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REVIEW ARTICLE

Genetically modified agriculture. A bioethical evaluation of a case from Colombian

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ABSTRACT

Transgenic technology promises to eradicate hunger and poverty worldwide, among other sustainable development goals, and as a result, its acceptance is increasing. However, there are perspectives that highlight the challenges raised by such expansion. This paper is a reflection on a study effort on the bioethical consequences of using transgenic technology in agriculture in Colombia. The goal is to prove that this adoption poses a bioethical danger. The paper, on the one hand, addresses the problem that arises from confronting arguments for and against the adoption of this technology, while also noting the absolute importance of the economic aspect in the provision of genetically modified organisms (GMOs) and the general difficulties of Colombian national regulations regarding GMO control and surveillance. Finally, it discusses the bioethical implications of adoption, beginning with the illusion of a transformational technology and progressing via the political will of the government to its eventual delivery to consumers.

Keywords: agriculture; bioethics; biotechnology; GMO; hunger

1. Introduction

Since the acquisition of fire, human beings have developed several capabilities and technologies, not only to survive as a species in different environments but also to transform the environment to our interests and needs, as in the case of agriculture and, in particular, the transformation of seeds for food production. At present, in the era of 'biotechnology' as Rifkin[1] calls it, we have the intention and the capacity to transform the biological basis of life and the challenge of reducing poverty and world hunger, thus reinforcing with greater urgency the adoption of transgenic technology, a term that has been referred to as the genetic modification of organisms, in which the genetic material has been artificially altered with the so-called genetic technology or modern biotechnology. According to some experts, with the increase in the human population and the challenges of feeding it, a type of modern agriculture that satisfactorily responds to the demand is justified. Chivian and Bernstein[2] state, citing Dyson[3], that:

> By 2025, the world's approximately 8 billion people will require an average grain yield of about four tons per hectare. And if reliance continues to be placed on traditional methods in the manner in which (sic) it is being done so far, it is anticipated that the current global amount of synthetic nitrogen needed to produce the 3 billion tons of grain will need to be doubled (p. 569).

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From this perspective, it seems simple, necessary, and justifiable to adopt an agricultural technology such as genetic modification of seeds that responds to the food needs of the growing population. In the Colombian case, according to a study conducted by the Brazilian agro-consultancy Céleres and contracted by Agro-Bio, the contribution of this technology to Colombian agriculture is "very valuable to have higher productivity in crops, besides being an effective tool capable of contributing with better agricultural practices, which reduce the pressure exerted on natural resources and the environment"[4]. However, there is strong opposition from farmers, academics, and environmentalists who point out the risks of this technology for the entire agricultural system of the country. In this logic, for example, Novas[5] raises a look at the social aspects of genetically modified foods (organisms) and the problem of food supply in developing countries, an approach that indicates fully dimensioning the true benefit of the adoption of transgenic technology.

This text is a reflection derived from the initial results of a research project, from academic work, and from continuous research on the subject by the author in recent years. It is not a finished text but a starting point from the bioethical perspective of the biochemist Potter[6], of bioethics as a science of survival, under the premise that a 'knowledge of how to use knowledge' is needed for human survival and the improvement of the quality of life' (p. 127). Here, the thesis is defended: there is a bioethical risk at the base of this adoption for Colombian agriculture. It is proposed to present a bioethical assessment based on the correlation between ends and means. In this sense, the basic question is: how should transgenics be understood and accepted for Colombian agriculture?

In the aforementioned bioethical perspective, three specific purposes are postulated: sustainable agricultural development, the defense of the survival of life (human and non-human, specifically the primary access of Colombians to a healthy and continuous diet), and the appreciation of ethical values such as the common good, nutritional self-determination, and individual and social responsibility in decision-making, because deciding what to consume or not, what to grow or not, is a legitimate and concrete act of civic freedom, an inalienable value in a well-constituted society. Therefore, it is considered that transgenic technology is a means that must have the function of making possible the achievement of such ends.

Based on the perspective of the relationship between ends and means, two moments of reflection are presented. On the one hand, the tensions that are evident in the disposition of transgenics in Colombia are presented, and on the other hand, the bioethical evaluation of the adoption of this technology is presented.

