of all the identifiable impeding factors against the productive utilization of opportunities presented by biotechnological research and development, distorted policy projection and advancement on the part of the political leadership has remained the most potent; and of course, the pivot around which all other factors oscillate.

The following findings are, thus, derived from the study:

i. Biotechnologies, through the genetic modification of living material, have presented to humankind the platforms for tackling cogent existential challenges that were previously considered insurmountable, especially in areas of food production and disease management. As such, biotechnological innovations are taken as formidable social constructs. In turn, however, as these novel possibilities have led to the need for a new ethical framework, they have equally compelled specific legislative provisions;

ii. While the risk of genetic engineering accident and other bio-hazards arising from biotechnologies appear to be receding in the advanced countries, such as, US, Germany, Japan, Canada, Australia and so on, strict regulations of the new technologies are not yet being relaxed in such countries;

iii. The study has sufficiently shown that most Nigerians are ignorant of the opportunities obtainable from the applications of biotechnologies to relevant human endeavours in the country as there are no concrete reasons to be believe such for now;

iv. Though, biotechnological research and development is still, at best, in its infancy in Nigeria, there is however a potent apprehension already in place from concerned individuals vis-à-vis its safe applications and management in such undeveloped society, where rules and regulations are easily flouted at will without any commensurate reprimanding;

v. In all, rather than serving as platforms for advancing the course of humanity as tenable in relatively developed societies, biotechnologies could spell doom for Nigerians and their biodiversities if eventually introduced into their society without any relevant; concrete and positive change in attitudinal disposition, especially, at the level of policy planning.

CONCLUSION AND POLICY RECOMMENDATIONS

This study has been able to present biotechnologies as a potent representation of one of the dynamic technological revolutions of this century, which is set to impact every aspect of our society; introducing radical changes in the way many problems regarding human health, agriculture, security, environment *et cetera* are addressed.

Nevertheless, biotechnological research and development has undoubtedly raised challenging environment-related, ethical and social issues that have caused variations in the level of its social acceptance across the globe. While most societies of the developed world have been able to douse fear of related biohazards by means of cogent empirical affirmations, societies on the other divide, such as, Nigeria are yet to take full advantage of the promises presented by biotechnologies, not to talk of the implications of the technologies for the society.

It is, thus, of a concise summation of this study that since some of Nigerian universities and research outfits have played a major role in the development and promotion of science and technology over the years, they equally have an obligation to help policy planners and the larger society understand and manage the changes that are bound to arise from eventual incorporation of biotechnology and genomics in the country.

More importantly, a significant expansion of sociological research will be needed in elucidating the full range of views from the prevalent interdependent global configuration. The impact of such an integrated approach to social construction of biotechnology's reality in the country will be for enhanced policy and public understanding of the promises, and related undoing, which the technology holds for our society at large.

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