Biotechnological Advancement and Its Impact on the Society

Numa Limbu[1]

Abstract

Technology has made a huge advancement in 20th Century, it has in a dynamic way changed the life of human beings. With increase in technological information there has been tremendous growth of database of scientific knowledge.[2] *Improvements in technology leads to increase in knowledge and information further creating better technology.*[3] *Firstly, it was the computer technology that brought about a global impact on the activities of human beings. Further internet provided exciting new possibilities for electronic communication. The human life no longer remained the same.*[4] *Later with biotechnological advancement there was rapid change in the quality of life. It is also considered as one of the most controversial scientific advancement. Generally, biotechnology means application of technology to the practice of medicine.*[5]

In old times, biotechnologies mainly aimed to provide a more reliable food source by growing plants and domesticating animals rather depending on hunting and gathering. It was in 1953, when structure of DNA was discovered which led to numerous applications particularly in forensics, medicines and agriculture.[6]

---

[1]Ph.D. Scholar, Sikkim University

[2]*The 20th Century*, BRITANNICA (Sep.14,2019,10:00AM),https://www.britannica.com/technology/history-of-technology/The-20th-century.

[3]L.A.Ogunsola,*Information and Communication Technologies and the Effects of Globalization: Twenty-First Century "Digital Slavery" for Developing Countries—Myth or Reality?*, ELECTRONIC JOURNAL OF ACADEMIC AND SPECIAL LIBRARIANSHIP(Sep.15,2019,12:00 PM), http://southernlibrarianship.icaap.org/content/v06n01/ogunsola_l01.htm.

[4]ZarynDentzel, *How the Internet Has Changed Everyday Life,*TECHNOLOGY(Sep.15,2019,2:00PM),https://www.bbvaopenmind.com/en/articles/internet-changed-everyday-life/.

[5]Riel Miller et al, *The Promises and Perils on 21st Century Technology: An Overview of the Issue*, 21ST CENTURY TECHNOLOGIES,(Sep.15,2019,1:00 PM),https://www.oecd.org/futures/35391210.pdf.

[6]Dr. Bharat M. Kher,*Impact of Biotechnology on Society, Ethical Issue*, INTERNATIONAL JOURNAL OF RESEARCH IN ALL SUBJECTS IN MULTI

Though, technological advancements have created numerous possibilities, it has also led to various concerns like social isolation, random and reckless dissemination of non-verifiable or inaccurate information.[7] Biotechnological advancements has a negative impact on a special group of society they are the indigenous people. In a way their practices, their knowledge is being misappropriated by corporations, companies and researchers for developing new medicines, without acknowledging the economic rights of the indigenous peoples.[8] As they are a part of society their rights are infringed and no proper legislation provides protection to them. Though, the need for recognizing the rights has been debated a lot, yet a strong step needs to be taken. This paper strives to provide an outlook of how biotechnological advancement has an impact on the rights of indigenous communities who are one of the important parts of society.

***Key words**: Technology, Advancement, Biotechnology, Society, Indigenous Communities, Indigenous Peoples.*

I. Introduction

Biotechnology is a scientific term formed with two words 'Bio', which stands for biology, the science of life; and 'Technology', the tools and techniques used to achieve a particular purpose. KarolyEreky, a Hungarian agricultural economist coined the term Biotechnology in 1917. He is also regarded as the "father "of biotechnology.[9] The entrance of this new field created many controversies that concurred with increasing awareness of the

---

LANGUAGES (Sep.15, 2019, 2:00PM),http://www.raijmr.com/ijrsml/wp-content/uploads/2017/11/IJRSML_2013_vol01_issue_02_25.pdf.

[7]*Technology and Social change*,SOCIOLOGY, (Sep.15, 2019,3:00PM) https://www.cliffsnotes.com/study-guides/sociology/social-change-and-movements/technology-and-social-change.

[8]Victoria Tauli-Corpuz, *Biotechnology and Indigenous Peoples,*THIRD WORLD NETWORK (Sep 15, 2019, 3:30PM), https://www.twn.my/title/tokar.htm.

