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Plundering Nature's Code: The Ethics and Consequences of Digital Biopiracy

Imagine a single act that could forever alter the course of an entire industry. In 1876, Henry Wickham, a self-taught rubber tapper working for the Royal Botanic Gardens at Kew in London, accomplished just that. He collected 70,000 highly vulnerable Hevea rubber seeds from Santarém, Brazil, which some people would later label as the original act of 'biopiracy.' With the clock ticking, Wickham hurriedly transported the seeds on a steamship to Kew, where they were immediately germinated and sent to British colonies in India. The resulting plantations shattered the Amazon's rubber monopoly and dominated the rapidly expanding market until Japan seized control during World War II and synthetic rubber was later invented (Gollin, 2008). This fascinating story highlights the impact of a single individual and raises important questions about the ethics of exploiting natural resources.

As digital technology continues to evolve, so do the methods of exploitation. Just as the term "biopiracy" was coined to describe the unethical exploitation of natural resources, a new form of theft has emerged: digital biopiracy. This refers to the unauthorized collection and use of digital data related to biological materials, such as genetic codes and chemical structures (Bond and Scott, 2020). The stakes are high, as these digital assets can be worth billions in industries ranging from pharmaceuticals to agriculture (Delgado, 2002). While the methods may be different, the impact of digital biopiracy is just as significant as its predecessor, highlighting the urgent need for ethical guidelines in the digital age.

Digital biopiracy involves illegal procurement, processing, and transfer of genetic information from plants and animals without the proper consent and compensation to the original sources (Rose, 2016). The extracted data can be used to identify valuable traits and genes that can be used for various purposes including the development of new medicines, crops, and industrial products. However, the illegal obtainment of these data without proper consent is a clear violation of intellectual property rights and the sovereignty of nations that own the genetic resources.

One of the biggest concerns surrounding digital biopiracy is the issue of fair compensation. Multinational corporations often target indigenous communities and developing nations since majority of these communities are melting pots of valuable genetic resources (Mackey and Liang, 2012). Non-payment and unfair compensation violate the principles of justice and fairness, and perpetuates economic inequality between developed and developing nations. The sadder reality is, business politics come in between and officials are oftentimes bribed to accelerate the process of getting approvals and environmental certificates that would allow the companies to do their work. Digital biopiracy also exacerbates existing power imbalances, as those with access to advanced technologies and capitals are better positioned to benefit from genetic data than those without.

Another ethical concern is the potential impact on biodiversity and ecosystem stability. Collecting genetic data from a wide range of species often disrupt the ecosystem balance and leads to the loss of certain species and ecosystems. The International Union for Conservation of Nature has emphasized biopiracy as a significant threat to global diversity conservation and can lead to the erosion of traditional knowledge systems and extinction of endangered plants and animals (Mackey and Liang, 2012). Moreover, the commercialization of certain data establishes monocultures where only a few genetically modified species dominate the agricultural landscape. This accelerates the loss of traditional crops in the market and promotes homogenization of cultural diversity.

Digital biopiracy has huge implications for the practice of biological and agricultural engineering. It raises questions about the legality and ethics of patenting biological materials and processes. Monopolization of genetic resources and the potential for companies to control the entire agricultural and medical sector has long been controversial for many years yet it has not been completely eradicated until now and will not be for several years. Monopoly leads to overexploitation of genetic resources and excludes local communities from the benefits of their uses (Fredriksson, 2017). This also causes displacement of indigenous communities and local populations that have developed and conserved these resources over generations with some even having strong cultural and spiritual connections to them.

Another ethical concern is the use and transfer of data with proper privacy and security (Martinez-Martin and Magnus, 2020). Genetic data is highly sensitive and contains personal information that can reveal an individual's health, ancestry, and genetic predispositions. Despite being extra careful and meticulous, researchers and companies have big tendencies to access and share unauthorized data which significantly leads to privacy violations, discrimination, and stigmatization. Researchers who have experienced such things may also face reputational harm, psychological distress, and potential termination of insurance coverage and loss of employment opportunities. Hence, there is a need for transparency and accountability in the acquisition and use of genetic data.

One approach to address digital biopiracy is the adoption of international treaties and agreements that promote ethical practices in the use of genetic data. For example, the Nagoya Protocol on Access and Benefit Sharing is an international agreement that promotes fair and equitable sharing of benefits arising from the use of genetic resources. This protocol outlines the framework for ensuring that genetic data is collected, used, and transferred in a responsible and sustainable matter. It also enhances participation and consent among local populations and communities. To facilitate the implementation of the protocol, the Access and Benefit-sharing Clearing-House (ABSCH) was created. It is a platform under Article 14 of the Protocol to enable the exchange of information regarding access and benefit-sharing. The ABSCH plays a vital role in implementation by increasing transparency and legal certainty regarding procedures for accessing and sharing benefits, as well as monitoring the utilization of genetic resources throughout the value chain. It also involves the use of a certificate of compliance that has international recognitions (Convention on Biological Diversity, 2023).

The absence of clear and up-to-date legal frameworks to address this complicated and constantly changing problem is one of the biggest challenges in the fight against digital biopiracy (Yusuf, 2021). The complexity of digital biopiracy is not taken into account by outdated laws, making it challenging to effectively prevent and prosecute these crimes. It is imperative that we create and implement new laws that place a high priority on the rights of local and indigenous populations while fostering the ethical and sustainable use of genetic resources. Furthermore, these frameworks must guarantee that genetic data is

gathered, maintained, and disseminated in a responsible, open, and secure manner that respects people's privacy and data security. The widespread theft of digital biological data will continue to endanger our environment and human health without appropriate legal restrictions.

Another important approach to combating biopiracy is through education and awareness-raising. Many people are not aware of the consequences and the ethical issues surrounding biopiracy. Therefore, it is important to educate them about the importance of respecting intellectual property rights related to biotechnology and genetic resources. Some of the ways people can get involve include creating informative content that are fact checked, leveraging technology to reach more people and advocacy groups that could potentially be excellent partners, organizing webinars and workshops to allow open discussion of issues, and developing tools and applications that can be used to track and monitor digital biopiracy activities and enable people to report incidents of digital biopiracy.

Finally, blockchain technology can help address digital biopiracy as it can be used to create secure and transparent databases of genetic information that are resistant to alteration, tampering, and unauthorized access. For example, the Amazon Bank of Codes initiative, introduced in 2018 as a collaboration between the World Economic Forum, the Earth Bank of Codes, and the Earth Biogenome Project, aims to log genetic sequences of every plant and animal species in the Amazon Basin on the blockchain. This allows for the recording and tracking of the provenance and use of natural resources, ultimately creating a platform for fair benefit-sharing with the country of origin. This innovative step towards protecting biodiversity through secure and transparent means aligns with the potential of blockchain in the industry (Yusuf, 2021). However, political commitment is necessary to take further action towards preserving our planet.

In conclusion, digital biopiracy is not just a technological issue, but a human one that affects the rights of several communities and populations and the well-being of our environment and health. We need to act through a comprehensive approach that involves setting up clear legal regulations, promoting international cooperation, increasing awareness, and engaging all stakeholders. Only by working together

can we create a fair and sustainable future for agricultural and biological engineering that benefits everyone.

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