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Towards Sustainable Agriculture: Inventing an Ideal Ethical Tool for Malaysian Farmers in Genetically Modified Organisms (GMO) Era

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Abstract

Sustainable agriculture is an ecological approach to unravelling essential issues related to food production. Biotechnology, in particular, the genetic modification (GM) technology, is considered one way to sustain food security. Farmers, the main actors in modern agriculture, have always been absent in the debates involving GM technology, giving rise to whether their rights are at the forefront when debating these issues. Ethical principles serve as criteria for evaluating policies' practices concerning technology. This paper, therefore, discusses the principles of ethical indicators and guidelines for releasing genetically modified organisms (GMOs) into the environment to protect Malaysian farmers. Applying the qualitative research method, a systematic literature review of secondary sources on genetically modified (GM) crops from socio-economic, politic, institutional, social, cultural, safety, religious, common and morality as well as environmental effects are analysed to consolidate the evidence in developing the potential ethical indicators to protect farmers' rights.

Keywords: GM Crops, Ethical Tool, Indicators, Socio-Economic, Environmental, Farmers, Sustainable Agriculture

Introduction

Sustainability works on the basis that the fulfilment of the current needs must not be to the detriment of the future generation's ability to fulfil their needs and to enjoy what is there on earth (Velten, Leventon, Jager and Newig, 2015; Ismail, 2006; Goldman, 1996). Sustainable agriculture is an ecological approach to unravelling essential issues related to food production

(Lal, 2008). A variety of agricultural technologies are being utilised to increase farm efficiency and, eventually, food security, such as the utilisation of biotechnology, innovations in machinery, chemicals, agronomy and information revolution (Chambers & Sheng, 2022; Joseph et al, 2017; Godfray et al., 2010; Rosegrant & Cline, 2003). In the National Agri-Food Policy for 2011–2020, genetic modification (GM) technology is considered one way to ensure food security in a sustainable way. Food safety, animal welfare, environmental impacts, social consequences, and the issue of naturalness versus unnaturalness are five significant aspects of biotechnology ethics (Comstock, 2000; Thompson, 2002). The core activities related to the agricultural and food sector are so much associated with farmers, and yet, ethical debates related to these issues are rarely initiated or involved by farmers (Meijboom and Stafleu, 2016).

Literature Review

GM crops are introduced via GM technology but not without bioethical issues. Concern about farmers' rights to livelihood and rights to contractual justice are among the matters that emerge in bioethical debates on GM crops (Idris, 2019). The assessment of ethical aspects of the use of GM crops is essential to ensure its consistency with fundamental societal values. This is despite the challenges in translating the descriptive nature of ethical principles into practice (Amin, 2016). A practical, measurable indicator of the ethical principles must assist the regulators in assessing the ethical compliance of researchers and industries in utilising GM technology that protects farmers' rights.

Recent bioethical debates on these issues in Malaysia are primarily concerned with exploiting of potential benefits of GM technology within the corporate-dominated seed sector. Farmers are mostly affected by these in terms of their livelihood and contractual relationship. Previous research in Malaysia has not addressed these issues. Hence, to ensure the use of GM crops unfolds consistent with fundamental societal values, an assessment of its ethical aspects is crucial. Unfortunately, there has been little effort in developing ethical indicators that can assist the local regulators. Indeed, Mepham (1994, 2006) has proposed the need for an ethical matrix in this context. Proper development and incorporation of a relevant ethical matrix can contribute toward a more sustainable approach to agriculture.

To ensure that farmers' interests are safeguarded in the process of policy decision-making regarding GM crops, the policymakers should consider the ethical indicators benefiting farmers. The economic, justice (political), institutional, social, cultural, safety, religious, and common morality are identified as the indicators that may facilitate democratic decision-making in this aspect. This will significantly leap towards sustainable agriculture and the food production industry. Hence, the main objective of this study is to identify suitable indicators to be included in the ethical tools to be used in decision-making relating to GM crops that protect farmers. In search for appropriate indicators customised to Malaysian farmers, the method of a systematic review of the literature concerning the same subject matter is examined. This will assist in developing a tailor-made ethical tool to address the issue of farmers' rights in Malaysia.

Farmers are potentially susceptible to influence from both sides of the GMO debate. Even though they may be primarily economically motivated, Meijboom and Stafleu (2016) found that farmers hold moral values and ideals. Economy and profit are not the only concern when they conduct agricultural activities (De Rooij et al., 2010; De Lauwere and De Rooij, 2010; Driessen, 2012, 2014; Grimm, 2010; Cardoso and James, 2012). They have moral beliefs and convictions beyond economic considerations. In this discord, the agro-biotech industry

encourages farmers to adopt the new technology while those who dissent, the consumers and supermarkets, may reject GM food (Hall, 2008). The farmers strive to meet and respond to agricultural, environmental, business, and consumer ethics demands. However, their ethical choices are often constricted by the economic challenges posed by industrialised agriculture (Hendrickson and James, 2008; Stuart, 2009). Hence, the farmers' personal and socio-cultural identity is being challenged amidst all this.