[9]*The founding father of biotechnology: Karoly (Karl) Ereky*, (Sep.16, 2019, 12:00PM),https://www.researchgate.net/publication/329633697_The_founding_father_of_biotechnology_Karoly_Karl_Ereky.

negative effects of industrialization, and with the greater possibilities in science and technological progress.[10]

Biotechnology is the area of biology that involves the use of living processes, organisms or systems to manufacture products or technology intended to improve the quality of human life.[11]

Such inventions have led to improvement in various fields, from introduction of new drugs to various others products that has helped human life. Successful applications of such processes have resulted in treatments of diseases, environment impact reduction and more efficient use of natural resources[12]. There are various examples of biotechnological applications, to name few are:

1. Pharmaceutical industries use biotechnology to find cures for diseases, and develop various drugs.
2. Chemical manufacturing engineers use biological processes, such as fermentation and the use of enzymes or microbes, to streamline chemical manufacturing, reduces operational costs and reduces chemical emissions.[13]
3. Biofuels can be created by altering natural resources to produce combustible fuel.
4. Nutrient Supplementation can involve biotechnology as some foods are infused with necessary added nutrients to aid in diet planning or medical treatment.
5. Plants and crops can be bred to handle external stress, such as minimal space or extreme weather conditions, through biotechnology.[14]

---

[10]*Biotechnology, Molecular Biology and Genetic Engineering of Plants,*VARDHAMAN MAHAVEER OPEN UNIVERSITY, KOTA (Oct.6,2019, 12:00PM), http://assets.vmou.ac.in/MBO08.pdf.
[11]Margaret Rouse, *What is biotechnology(biotech)*? ,WHATIS.COM(Oct.6, 2019,12:00PM),https://whatis.techtarget.com/definition/biotechnology.
[12]Gordon M. Cragg et al, *Natural Products: A Continuing Source of Novel Drugs Leads*,NATIONAL LIBRARY OF MEDICINE (Oct.3, 2019, 1:00PM),https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3672862/.
[13]*What is Biotechnology?* (Oct.4,2019,2:00PM), https://www.bio.org/what-biotechnology.
[14]*Id.*

II. Impacts of Biotechnology on the Society

Biotechnologies were an outcome of needs and demands of the society. There is always a negative and positive response to new biotechnological inventions, but over time, they tend to become more widely accepted. New biotechnologies are often controversial because of the ethical issues. They frequently become the subject of public debate.[15] Sometimes, people are wary of new biotechnologies because they involve doing things that haven't been done before, and they are unsure of possible future effects.[16] Public debate raises the issues and presents different viewpoints. This can help people make informed decisions and also influence government organisations that control new research and development.[17]

There is no doubt that the effects of any new technology introduced on the scale anticipated for biotechnology extend beyond the factories and research centres influencing our everyday lives. "Biotechnology has, for example, made it possible to detect, and in some cases treat, diseases such as sickle-cell anaemia, Tay-Sachs disease, diabetes, and cystic fibrosis".[18]While it is not possible to eliminate completely the risk of a genetic engineering accident, the experience of the last ten or so years of research has indicated that the chances of constructing a disease-producing organism by accident are very remote. This is

[15]Michael C. Falk etal,*Food Biotechnology: Benefits and Concerns*, NATIONAL LIBRARY OF MEDICINE (Oct.5, 2019, 2:20 PM), https://pubmed.ncbi.nlm.nih.gov/12042463/.

[16]*Impacts of Biotechnology on society*, SCIENCE LEARNING HUB (Oct. 5, 2019,2:30 PM),https://www.sciencelearn.org.nz/resources/1209-impacts-of-biotechnology-on-society.

[17]Begum K.A, Aftab. *Biotechnology in society -Boon or Bane: A Case Study, 2014*, RESEARCH GATE (Oct.5, 2019, 4:00 PM),https://www.researchgate.net/publication/262725713_Biotechnology_in_society_-Boon_or_Bane_A_Case_Study.

[18]Albert Gore, Jr. et al,*The Challenge of Biotechnology*, JSTOR (Oct.5, 2019, 1:30 PM),https://www.jstor.org/stable/40239194?seq=1#metadata_info_tab_contents.

because such pathogens require an extremely complex set of distinct characteristics, and are effective only when all are present.[19]

Most of the biotechnological inventions are patented, as it is risky as a long period of time is required to complete it.Such inventions takes more than 10 years to develop a biotech medicine or a plant improved through agricultural biotechnology from its inception to regulatory approval and finally to market launch.[20]"The average, of fully capitalized cost for developing a new medicine has been estimated at $1.2 billion and a new biotechnology derived plant product at $133 million. Most biotechnology innovation begins in the laboratory where a particular gene of interest is identified. This gene may have some correlation with a specific disorder or disease or perhaps a new plant trait or enzyme. Further research and development of these promising discoveries can take years, even decades, and hundreds of millions of U.S. dollars to achieve".[21] The main motive of the biotechnology innovators are to patent the inventions to generate interest from investors to further research on these discoveries and/or to license them to potential partners or developers. In these situations patents are used as instruments to assure investors that their investment is secure and has the potential to be recouped and can be transferable.[22]With weak patent rights, or an absence of patent rights, the development and commercialization and hence the availability or promising biotechnology discoveries will beseverely hindered.[23]

---

[19]*Biotechnology's Impact on the Society*,ACCESS EXCELLENCE (Oct.5, 2019, 2:00 PM),http://www.accessexcellence.org/RC/AB/IE/Biotechnologys_Impact.html.

