

Transgenic seeds in Ecuador: Technological innovation or destruction of agriculture in Ecuador? A bioethical perspective

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Introduction

Ecuador is one of the most megadiverse countries in the world, has almost 18 million inhabitants, 20 % of the population in Ecuador is focused on the agricultural sector and it is estimated that 54 % is carrying out agricultural activities (INEC, 2020). For decades, the green revolution has been putting forward the discourse of ending hunger in the world, giving rise to the genetic revolution, which aims, through transgenic crops, to continue the trend of blind productivism that does not see the social and environmental impact.

This study aims to question the cognitive capitalism that is behind the seed patents obtained as supposed innovations and that, at the rural level, usurp peasant

biodiversity, causing land dispossession, migration, and in some cases, a farmer class subordinated to capital and condemned to destructive processes for the health of the communities. This analysis shows that bioethics is an essential tool for evaluating and regulating the use of genetically modified organisms and ensuring that technological advances are developed responsibly and ethically.

Bioethics is a discipline that relates human behavior to the development of life (Rodríguez, 2010). Ecuador is considered a transgenic-free country, prohibiting the introduction of modified organisms harmful to the ecosystem, society, economy, and agrobiodiversity (Bravo & León, 2013). According

to Nicolas (Cuvi, 2013) science and technology should be promoted in a sovereign and sustainable manner to not depend on corporations that con-

trol markets. This study questions the cognitive capitalism behind the seeds created with technological innovation from bioethics principles.

Body

This research is qualitative, conducting critical analysis and a review of updated scientific literature of scientific research through the Google Scholar search engine using keywords such as (Bioethics, Transgenics, Ecuador, and biotechnology) from 1991 to 2021.

The advance of science and technology has allowed the development of different techniques for food production for humanity (Hurtado, 2017). However, there is a controversy between technology and its relationship with industry, the market, and the human, social and natural balance (Larach, 2001).

Bioethics is a discipline that analyzes and evaluates scientific, economic, technological, social, legal, cultural, and religious aspects, considering humanity’s values and moral principles (Jumbo, 2021). Bioethics seeks to establish ethical standards and guidelines for researching, developing, and applying GMOs. Bioethics is essential in evaluating the potential risks and benefits of its use and in regulation and application.

In Ecuador there are critical issues that need to be analyzed from bioethics such as transgenics. According to Bravo (2017) mentions in Table 1 the following.

Table 1
Tensions and visions on transgenics in Ecuador

Topic	Problem	Visions pro GMO	Visions anti GMO
Legal and Constitutional Framework	Although the Constitution of Ecuador prohibits GMO crops and seeds, there have been proposals to amend it.	GMOs need to be regulated as is the case in other countries.	Ecuador should remain GMO-free.
Role of Scientists and the Population in the GMO Debate	There is very little understanding about GMOs and their dangers in Ecuador	Scientific groups are the ones called to influence decisions on the topic.	Decision-making on GMOs is influenced by power dynamics and inherently political.
Scientific Uncertainty about GMOs	There is no scientific certainty about the impacts of GMOs.	GMOs are becoming increasingly safe.	There is an increasing number of studies showing the impacts of GMOs.
GMOs and Biodiversity	Ecuador is a country rich in agrobiodiversity.	We should exploit biotechnology based on our biodiversity.	The introduction of GMOs could put Ecuador’s rich biodiversity at risk.

GMOs and agriculture	Agricultural productivity in Ecuador is very low, especially in the inter-Andean region.	GMO crops can solve many of the country's agronomic problems.	Support should be given to research on agroecological practices and peasant production
GMOs and human health	Biotechnological developments in the field of health will save millions of lives.	The state should invest in science and technology in the field of health biotechnology.	Both GMOs and the associated technological package are risky for health.

Note: Adapted Table by Bravo (2017)

Bioethics introduces four principles: beneficence, non-maleficence, autonomy, and justice. These principles are essential to value the discourses of agricultural development and encourage the different actors of Ecuadorian society to make wise and intelligent decisions

about agri-food systems to create a balanced society-nature metabolism.

According to Freire (2002), Bioethics demands that agricultural activities comply with the following principles or moral values as shown in Table 2.