Therefore, farmers, whenever they are faced with ethical challenges, their ethical stand may be influenced by other factors. Hence, it is paramount to understand the factors or indicators that may affect farmers' ethical behaviours in agricultural activities. In addition, the actions of farmers may affect the availability and production of public goods essential to society (Raymond et al., 2022; Meijboom and Stafleu, 2016; Hendrickson and James, 2008).

Methodology

This paper is qualitative and prepared following the doctrinal research approach. The indicators gathered in this qualitative study using the systematic literature review method. However, they are typically conceptualised, measured, and captured as an individual-theme level construct and are elicited through various qualitative methods (Hitlin & Piliavin, 2004). The process of building up indicators of the potential socio-economic, environmental, cultural and other impacts of GM crops consists of three stages:

- Stage I - Background review related to the key cognitive constructs of the indicators approach to GM Crops in protecting farmers' rights and trend analysis. It is done at three sub-levels: i) Criteria (Valid/Reliable/Simple and Affordable), ii) meaning and iii) the extent of its relevance in protecting farmers' rights in Malaysia.
- Stage II – The representation of a specific property or characteristic of relevant socio-economic, environmental, cultural, and other factors to identify potential impacts.
- Stage III - Identified variables within each factor that have been defined (Stage II) will be used to generate socio-economic, environmental, cultural, and other indicators through their interrelationships. Thus, achieving unambiguous connectivity between variables will optimize the indicator's performance. In addition, the indicator reflects the variations experienced by its constituent variables and, as a result, assumes a qualitative value.

Discussion

The study identified eight indicators incorporated into the ethical tools benefiting farmers. The indicators are the economic, justice (political), institutional, social, cultural, safety, religious, and common morality that may facilitate democratic decision-making involving GM crops and farmers. This finding can be summarised in Table 1 below.

Table 1
Definitions of Key Cognitive Constructs of the Indicators Approach to GM Crops in Protecting Farmers' Rights

Indicator	Criteria	Meaning
Economic factor	Increase income and low production cost. Control of agro-product and agro-technology know-how.	Using GM crops promises profits that will improve the economic status of farmers. The control issue is due to the imbalance in economic standing between farmers and owners of technology.
Political factor	Fair and equal treatment. Potential marginalization and monopoly.	Political intervention ensures equality and fair distributions among unequal actors in GM crop production. To ensure a level playing field and fair opportunity to compete. Inequality leads to economic and social injustice.
Institutional factor	Legal and administrative setup.	Biosafety approval and monitoring by the government ensure proper employment of GM crops and their technology.
Social factor	Socio-economic consideration.	Socio-cultural factors reflect the behaviours and practices of the people, their collective identity, habits, and rituals. Therefore, the impact socio-cultural and traditional practices of farmers (for, e.g.) related to the use of seeds and seed saving may be impacted by GM crops.
Cultural factor	Cultural consideration	
Safety factor	Safe and healthy food production. Safe for the environment.	Impact on human health and natural environment.
Religious factor	Religious dimensions as a vital societal force.	Concerns on whether it violates the laws set forth by God.
Common morality	Multi-ethical perspectives and traditions.	Accepted principles of common morality in a multi-cultural society of different values and perceptions.
Environmental factor	Alleviation of food crisis and poverty. Sustainable development to secure biodiversity.	Global environmental issues that global food security must be addressed with minimal disturbance of biodiversity.

In their study, Mustafa et al (2021) offered empirical evidence in support of a theory explaining the factors that affect farmers' attitudes regarding adopting genetically modified (GM) crops. This study reveals the importance of five predictor variables. Malaysian farmers also elicited favourable opinions on the usage of GM crops. High perceived advantages and low perceived dangers were found to impact farmers' positive sentiments substantially. Institutional support in the form of government support and assistance is regarded to be the most crucial component in encouraging farmers to use GM crops. Government initiatives to lower the cost of cultivating GM crops and to boost farmers' self-efficacy should be included in this, as both were found to be highly significant determinants of their opinions. The proper

authorities will be able to develop effective strategies for the successful diffusion of GM crops to boost food security in non-self-sufficient countries by recognising the significance of the elements mentioned earlier in affecting farmers' attitudes. The results of this study have substantial ramifications for Malaysia, and other developing countries' use of genetically modified crops in the future.