It should be noted that the methodology applied in the research exercise, of which this text is a product, was based on the documentary analysis of secondary sources, primarily, and of sources of an informative nature; in addition, a characterization was made of the perceptions and theoretical reasons regarding the scope and limitations of the application of this technology. In this regard, the positions and opinions of different stakeholders involved in the adoption of this technology applied to agriculture were taken into account, such as multinationals, government agencies, non-governmental organizations, scholars and researchers on the subject, national producers, networks of distributors and consumers, production areas, and communities involved. Finally, an analysis was made of the ethical principles that are at the basis of a society founded on human rights and the scope of these principles in specific fields of everyday life. It is also important to clarify that in this text, only the ethical nature of this technology applied to Colombian agriculture can be appreciated.

The following is a brief description of the place of transgenics in Colombia, followed in three sections by the reasons for the tensions that appear in the disposition of transgenics, and concludes with the ethical implications as a closing of the bioethical assessment.

According to statistics from the International Service for the Acquisition of Agri-Biotech Applications ISAAA[7], since 1996, the growth of biotech crops (transgenic or genetically modified crops) has been

increasing. The report states that in 2007 there were 23 countries involved with transgenic crops, and that in 2014 it rose to 28, reaching a total average of 181.5 million hectares cultivated. Thus, from 1996 to 2014, the number of hectares cultivated with GM crops has grown more than 100 times. According to ISAAA's international scale, Colombia ranked 18th in 2014, with 0.1 million hectares in the cultivation of transgenics, namely carnation, cotton, and corn. Since the Colombian Institute of Agriculture, ICA, applied Resolution 3492 of 1998, which establishes the procedure for the introduction, production, release, and commercialization of genetically modified organisms (GMOs) in the agricultural sector, Colombia has opened a path towards transgenic crops. Thus, in 2002, the cultivation of transgenics began in the country with 2 hectares of blue carnation, and since this time, the increase has been progressive. To date, there are more or less 100,109 hectares of genetically modified corn, 9814 hectares of GM cotton, and 12 hectares of GM blue flowers[8]. According to the ICA[9] in Colombia, in addition to evaluation plantings of corn and cotton, commercial plantings of Roundup Ready soybeans have been authorized in different areas of the country (Resolution 2404/2010 and Resolution 227/2012), so this denotes that there is a governmental determinant opening for the adoption of GM crops in Colombia.

However, it is important to note that there are nonnegligible oppositions from peasant groups, indigenous communities, rural development promoters, citizens, academics, and non-governmental organizations. This is the case of the ETC group[10], which, in a document entitled *Who Will Feed Us*, indicates, among many aspects, how the industrial agri-food chain only allocates its food production to less than 30% of the world population because 44% goes to meat production, 15% is lost in transportation and storage, 9% is used in biofuels, and 8% ends up in garbage cans. Although these references, among many others, as is the case of the group Seeds in Colombia or the group Friends of the Earth, FOEI[11], show a clear opposition, as we will see below, here an ethical-political and social importance is manifested in the sense of a responsibility that concerns both different state entities and citizens in general, who together should know firsthand the dissemination of this technology, its advances in research, its implementation, its consequences, and the development of the respective norms.

With this approach, and as indicated above, there are three moments in which the disposition of transgenics generates tensions with ethical implications, which are manifested in the discursive, management, and regulatory spheres.

2. Tensions in the disposition of transgenics

2.1. Clashing arguments

Identifying the problem of transgenics in ethical terms goes beyond a matter of perceptions and opinions; it implies understanding what is behind the discourses that are used when defending or attacking this technology. In the first instance, there is a polarized discourse between those in favor and those against the implementation of this technology on scientific grounds. Both positions adduce several scientific studies that support the welfare or not of health, economy, and environment and the overcoming or not of hunger and poverty in the world, in which the reader is expected to make a final decision, and it is here where myths set the trend. It is generally believed that transgenic products or derivatives are consumed in Colombia, but it is not known exactly which ones or in which products. In this way, informative publications generalize the information, generating a risk in the use of informed consent. For example, from the pro position, the great benefits of transgenics are announced, due to the decrease in the use of agrochemicals, the ease in the management of pests and weeds, the economic benefits, and the possibility of cultivation in extreme environments[12]. In this same sense, opponents point out that:

> farmers in the United States, India and Argentina report the use of increased amounts of pesticides in GM crops, and evidence from communities in Argentina and Paraguay raises serious concerns about the health impacts of these pesticides. It is also known that the cost of GM seeds has been increasing[13] (p. 6).