[20]Reid G. Adler, *Controlling the applications of Biotechnology: A critical analysis of the proposed moratorium on animal patenting*, HARVARD JOURNAL OF LAW AND TECHNOLOGY (Oct.5, 2019, 4:00 PM),https://jolt.law.harvard.edu/assets/articlePDFs/v01/01HarvJLTech001.pdf.

[21]William A.Haseltine, *Discovering Genesfor New medicines*, (Oct.5, 2019, 4:30PM),https://research.mcdb.ucla.edu/Goldberg/HC70A_W05/pdf/NewGenesForMedicine.pdf.

[22]*Comments of the Biotechnology Industry Organization*, BIOTECHNOLOGY INDUSTRY ORGANIZATION (Oct.2019,5:00PM),https://www.bio.org/sites/default/files/legacy/bioorg/docs/BIO%20Comments%20to%20India%20TK-GR%20Guidelines.pdf.

[23]Diego Giugni et al,*Intellectual property: a powerful tool to develop biotech research*, MICROBIAL BIOTECHNOLOGY (Oct.5, 2019, 10:00PM),https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3815763/.

III. Advantages of Biotechnological Inventions on Society

There is no question of denying the potential benefits of biotechnologies in solving world food shortages, and improvements in medicine, agriculture, and veterinary sciences. Biotechnology has power to give humans good health, help in maintaining favorable environment conditions and also help in well-being of communities.[24] Biotechnological industries plays an important role in field of economics, health and environment. One of the advantages of biotechnology is its inputs on environment, through which various products has been introduced, to treat, and also to monitor the environmental conditions for example, treating environmental pollutions through bio treatment and bio monitoring of environmental and treatment processes. Secondly, biotechnology also produces eco-friendly products. These types of product give many benefits to civilians, and also to the environment.[25]Apart from benefiting environment, there are numerous products that has been developed that have a positive impact on the society.[26]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 years. These crops have been adopted worldwide at rates exceeding any other advances in the history of agriculture.[27]

Biotechnology in agricultural fieldhas been seen as the answer to meet such demands. Because it isn't possible to make a growth by using the traditional

---

[24]*Biotechnology Advantages and Disadvantages*,ESSAYS (Oct.4, 2019, 12:00PM),https://www.ukessays.com/essays/biology/advantages-disadvantages-biotechnology-8696.php.

[25]Chukwuma S. Ezeonu, *Biotechnological Tools for Environmental Sustainability: Prospects and Challenges for Environments in Nigeria-A Standard Review*, BIOTECHNOLOGY RESEARCH INTERNATIONAL (Oct.6,2019,12:00PM),https://www.hindawi.com/journals/btri/2012/450802/.

[26]Md.WasimAktar et al,*Impacts of pesticides use in agriculture: their benefits and hazards,* (Oct.7, 2019,12:00PM),https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2984095/.

[27]Ademola A.Adenle, *Global capture of crop biotechnology in developing world over a decade*, JOURNAL OF GENETIC ENGINEERING AND BIOTECHNOLOGY (Oct.7, 2019, 1:00PM),https://www.sciencedirect.com/science/article/pii/S1687157X11000266.

agricultural techniques.[28] With the help of biotech crops farmers in different places have earned more than the usual amount and this leads to improvement in economic conditions in their communities. Apart from agriculture and the economic conditions of farmers, biotechnology has also had a tremendous impact on the environment.[29] With the application of herbicide-tolerant crops farmers are free to eliminate ploughing on their fields which has indirectly resulted in better soil health and conservation, improved water retention and also decreased soil erosion.[30]Though, biotechnologies has helped in various fields but the truth about its negative impacts cannot be overlooked.