Table 2
Bioethical Definition

Principle:	Description by Moorthy (2021)	Description by Freire (2002)
The Principle for Autonomy	Moral decision-making assumes that rational agents are involved in making informed and voluntary decisions.	Respecting people's right to make decisions regarding their life and environment
The Principle of Non-maleficence	The principle of nonmaleficence requires of us that we not intentionally create harm or injury, either through acts of commission or omission.	Internalizing the principle of 'not harm' to others.
The Principle of Beneficence	Those involved should take positive actions to enhance the well-being of both people and the environment.	The benefit life, contributing to well-being, health, and better quality of life.
The Principle of Justice	Justice is usually defined as a form of fairness, or as Aristotle once said, "giving to each that which is his due".	Equitable access to well-being.

Note: Adapted Table by Moorthy (2021) & Freire (2002).

According to these Table 2, a critical retrospective can be made on the green and current genetic revolutions. This refers to the dialectical transition from industrial capitalism to cognitive capita-

lism, with its devastating consequences for sustainable and human development.

Beneficence is the first principle violated by genetically modified organisms (GMOs) since their hidden intention is

to foster processes of capital accumulation through accumulated intellectual knowledge or cognitive capitalism, an issue manifested in the production of transgenic seeds. Vercellone (2006) suggests the need for a cognitive division of labor that differs substantially from industrial capitalism, the basis of which is the transition from industrial capitalism to a new type of capitalism, cognitive capitalism, characterized by valuing knowledge more than labor power.

Cognitive work is the exclusive use of intelligence, an action of cognition that excludes the direct physical manipulation of matter. In work processes and value chains, cognitive labor is the hegemony of work with a high intellectual content that conditions the application of traditional labor and thus gives rise to novel forms of capital valorization (Miguez, 2016). The cognitive labor manifested in obtaining a genetically modified seed demonstrates that capitalism in agriculture seeks its expansion at the expense of people's food sovereignty.

Capital seeks strategies to circumvent the obstacles in agriculture, concentrating on providing supplies and transforming agricultural products to be more highly valued. Nature was excluded from being patented in constitutions worldwide, but several companies have succeeded in patenting living organisms in the United States. This has set a legal precedent, causing some multinational companies to patent thousands of varieties from germplasm banks. With the expansion of biotechnologies applied to

agriculture, there have been significant changes in the privatization of knowledge, use, and reproduction of seeds, giving rise to new capital accumulation mechanisms (Bianco, 2015). Thus, all the accumulated knowledge of the development of science and technology around obtaining improved seeds and their supposed intellectual property rights is verified.

It is also questionable that through the patent system, benefits are not appropriately shared; modern science only recognizes as valid knowledge the knowledge generated in laboratories by the patent system. The populations that use the original organisms do not receive any compensation, and their knowledge is exploited for the benefit of third parties (Rodríguez, 2010). Due to advances in science, technology, and law, there are new forms of domination, capital accumulation, decapitalization of farmers, and dispossession of their traditional practices of saving their seed, aggravating the migratory crisis of farmers.

The principle of non-maleficence seeks not to cause harm while producing or consuming and to protect the society-nature metabolism relationship. This principle relates to the duty to respect all living beings, including humans, that may be harmed by human actions (Rodríguez, 2010). It is essential to analyze the potential risks of genetically modified organisms before they are released for commercial use, such as toxicity or allergenicity assessment.

In the last fifty years, and at an accelerated pace since the 1970s, the world

has experienced an increasing concentration of the whole agricultural chain from production to marketing, processing, and production of chemical inputs, and increasing dependence on a limited number of foods (Houtart & Michel, 2016). This is why the green revolution model and the genetic revolution have been allowed to open new frontiers of capital (Guaman, 2020), triggering destructive processes in rural spaces around the world, such as the decapitalization of small farmers, land dispossession, and shock. Grain (2012) has reported 400 land-grabbing cases over almost 35 million hectares in 66 countries.

The causes of these processes are strongly related to the capitalist crisis and the strategy of domination of developed countries through the expansion of vanguard capital. The North loses competitiveness and seeks spatial solutions to its decadence in the South (Rubio, 2015).

Bioethical reflection on GMOs can help to point out areas that need to be regulated. There are many gaps in the legislation of Latin American countries regarding the use of and research on transgenics. Some GMOs are introduced without adequately evaluating their safety, possible health risks, and the possibility of gene transfer to wild populations (Rodríguez, 2010). It is essential to apply the precautionary principle, which states that when there is a danger of severe or irreversible damage, a lack of absolute scientific certainty should not be used to postpone cost-effective measures to prevent environmental degradation.