In this way, under supposed scientific studies, which are not possible to know, the aim is to make people realize what real interests are behind the arguments in favor and against. For this reason, throughout the text, use is made of nonacademic secondary sources that contribute to some extent to the awareness of information on the disposition of transgenics. The tension of these arguments on issues such as food, poverty alleviation and economics is presented below.

The most beneficial consideration of the adoption of biotech crops refers to overcoming the food crisis, since it generates more affordable production, increased supply (increased productivity per hectare), and reduced production costs (less need for inputs, less tillage and less application of pesticides), which leads to a reduction in the consumption of fossil fuels for vehicles, thus contributing to minimizing some of the impacts of climate change[14] (p. 11). On the other hand, counterarguments claim that most GM crops are not intended for hungry people in developing countries, but are used for animal feed, meat production and highly processed foods, along with the production of agrotoxins. For example, in Latin America, particularly in Brazil, the growth of pesticides has been denounced with the expansion of transgenic crops, specifically transgenic soybeans[15] (p. 14).

With regard to the fight against poverty, the generic contribution of biotech crops is pointed out because:

> currently, GM cotton in India, China and South Africa, and GM maize in the Philippines and South Africa account for a significant share of the income of more than 12 million poor farmers, which may increase significantly in the remaining 7 years of the second decade of commercialization (2006–2015)[7] (p. 12).

On the other hand, it is argued against seed patents because they produce damage in economic and social aspects, and therefore have a negative effect on the fight against poverty, because they imply the control of the supply of seeds to farmers by the large transnationals that produce them, generating the opposite effect of reducing costs and rather causing an increase in prices. The legal provision in favor of patents has a negative impact on the traditional practice of farmers saving seeds to protect their variety, putting food security and food sovereignty at risk.

From the perspective of lawyer Gregorio Mesa, such an argument is serious because intellectual property treaties (TRIPs) could generate a monopoly of crops with serious consequences for the conservation of biological diversity. "It establishes the patentability of microorganisms, as well as biological procedures for the production of plants and animals, with the foreseeable impacts that the uncontrolled release of GMOs into ecosystems will generate"[16] (p. 189). Associated with the above, is the process of privatization of the public sector, which Professor Mesa Cuadros[16] calls

> appropriation of social collective efforts, which affect the general interest of peasants, small producers, indigenous peoples and communities that are being expropriated of their knowledge and rights by patent law (p. 198).

The Colombian government sector considers that transgenic biotechnology is a good opportunity for the development of the agricultural sector, such as cost reduction, without impacts on natural ecosystems or on the health of the population, among others. On the other hand, arguments against it point to criticisms of the biosafety studies carried out by the control agencies in response to the requests of some transnationals. Specifically, they point out the lack of confidence in biosafety evaluations on risks to the environment, health and socioeconomic impacts[17] (p. 11).

The positions presented on transgenics reveal at least two worrying aspects for anyone considering the importance of adopting this technology in the context of Colombian agriculture. On the one hand, the public debate on the adoption of transgenic technology is merely discursive and polarized through an informative information system with little capacity for citizen impact. Beyond evidencing the arguments for and against, it remains inconclusive whether or not the adoption of this technology is beneficial, despite the fact that there are scientific studies that support each position, because the decisions are centered on the governmental level, leaving the impression that citizen participation, specifically that of farmers, growers, producers, and consumers, has little or no impact. For example, in Colombia, it is not publicly known exactly what transgenic products or derivatives are consumed, in what quantity, and what the benefit or harm produced to the health of the population is. There is no information on the seals or packaging of the products, nor is there a culture of reviewing this information; everything is focused on the cost of the product. Here, there is an ethical and social challenge in relation to favoring the self-determination of consumers through an informed decision.

On the other hand, what it does know is the economic and social impact on Colombian agriculture because it is favoring the importation of agricultural products and decreasing national production, despite the launch in October 2016 of the Plan Colombia Siembra program[18], and it ignores the great agricultural vocation and capacity that the country has by claiming that transgenics would bring economic benefits. And it is there that a major agricultural problem can be recognized, because this situation reveals an impact on the protection of national production and on the economy of farmers.

Finally, it can be considered that the polarization of the arguments for and against transgenics veils the true scope of the development of this technology, and here an ethical-social risk could be noted: the responsibility for the information given to the public must clarify the benefits and limitations; otherwise, it feeds the power mechanism of the myths that would mark the tendency at the time of making a decision and that favors some and not others. Notwithstanding the above, it is important to bear in mind that biotechnological development is an important human achievement, and it is necessary to make it a true means to achieve the welfare of all mankind.