III. Negative Impacts of Biotechnological Inventions

There is a divide among peoples who support biotechnological applications and people who are against its application. Many are of the opinion that biotechnological inventions have more negative impacts as compared to positive ones. As biotechnological inventions involve gene manipulation and cloning of animals, it has raised many ethical issues. The development in biotechnology during the last few decades has raised a lot of ethical controversy. People criticize it and state that it is "objectionable in itself". [31]The application of various processes on animals has been regarded as unnatural. According to many biotechnologies could mean, challenging God's Creation. Biotechnology has many disadvantages, on biodiversity and the ecosystem. Genetically modified organisms can escape into the wild and cause damage to the ecosystem. Due to rapid introduction of various new organisms has led to decrease in the biodiversity.[32] Genetically modified crops have been introduced

[28]*Healing, Fuelling, Feeding: How Biotechnology Is Enriching Your Life*, BIOTECHNOLOGY (Oct.7, 2019, 3:00PM),https://www.bio.org/sites/default/files/files/ValueofBiotech.pdf.
[29]Graham Brooker et at,*Economic impact of GM crops, the global income and production effects 1996-2012,biotechnology in agriculture and the food chain* (Oct.7, 2019, 3:30 PM),https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5033197/.
[30]Victoria Tauli-Corpuz*, supra* note 7.
[31]*Methods and Mechanisms of Genetic Manipulation and Cloning of Animals, Safety of Genetically Engineered Foods*(Oct.6, 2019, 3:00PM),https://www.ncbi.nlm.nih.gov/books/NBK215769/.
[32]Heather Landry, *Challenging Evolution: How GMOs Can Influence Genetic Diversity* ,SCIENCE IN THE NEWS,(Oct.6, 2019,

in the markets, these crops often combine herbicides tolerance with pest resistance, since both are highly desirable traits. Since such new crops are introduced the productivity though might be improved but there are negative impacts on the environment as well as human health.[33]

Some people hold strong moral and ethical views on particular practices based on their religious and cultural beliefs. Biotechnologies involving practices such as organ transplants, manipulating human embryos and using animals in research may be particularly offensive to some groups of people. Their views are likely to affect progress and availability of some biotechnologies in different societies.[34]"Though there are some disappearances of various bio hazards but it does not mean that strict regulation of the new technology should be relaxed. A strong vigilance must be maintained, to look into a wide range of exciting prospects that stem from biotechnology".[35]

While discussing the various areas this article highlights the impacts that biotechnologies has made on the society. There are many negative impacts, one of the impact is seen upon the Indigenous Peoples. Indigenous Peoples are those who inherit and practice unique cultures and ways relating to people and the environment and have retained their own social, culture, economic and political characteristics that are different from those living in a society.[36] Indigenous peoples being an important part of the society has also been affected by various applications of biotechnology.[37] With various Intellectual Property Rights

---

2:00PM),http://sitn.hms.harvard.edu/flash/2015/challenging-evolution-how-gmos-can-influence-genetic-diversity/.

[33]Dhan Prakash, *Risk and Precautions of Genetically Modified Organisms,*INTERNATIONAL SCHOLARLY RESEARCH NOTICES (Oct.6, 2019,2:00PM),https://www.hindawi.com/journals/isrn/2011/369573/.

[34]*Supra* note 15.

[35]*Emerging Trends and Products of Biotechnology,*PREPARING FOR FUTURE PRODUCTS OF BIOTECHNOLOGY (Oct.6,2016, 1:00PM),https://www.ncbi.nlm.nih.gov/books/NBK442203/.

[36]*Indigenous Peoples at the United Nations*, DEPARTMENT OF ECONOMIC AND SOCIAL AFFAIRS (OCT.6, 2019 1:20 PM),https://www.un.org/development/desa/indigenouspeoples/about-us.html.

[37]Wilma Mankiller, *Being Indigenous in the 21st Century*,CULTURAL SURVIVAL QUARTERLY MAGAZINE

guaranteed under the Trade Related Aspects of Intellectual Property Rights (hereafter referred to as TRIPs),1994.[38] There are various inventions and researches made on the biological resources by applying the Traditional Knowledge (hereafter referred to as TK) of the Indigenous Communities, such inventions have led to various concerns that needs to be addressed. With patent claims on the TK of indigenous communities there is an urgent need for effective measures to be implemented. Though application of technologies has benefited human lives, but its negative impacts cannot be overlooked.[39]Biotechnology is as old as humankind. From ancient times women, farmers and indigenous peoples, have been domesticating animals and cross-pollinating plants. Cross-breeding and taming of wild animals were also done. Human beings have through interventions led to the further development of biodiversity.[40] Indigenous Peoples have their own practices that they have come up with after many trials . For example, the Igorot people in the Cordillera region of the Philippines, have been fermenting their tapey (rice wine) and basi (sugar cane wine) since time immemorial. Tapey is made with a native yeast called bubod which is made by the women. Basi, on the other hand is prepared with some seeds called gamu which comes from the forest. Indigenous biotechnologies included fermentation technology to brew beer, wines, and other food preparations, and the domestication of wild plants and animals.[41] They have used their understandings to come up with something new and useful to them and the communities. One cannot deny the input that indigenous peoples have made to discover a vast array of medicinal plants, that are being used since ages through the generations. But the issue related to "biopiracy"[42] is rampant. To name some one cannot forget the patent claim on turmeric, basmati

(Oct.6,2019,2:30PM),https://www.culturalsurvival.org/publications/cultural-survival-quarterly/being-indigenous-21st-century.