The principle of autonomy, which means respecting the right of people to make decisions regarding their lives and their environment, can be applied within the agri-food system in the areas of production and consumption. The processes associated with patenting biological and genetic diversity are related to economic and power issues, leaving aside the autonomy that native peoples have concerning their natural environment (Rodríguez, 2010). Transgenesis technologies in production areas are functional to capitalism, forgetting the understanding of the reality of farmers, causing an increasing dependence on these supposed “innovations” and bringing social and environmental consequences.

The strategies of dominance within the green revolution and the genetic revolution emerged as an idea of technical progress and innovation in the agricultural sector, with the promise of improving productivity, increasing efficiency, and the welfare and progress of farmers. The source of ideological power is amalgamated with the source of *economic power* since this model is designed to homogenize and standardize largescale agricultural and livestock production systems and seek the longed-for productive efficiency of specific segments of producers (Lizano, 2017).

The green and genetic revolutions have positioned their technological package at an ideological level and sold it to the global agricultural sector as the entrance to “agricultural modernity” and “agricultural competitiveness.” These phrases have been used to convince at

the political level to “feed the world,” arguing that the problem is not the food supply on the planet but the lack of money to buy food for the inhabitants. However, if it is not a problem of supply, and considering that productivity was an imperative concept according to the green revolution, why do we persist in that paradigm of productivism and efficiency? Regarding world agriculture in the 2015/2030 horizon, the FAO recognizes that:

...the problems of world agriculture will not be caused by productivity needs but by access to the already available factors and means of production. Solving the problem of world hunger is not a matter of food production but of access and distribution (Mann, 1991).

The productivism paradigm is highly questionable, both the one that promulgated the green revolution and the one that attempts to perpetuate the genetic revolution with promises of innovation and progress. **This vision threatens environmental balance, security, food sovereignty, and public health.** Unfortunately, these externalities remain hidden from public opinion, making them part of the Central American and South American reality, where we can see how the dominant capital-holding classes have assimilated this homogenizing model of the global North in agriculture and livestock, extending their ideological, economic, political and even, in some places, military power.

This model is functional for the owners of the means of production, distribution, and exchange and not for those

who only control their labor; in most agricultural societies, an extensively organized ruling class cages the subordinate latent classes within their segmental organizations of power (FAO, 2001). This chain of subordination to capitalism in agriculture and the interests of the national and transnational bourgeoisie have maintained a primary export model that violates our territories, culture, and people. The Brazilian case shows how the rural areas of the states of Mato Grosso and Mato Grosso do Sul have been more open to expanding the current forms of capitalism than the cities, making agricultural regions more vulnerable than urban areas (Santos, 2004). The reality of these areas in Brazil represents the reality of many other rural areas in Latin America, where the promises of growth and progress from the political sphere have brought disease, dispossession, and migration to their populations.

Regarding consumption, the principle of autonomy questions the right of food consumers to know whether what they are consuming is GMO or not and its risks, promoting public labeling policies because it is the right of a society to be well informed to make decisions.

Finally, the principle of justice seeks to protect vulnerable populations and promote equity in using these technologies. GMOs violate this principle since only advanced technology companies can patent organisms with agricultural and livestock utility. In contrast, those who do not have the technology cannot do so. This is another injustice resulting

from the lack of technology transfer, demonstrating that the objective of GMO production seems to be the profit motive of companies rather than the sustainable development of countries (Gómez, 2020). It is also questionable that private entities can appropriate nature. The philosophy behind GMO production is to maximize economic benefits, which does not benefit society and even less so the poorest populations. On the contrary, it increases their vulnerability because it increases the cost of production for farmers, making these more expensive foods unavailable to the people. GMOs provoke greater dependence on farmers, i.e., they destructure local economies since they do not generate employment or economic growth sources. On the contrary, there are many hidden risks within their environmental and social consequences.

In conclusion, transgenic seeds violate all bioethics principles in agriculture, demonstrating that capitalism seeks to commodify a genetic material that should remain a heritage of humanity and a common good in the hands of farmers. It is considered that transgenic seeds do not follow the logic of the 4 S's proposed by Jaime Breilh: sustainability, solidarity, security, and sovereignty. On the contrary, they follow the logic of accelerated capitalism that wants to appropriate our rural areas. It is necessary and urgent that the different actors of society, especially from academia, expose these pernicious technologies to propose alternatives to promote sustainable rural development and achieve more equity for farmers who contribute so much to the world.

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