Continuing with the description of the tensions in the decision to adopt transgenic technology, the following is a second tension that opens an interesting avenue for further research and reflection on the place of technological developments in the life of a country with great agricultural possibilities and at the same time with great biological diversity.

2.2. Confronting dimensions

In order to understand the implications of the decision to adopt transgenic technology, a research exercise was carried out on the dimensions involved and the interrelated aspects contained in such a decision. The result of the exercise yielded eight dimensions: a. scientific-biotechnological; b. environmental; c. cultural; d. social; e. economic; f. international-transnational; g. political-legislative and h. national public-private institutional. The way in which the dimensions or aspects involved were determined started with a process of research in many documents referring to the subject and in people knowledgeable or studious about it through the question: what should be taken into account to adopt a transgenic technology? A selection was then made, as precisely as possible, of the determining aspects and factors, and a group of eight dimensions was defined, as objectively as possible, which could be the basis for a decision on whether or not to use transgenics. Subsequently, a characterization of each of them was made, and then they were confronted with each other as in a double-entry matrix by means of critical questions. For example, the scientific-biotechnological and environmental dimensions were confronted with the question: how to relate the scientific-biotechnological knowledge of transgenic crops to the sustainable conservation of ecosystems? The basic answer revealed that the harmonic

relationship between these two aspects depended centrally on an agreement on the type of value given to biodiversity in Colombia in each dimension. In this case, both dimensions coincided in granting a high value to biodiversity; however, there were two differences in specifying the high value. On the one hand, scientific knowledge prevailed over conservation, due to the argument that only what is known is conserved. On the other hand, the estimated cost of research is higher than the cost of conserving the diverse environment. In other words, it was assumed that the economic result of scientific and biotechnological research should always be greater than the investment made, and it was deduced that the scientific-biotechnological dimension prevailed over the environmental dimension of conservation and under the prevalence of the economic dimension in terms of profit. This is an example of the way in which the confrontation exercise was carried out with the rest of the dimensions.[1]

Taking into account the advances of this research and investigation exercise, it was concluded that all the dimensions, particularly the environmental and social ones, were highly conditioned by the preference of the economic dimension in its profitable aspect. In other words, interest in income became the major determining variable for adopting transgenic technology, thus reaffirming the thesis that transgenics are becoming the new mega-business of the 21st century.

Regarding the impact on the environmental and social dimensions mentioned above, it was pointed out that, despite the risk of the flow of uncontrollable genes from a genetically modified crop to a crop that is not genetically modified and that would bring about social consequences such as the appropriation of crops through patent rights on seeds, the prevalence of economic costs over social costs was ratified. It was also confirmed that it is difficult to reduce the use of herbicides and pesticides on genetically modified crops because the weeds that grow around the crops make it necessary to eliminate them through the application of herbicides without guaranteeing their reduction. In this same perspective, it was concluded that the impact of transgenic crops in relation to the particularities of the diversity of Colombian ecosystems, which by simple logic would require a differentiated treatment, is of little relevance when balancing the goals of profit and expansion of transgenic technology.

Although it is true that the disseminators of transgenic technology point out, from scientific studies, the reduction of hunger and poverty in countries that have adopted this technology, the logic of the market and of de-development turns this discourse into an ideology, and the facts pointed out are not so conclusive to eliminate this final characteristic because, although it is stated that rich and poor countries participate in this technology, what is denoted is that it happens in a nonequal way: poor countries have fewer opportunities for technological development than rich countries. For example, Nigeria is the first oil-exporting country on the African continent, with a wealth of minerals and natural resources, but 70% of its population lives below the poverty line.

The exercise of inquiry and analysis, not finished with respect to the dimensions indicated, showed a very important challenge in relation to the right to information regarding the real scope of broad participation to decide on the cultivation, distribution, and consumption of transgenics. Due to the importance of public character and, more properly, the welfare of all, the dimensions of the adoption of this technology could be in a relative balance between them under more general national criteria and values such as biodiversity and favoring crop diversity, the richness of local production, and not absolute dependence on a single profitable seed.

The conclusion of this section is directed at the importance of generating spaces for public analysis of this technology and its probable and real benefit to Colombian society, to the peasantry as citizens, and to the

[1] A more detailed article on the analysis of the confrontation between the eight dimensions is planned.

agricultural activity itself. On the other hand, it is vital to encourage the population to be aware of the importance of these technologies in the quality of their lives, which would imply assuming and exercising the value of self-determination in relation to food.