[38]*Social and Economic Effects of Genetically Engineered Crops, Genetically Engineered Crops: Experiences and Prospects*(Oct.6, 2019, 2:00PM), https://www.ncbi.nlm.nih.gov/books/NBK424536/ .

[39]*Intellectual Property and Traditional Knowledge*,WIPO (Oct.6, 2019, 2:00PM),https://www.wipo.int/edocs/pubdocs/en/tk/920/wipo_pub_920.pdf.

[40]*Supra* note 23.

[41]Victoria Tauli-Corpuz *,supra*note 7.

[42]Biopiracy is the unethical or unlawful appropriation or commercial exploitation of biological materials that are native to a particular country or territory without providing fair financial compensation to the people or government of that country or territory.

rice, neem etc. The patent claims were awarded patent rights, without acknowledging the prior art of people in India.[43]The corporations or the researchers use the knowledge of the indigenous peoples for making new products without informing or seeking approval of the indigenous peoples. In this way they infringe the economic, cultural as well as social rights of the indigenous peoples. They have failed to recognise the TK of the indigenous peoples. There is no doubt that indigenous peoples have contributed significantly to the present body of knowledge, such as ethno botanists, ethno pharmacologists, and by agriculturists, foresters, and food technologists.[44]Recently, biotechnology is more often associated with the most modern technologies, particularly genetic engineering, new cellular procedures based on the old technology of tissue culture, and embryo transfer.[45] It is this modern biotechnology which poses a major threat to our indigenous values and belief systems, lifestyles, biological diversity, and the last remaining indigenous sustainable resource management systems, and socio-politico-economic formations. The philosophical, social, economic, ecological and cultural implications of these are serious not only for indigenous peoples but for the whole world.[46]

Bio prospecting[47] is also one of the ways through which the companies or researchers are infringing the rights of indigenous peoples. Though it cannot always be that the rights of indigenous peoples are infringed but the researchers identify valuable chemical compounds from plants, animals and microorganisms

[43]*India: Traditional Knowledge and Patent Issues: An Overview of Turmeric, Basmati, Neem Cases,* MONDAQ (0ct.7, 2019, 9:30 AM), https://www.mondaq.com/india/patent/586384/traditional-knowledge-and-patent-issues-an-overview-of-turmeric-basmati-neem-cases.
[44]Victoria Tauli-Corpuz *,supra*note 7.
[45]G.Junne, *Biotechnology: the impact on food and nutrition in developing countries*,(Oct.7,2019, 6:00PM), http://www.fao.org/3/U3550T/U3550T0H.html.
[46]Patrick Heffer,*Biotechnology: a modern tool for food production improvement*(Oct.7,2019, 1:00PM),http://www.fao.org/3/y2722e/y2722e1f.htm.
[47]Is the exploration, extraction and screening of biological diversity and indigenous knowledge for commercially valuable genetic and biochemical resources.

which are used by the indigenous peoples or are found in their territory.[48] There are numerous cases where commercial bio prospecting agreements has not been effectively monitored or enforced by source communities, countries, or by the Convention on Biological Diversity[49], and amount to little more than "legalized" bio-piracy. There are number of pharmaceutical corporations as well as researchers and biotechnology companies that are stalking the forests, fields and waters of the developing world in search of biological riches and indigenous knowledge.[50]Their main aim is to gather information's and use it to patent a product so that they can avail private rights over it. By doing so they infringe the rights of the indigenous people, their rights aren't recognised and hence, are deprived of the economic rights. Under the vast majority of current bio prospecting agreements, when indigenous peoples share information or genetic materials they effectively lose control over such resources, regardless of whether or not they are compensated.[51]

IV. Biotechnology and Its Impact on Rights of Indigenous Peoples

Biotechnology is capable of changing genes within and between species of plants, animals, human beings and microorganisms. With its application the living matters are converted into materials and designed into new life forms.[52] There exists a huge difference between the new biotechnologies and what we previously knew as biotechnology. In the traditional cross-breeding of plants and animals, the reproductive process was not drastically short-

[48]*Bioprospecting/Biopiracy and Indigenous Peoples,* (Oct.7,2019,2:00PM),https://www.etcgroup.org/content/bioprospectingbiopiracy-and-indigenous-peoples.

[49]The Convention on Biological Diversity is the International legal instrument for "the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources" that has been ratified by 196 nations.

[50]Nirmal Bhattarai et al, *Sharing local and national experience in conservation of medicinal and aromatic plants in South Asia*, (Oct.7,2019, 2:30 PM),https://idl-bnc-idrc.dspacedirect.org/bitstream/handle/10625/29240/120935.pdf?sequence=1.

[51]*Innovation and Intellectual Property*, WIPO (Oct.9,2019,10:00AM),https://www.wipo.int/ip-outreach/en/ipday/2017/innovation_and_intellectual_property.html.

[52]*The Power of Biotechnology*, AGRICULTURAL BIOTECHNOLOGY: STRATEGIES FOR NATIONAL COMPETITIVENESS (Oct. 9, 2019, 10:20 AM),https://www.ncbi.nlm.nih.gov/books/NBK217989/.

circuited.[53]Genetic engineering not only short circuits the reproductive process, but it creates new life-forms never before seen on the face of the earth. While it is true that throughout human history people have altered their environment and manipulated living things including themselves, this ability is constrained by nature itself. Plants can be bred with other plants and animals can be bred with closely related species.[54] Genetic engineering, however, can transcend nature's boundaries and engineer or create far beyond what was possible two decades ago. It is capable of changing the fundamental structures of living things because genetic material from an animal can be inserted into a plant or an animal gene can be inserted into humans, etc.[55] The boundaries between species are broken down by genetic engineering.The main raw materials for biotechnology industry are micro-organisms, plants, animals, and human beings, just as the non-renewable matter are the main raw materials for the industrial revolution. "The gross exploitation of non-renewable matter is regarded by indigenous peoples as the rape of mother earth".[56] The history of colonization and exploitation faced by many indigenous peoples in various parts of the world tells us how the colonizers and corporations got their hands on the rich deposits of minerals and the abundance of forests and forest products found in indigenous peoples' territories by using all kinds of legal and illegal methods.[57] The cruelty faced in the hands of colonizer and even post-colonial governments to our ancestors in the process of extracting and appropriating resources has caused serious impact.[58]With biotechnology, living matter can be fragmented into its smallest components and commodify the same.Hence, with the desire of profits in the genetic resources of our bodies, and in plants,

[53]*What is Biotechnology?Biotechnology: Combining Engineering with the Biological Sciences*, ENVIRONMENTAL SCIENCE.ORG (Oct.9,2019,11:00AM),https://www.environmentalscience.org/biotechnology.
[54]Victoria Tauli-Corpuz*, supra* note 7.
[55]*Id.*
[56]Victoria Tauli-Corpuz*, supra* note 7.
[57]*State of the World's Indigenous Peoples,*ECONOMIC&SOCIAL AFFAIRS (Oct.9,2019,12:00PM),https://www.un.org/esa/socdev/unpfii/documents/SOWIP/en/SOWIP_web.pdf.
[58]*Supra* note 30.

animals, and micro-organisms found in our territories, has led to a more insidious and dangerous threat.[59]

The main problem of biopiracy is not patenting inventions derived from traditional indigenous information, but rather the unfair acquisition or the misappropriation of knowledge and then the inequitable sharing of profits derived from developing such information into a valuable commercial products.[60]There needs to be a process through which traditional information is acquired fairly and that fair compensation is paid to the group who "owns" the information. It is not the use of traditional knowledge in a patent that is inherently wrong[61]but is rather the inequitable misappropriation and subsequent profiteering that is the real problem. Therefore, the answer to the question how to provide for fair and equitable compensation for traditional knowledge must be answered.[62] Hence, the policy makers must formulate methods for equitable access to the TK of the indigenous peoples/communities. By doing so compensation can be awarded to the rightful owner. Without a proper permission to avail the resources of the indigenous communities has led to infringement of their rights.[63]One of the critical concern is whether patenting conflicts with indigenous knowledge and value systems. In a basic theoretical sense, patents can significantly add to costs to new inventions, and thereby act as barriers.[64]

---

[59]Biotechnology and Indigenous Peoples, (Oct.12, 2019, 12:00PM),https://www.twn.my/title/tokar.htm.

[60]Henk Hobbelink*, Biopiracy,*ENVIRONMENT JUSTICE ORGANIZATIONS, LIABILITIES AND TRADE (Oct.9,2019,12:30PM),http://www.ejolt.org/2015/09/biopiracy/.

[61]Grethel Aguilar, *Access to genetic resources and protection of traditional knowledge in the territories of indigenous peoples,*ENVIRONMENTAL SCIENCE POLICY (Oct.12, 2019, 12:50 PM),https://www.cbd.int/doc/articles/2002-/A-00390.pdf .