With the intention of achieving greater clarity on the tensions of the adoption of this technology, the following is an approach to the problems identified within the framework of the standards established in Colombia.

3. Limitations of the standard

Within the framework of the problems studied, "Colombian regulations on genetically modified products reflect, among others, two key aspects that should be highlighted"[19]. The first is the encompassing concept referring to genetically modified products as a regime of access to genetic resources, which are conceived as the patrimony of the nation and are characterized by being inalienable, unseizable, and imprescriptible. This concept distinguishes between genetic resources and biological organisms, which implies that the Colombian legislation differentiates the ownership, access procedures, and competences of the environmental authorities depending on whether they are one or the other. The legal conceptual distinction in Colombia is between an entity (a biological organism) in which its phenotypic characteristics are observed and another component (genetic information) responsible for the genotypic characteristics of the organism. According to Nemogá et al.[19],

> these distinctions and the low institutional capacity of the state are the basis of a complex and inefficient legal formulation in terms of property, access and contract negotiation present in the legislation, the meager results of which are evident during a decade of validity (p. 23).

The second key aspect, following Nemogá et al.[19], is that Colombian legislation presents a hierarchy of norms that does not necessarily indicate a coherent and articulated formulation of genetic resources. The normativity ranges from the Political Constitution of Colombia, which establishes the responsibility of the state to protect the natural genetic resource and the wealth of cultural diversity, by "regulating the exit, entry and utilization of genetic material that is of national interest, to the applications of this general norm such as laws, decrees, decisions and resolutions"[2]: However, the problem that appears here refer to the difficult handling, to say the least, of the legal information to determine properly what to do concretely with a situation of risk or with a de facto situation, since, as it was pointed out, between genetic information and biological organism there is a gap that leaves open the own control over transgenics and, more specifically, over genetically modified crops, food, products and by-products.

Thus, it is considered an important and necessary challenge for Colombian jurisprudence, not only for legislators but for all citizens, to participate more in the development of a public good interest and thus be able to appreciate that transgenics are a means to an end, such as the public interest in the development and sustainability of Colombian agriculture.

With this last consideration of the first section of this paper, we now continue with the presentation of the ethical implications as a reflection that closes what constitutes the bioethical assessment of the adoption of transgenic technology in a country like Colombia.

[2] Law 99 of 1993, Law 165 of 1994, Law 21 of 1991, Decree 309 of 2000, Decree 2811 of 1974, Decree 730 of 1997, Decree 3266 of 2004, Decision 391 of 1996, Resolution 1367 of 2005, Resolution 68 2002, Resolution 307 of 2003. Along with this brief indication of regulations, other regulations that try to resolve processes, procedures and procedures must be taken into account.

4. Ethical implications

The bioethical assessment that has been made on the adoption of transgenic technology in the Colombian case poses a problem for society as a whole and its respective political, economic, scientific, cultural, and environmental developments because the risk of substitution of the highest human end or ends by means such as transgenic technology is clearly evident. And as Riechmann[20] says, the problem of biotechnology is not in biotechnology itself but in the application of biotechnology by multinationals with the tendency to become all biotechnology. The difference between traditional biotechnologies and the new biotechnologies is that the latter are based on genetic engineering and techniques such as cloning, cell and tissue culture in the laboratory, and cell fusion, among others, which represent a "qualitative leap with respect to the old ways of taking advantage of life: we are doing new things with techniques that were never before within our reach"[20] (p. 80). In this sense, it is important to understand that transgenic technology should be directed towards objectives such as sustainable agriculture in a country with high biological diversity, the nutritional self-determination of Colombians, and, consequently, the common welfare.

"Free from falling into technofanaticism or technocatastrophism"[19] (p. 322), it is a matter of demystifying the term transgenic and transgenic technology itself, so that it can be clearly seen that the bioethical risk lies in the political and ethical decisions that can be taken, at the same time, by both the state and the citizens, because in the logic of the objectives previously pointed out, the development of Colombian agriculture must prevail over a particular foreign good. For this reason, it should be remembered that the food program "Green Revolution", preamble of transgenic technology, initiated in Mexico in 1943 with funding from the Rockefeller Foundation, whose idea was to improve food production techniques, brought as a consequence, among others, the importation of food (grains) into countries that were previously exporters, This was due to the difficulties associated with the effects of the new technology, in particular, the increase and dependence on the package of seeds and chemicals produced by the United States.