[62]Molly Torsen et al,*Intellectual Property and the safeguarding of Traditional Cultures,* WIPO (Oct.12,2019,12:45PM),https://www.wipo.int/edocs/pubdocs/en/tk/1023/wipo_pub_1023.pdf.

[63]A.Krattiger et al,*Biotechnology Patents and Indigenous Peoples*,IPHANDBOOK OF BEST PRACTICES (Oct.12,2019,2:00PM),http://www.iphandbook.org/handbook/ch16/p01/eo/.

[64]*Fields of Intellectual Property Protection*,WIPO INTELLECTUAL PROPERTY HANDBOOK: POLICY, LAW AND USE (Oct.12,2019, 2:30PM),https://www.wipo.int/export/sites/www/about-ip/en/iprm/pdf/ch2.pdf.

The principle demands of the indigenous peoples can be summarized as follows:-[65]

- Self-determination, including demands related to property rights over land and resources.
- Prior Informed Consent in relation to the protection of traditional knowledge and plant medicines and the right to determine measures for their development.
- Human Rights that include rights to life and liberty and to freedom from discrimination and oppression.
- Cultural Rights that include the right to express and maintain different cultures, the right to religion, language, access to sacred sites and religious practices.
- Treaties as laws governing the relations between colonial systems and indigenous peoples and the renegotiations of said treaties.

With common property standards equitable divide of the benefits generated by the utilization of genetic resources and the traditional knowledge internally associated with the Indigenous People concerned must be defined.[66] If right of customary law is exercised as a part of the legal reality then traditional knowledge can be protected in those cases. With the political and legal supports indigenous communities can avail the standing as a 'legal entity' and can enter into contracts for access to genetic resources and the associated traditional knowledge.[67]The equitable distribution of the benefits derived from TK in association with access to genetic resources leads to an important question of who is the real owner of these resources. It is here that one should distinguish different types of property:

- Propertyrights in land/territory,
- Property rights in genetic resources,

[65]According to the bulletin of the Working Group on Rights over Traditional Resources (No. 3, 1996).
[66]*United Nations Declaration on the Rights of Indigenous Peoples,*UNITED NATIONS (Oct.14,2019,3:00PM),https://www.un.org/development/desa/indigenouspeoples/wp-content/uploads/sites/19/2018/11/UNDRIP_E_web.pdf.
[67]GrethelAugilar,*supra* note 57.

- Property rights in traditional knowledge, innovations and practices.[68]

Without proper protection and recognition of their rights, it is difficult to acknowledge their efforts and rights that they have applied to come up with various traditions or knowledge.

V. Legal Implications

It is thus essential that such issues are aired in public debate as the technology develops. Many countries are actively reviewing the safety and ethics of biotechnology research and its applications. Some countries have already established research guidelines for work on embryo transplantation, embryo research, and surrogate motherhood. Lawyers and the public at large will be required to face up to these and similar questions as the biosciences, and biotechnology in particular, move forward.[69] Legal problems have already emerged regarding patent laws. In 1980, for example, a U.S. court overturned existing practice and ruled that genetically-engineered microbes may be patented. Since then, laws are made to look into various matters that are caused when new biotechnological inventions are made. But there is still no specific legislation that looks after the economic rights of Indigenous peoples over their traditional knowledge.[70]

India's Traditional Knowledge and Biological Material Draft Guidelines has been framed to provide protection to TK and biological materials by the Biotechnology Industry Organization (hereafter referred to as BIO)and is a small step that recognises theTKof the indigenous peoples. The Draft Guidelines specify that Indian law shouldcontainprovisions for the protection of TKand biological resources pre-patent, during patenting and post-patent.[71] The

[68]*Id.*
[69]Michael Morrison et al, *CRISPR in context: towards a socially responsible debate on embryo editing,*HUMANITIES&SOCIAL SCIENCES COMMUNICATIONS (Oct.15,2019 10:00PM),https://www.nature.com/articles/s41599-019-0319-5.
[70]Arsenio M.Fialho et al, *Patent controversies and court cases*,CANCER BIOLOGY & THERAPY (Oct.14,2019, 12:00PM),https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3493429/.
[71]*India Traditional Knowledge and Biological material Draft Guidelines: Biotech Industry Provides Input*,BIOTECHNOLOGY INNOVATION ORGANISATION (Oct.21,2019, 10:00AM),https://www.bio.org/advocacy/letters/india-traditional-knowledge-and-biological-material-draft-guidelines-biotech-indust.

Guidelines further direct examiners and controllers to ensure screening of patent applications pertaining to TK.[72] Moreover, BIO is concerned that a special procedure for assessing "TK" given the ambiguity associated with what can be considered TK can create significant delays in patent examination. BIO is concerned that this may not be a mere process of classifying inventions, but rather could lead to determinations about the nature of the invention that may have a substantive impact on patent examination without a fair and effective system for enforcing the rights and adjudicating disputes. For example, it is unclear whether a determination that an invention is or is not based on TK would have any effect on whether currently publicly available information declared to be "TK" would be considered to withdrawn from the public domain.[73] In addition, such a determination may lead to an unintended result that TK rights are in conflict with or would be perceived to be superior in effect or operation than those provided under patents, copyrights, trademarks, trade secrets, plant variety protection or other intellectual property protection systems to other products.[74] BIO urges that all applications should be treated on a case-by-case basis, as indicated under the Indian Patents Act, for novelty, inventive step, sufficiency of description, etc.[75]

Though, the draft guidelines are framed but it contains various problems. The first problem occurs with the Guidelines creating another separate screening process to ensure patent applications do not claim TK.[76] While on its face this seems innocuous, India Patent Law already provides a process for analysing patentability claims which should already include reviewing TK. Even the

[72]*Id.*
[73]*Comments of the Biotechnology Industry Organization (BIO),* BIOTECHNOLOGY INDUSTRY ORGANISATION (Oct.21,2019,12:00PM),https://www.bio.org/sites/default/files/BIO%20Comments%20to%20India%20TK-GR%20Guidelines.pdf.
[74]Advocate Rakesh Tiwari et al, *Role of Intellectual Property in Innovation and New Product Development*,(Oct.20,2019,10:00AM), https://www.lawyered.in/legal-disrupt/articles/role-ipr-innovation-and-new-product-development/.
[75]*Supra* note 57.
[76]T.C.. James et al, *Protection of traditional knowledge in India*,SCOPING PAPER NO.2 (Oct.21,2019,3:00PM),http://www.ris.org.in/fitm/sites/default/files/Scooping%20Paper%20No%202.pdf.

United States and the European Union provides protection to India's TK under prior art review processes.[77]Another problem occurs when the Draft Guidelines begin to redefine substantive patentability standards. Guiding Principle 1 removes from patentability isolation of active ingredients from plants with associated TK. This is out of step with the European Patent Office, the USPTO, the JPO and the majority of patent offices around the world. The policy rationale also seems confusing as the identification of the specific ingredient is novel and non-obvious and the community is still free to use the plant as they always have regardless of the patent.[78]Finally, source and geographical origin requirements ignore the realities of bio prospecting. For biotechnology inventions, the majority of bio prospecting is done by university professors that collect samples and conduct the basic research. Small biotechnology companies later acquire the knowledge and sometimes the active ingredient itself without understanding where the original sample was obtained.[79] Further the small biotechnology companies have no way of knowing whether the access of the sample was done on "mutually agreed terms" and in accordance with the law of the country.[80]

VI. Conclusion

The Indian legislation that are enacted for protection of Intellectual Property Rights like the Indian Patent Act, 1970, the Trade Mark Act, 1999, the Geographical Indication of Goods (Registration and Protection) Act, 1999, the Design Act, 2000 and the India's sui generis act i.e. the Protection of Plant Varieties and Framers Rights Act, 2001 lacks specific provisions for protection of traditional knowledge of indigenous communities.[81]

---

[77]*Protecting India's Traditional Knowledge*, WIPO (Oct.20,2019,2:00PM),https://www.wipo.int/wipo_magazine/en/2011/03/article_0002.html .
[78]*Id.*
[79]*Guidelines for BIO Members Engaging in Bioprospecting,*BIOTECHNOLOGY INNOVATION ORGANIZATION (Oct.21,2019,2:00PM), https://www.bio.org/articles/guidelines-bio-members-engaging-bioprospecting.
[80]*A Guide to Intellectual Property Issues in Access and Benefit-sharing Agreement*, WIPO (Oct.22, 2019, 3:00 PM) https://www.wipo.int/edocs/pubdocs/en/wipo_pub_1052.pdf.
[81]*Intellectual Property Rights of India,*INTELLECTUAL PROPERTY OFFICE (Oct.23 ,2019,10:00 AM),

Even though there are many debates regarding protection of the rights of the indigenous peoples, yet not much has been done. There is a need to recognise and protect their rights.Hence, development is necessary but developments must be beneficial to every living beings. Such development must be sustainable one.

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/627956/IP-Rights-in-India.pdf.