In this sense, it is necessary to gain awareness in the following terms:

- Overcome the polarization between those for and against transgenics because it is a tricky game that has real implications for society. The disposition of this technology and its market must be seen in a multifaceted way in terms of truth and justice. This means, morally speaking, to act in favor of truthful, transparent, and timely information, making it a basic means for society to actively participate in making decisions about the destiny of its food security. For this reason, the state should be required to provide effective information to the entire population on the acceptance, dissemination, and/or adoption of policies, programs, and projects related to transgenic technology in as broad, transparent, equitable, and objective a manner as possible in order to guarantee compliance with constitutional rights. This implies opting as a fundamental criterion for public ethics within the framework of the recognition of a pluralistic and democratic society.
- To understand that the implementation of transgenic technology in Colombia, as perhaps in other similar countries, is not only a matter of the scientific and biotechnological dimensions and of a rentier economy that affects the democratic capacity to acquire capital and jeopardizes the diversity of Colombian agriculture, and therefore requires an inter-dimensional management articulated by agricultural sustainability.
- A commitment to an inter-dimensional approach to agriculture with a change in the agricultural axis would favor the sustainability of the business, farmer welfare, productive growth, and protection of the environment. A promoter of the issue cannot be left alone with the arguments in favor without objectively assessing the arguments against it. A consumer of transgenic food cannot ignore basic and sufficient

information; otherwise, it may affect his autonomy, his physical wellbeing, his economy, and his quality of life. A transgenic producer cannot ignore the richness of Colombia's ecological diversity.

- Understand that agrotechnology on a global scale pressures the rhythms of the natural capacity of crops and affects their resilience, putting at risk the sustainability of life on the planet, i.e., biodiversity. In this situation, bioethics and rural development in Colombia must work decisively for the generation of policies of greater social and environmental benefit for the nation that, supported by educational processes, are installed in the consciences of citizens as tools of confidence for participation in national and international decision-making in this sector.
- Having clarity on the distinction between human means and ends mentioned above allows us to recognize the capabilities and human inventiveness with respect to transgenics as a means to a greater end, the well-being of all Colombians, favoring the basis of life and specifically nutrition, sustainable agriculture, and food security.
- Publicly discuss the relationship between the patentability of organisms and biological processes that modify plants, animals, and other living beings and the monopolistic control of some companies. From a bioethical point of view, it is necessary to strengthen three basic systems in society and their interrelation in terms of objectivity (public interest), transparency, and equity: a. the legal, which develops the set of environmental biosafety standards, overcoming the state's inability to comply with the standards, especially because of, on the one hand, the uselessness of standards and, on the other, the effective impossibility of control; b. the scientific, which develops new knowledge, taking into account the need for transparency and equity. scientific, which produces new knowledge taking into account the territorial context, guaranteeing the application of biosafety protocols and overcoming the greatest weakness, which is the reduction of the genetic modification technique to at least two variables: resistance to insects and resistance to herbicides, which implies greater investment of state capital for the development of the research system and biosafety in transgenic technology, without it becoming hegemonic in agriculture, otherwise it would be a disaster; c. The communicative aspect, which through the dissemination and communication of truthful information, the basis of the constitution of the sociocultural system, makes possible greater participation in decision-making on the use or non-use of transgenic products or foods and favors the exercise of autonomy and responsibility, as principles of a free society with rights.
- Finally, it is necessary to appreciate that the problem of poverty and hunger in the world, and specifically in Colombia, does not absolutely require a rentier technological-scientific solution. The aforementioned reason for the impossibility of feeding a growing population with current technology is not a sufficient and certain justification for the adoption of the absolute implementation of transgenic technology; there are other possibilities that have to do with the solidarity and equitable distribution of resources and products. In Colombia, the problem of hunger is not one of lack of food but of distribution and profits; it is known by various sectors that in our country, as in other parts of the world, food that is not sold is thrown away, which generates a serious ethical and social problem. As A. Sen points out, "A famine is the result of many people not having enough food to eat, and in itself is no proof that there is not enough food to eat"[21] (p. 423). Colombian agriculture can and should be, in the first instance, sustainable and self-sufficient, as this would be the right way to live well.

Conflict of interest

The author declares no conflict of interest.

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