From the context of a political perspective, Chandra et al (2017) noted that socio-political issues of smallholder farmers are not appropriately supported. Instead, scientific methods and technical innovation, as well as their incorporation into national and international policy to minimize greenhouse gas emissions, have been given priority. The policies that concentrate on technical and scientific improvements at the farm level will not be able to address the growing climate and socio-economic implications fully. Inequality, unequal power relations, and social injustice all contribute to developing specific political ecologies in smallholder farming communities. Smallholder farmers' vulnerabilities will worsen on a local and global scale if "climate-smart" policies do not address their rights, the equitable allocation of agricultural resources, and the hegemonic power relations of the most marginalised. Inequality, unequal power relations, and injustice must be addressed outside the farm, and any policy interventions must address the socio-political processes affecting livelihoods, food production, and vulnerability.

The political indicator must play a role in eliminating or normalising the monopolistic political representations of elite institutions. The discriminatory policies of hegemonic groups concerning the unequal distribution of resources can contribute to the marginalisation of smallholder farmers and make their situation more uncertain (Yates, 2014).

Activities involving GMOs are governed by legal and administrative frameworks that offer rules, guidance, and help in the institutional components (Mustafa et al., 2021). Many governments have committed to protecting seed businesses' intellectual property rights through national legislation as part of international trade agreements (Dano, 2007). This element reflects biosafety approval, assistance, and monitoring conducted at the government level to assist farmers in using GM crops. As a result, the genetic alteration would prioritise adding genes that confer resistance to drought, salinity, and other stressors. In addition, the study programme would prioritise water-use efficiency and enhance nutritional and processing qualities—by implementing training and education on agronomic management practices for GM crop varieties.

The potential effects of GMOs on farmers' traditional methods of saving, reusing, sharing, exchanging, and selling farm-saved seeds, for example, on farmers' rights to save seeds, are an essential factor in assessing the socio-economic impacts of the technology. Traditional seed saving and the free exchange of planting materials are more common in developing countries than in developed countries, where industrial agriculture predominates. As part of their freedom to save and exchange seeds, farmers have the right to decide their operations. It is possible that GMOs could have a long-term impact on the ability of poor farmers to make their own decisions about what, when, and how to plant on their farms (Dano, 2007). GM crops, especially those protected by intellectual property laws, could limit farmers' ability to cultivate their land. Because of intellectual property laws, this is especially true for crops.

Regarding cultural factors, GMOs have gotten more attention than the socio-economic and cultural aspects of the use and release of science and technology because of their natural attributes (Dano, 2007; Carson, 2018; Myskja and Myhr, 2020). Public values, social and cultural factors, empirical knowledge, public opinions, feelings, and emotions may all impact (non)approval decisions and must therefore be accounted for in the matrix (Dassler, 2021).

Using an ethical sustainability matrix is an excellent way to locate and evaluate the relevant aspects of GMOs regarding their sustainability and ethical justification. Mepham's original ethical matrix, restructured here, can be used in technology assessment of GM and genome-edited organisms (GE) and in GMO regulations that include non-safety factors. Reorganising the original ethical matrix based on virtue ethics and ethics of care was done to reduce the risk of bias. Sustainable development goals, such as those set by the United Nations, were also incorporated. There are many types of (non)knowledge, significant ethical traditions, and a comprehensive set of values and stakeholders to consider in the proposed ethical sustainability matrix. For this reason, the European Social Model (ESM) emphasises that technological innovation is not a one-way street; it must also benefit society, the economy, and the environment (Dassler, 2021).

Strong feelings of safety and health, as well as identity and culture, characterised attitudes toward GMOs, particularly GMOs developed for food production (Carson, 2018; Myskja and Myhr, 2020). There is uncertainty regarding the (in)safety of GMOs in terms of their impact on human health and the natural environment, which interests the product will serve, which groups will be affected by its use and release, and how the technology may threaten some of the fundamental values upon which our society is founded (Antonsen & Dassler, 2021). In many countries where religion remains a significant social force, the ethical and religious dimensions of the GMO controversy are the most prominent. Whether GMOs are halal or haram, for instance, determines the tone of the debate over their acceptability in Muslim societies (Safian & Hanani 2005). Food has always been connected to the divine or intricately woven into the cultural fabric of societies. Religion and culture mix and separate at an ever-changing rate within modern human paradigms; even today, one could argue that in the modern world, culture is continually transforming and emerging (Coe, 2014).

Religion focuses on whether something violates God's laws, whereas culture focuses on the daily habits and rituals people observe as part of their personal and collective identity (Coe, 2014). Cultural practices are considered to ensure the highest level of acceptance. Corporations and governments must thoroughly scrutinise GMOs to see if it improves the region's agriculture while respecting sacred values and promoting community health and well-being (Coe, 2014). Religious beliefs heavily influence the use of GM crops. Even in farming, the main guiding principle is the benefit of protecting and preserving religion, life, intellect, progeny, property, and the environment (Idris et al., 2020).

Finally, as in the environmental factors, even though GM crops grow more quickly than native ones, they help alleviate the global food crisis. Increased income for poor farmers helps alleviate the food shortage and poverty. In addition, GMOs are said to reduce greenhouse gas emissions and pesticide usage. As a result, reducing harmful agents promotes long-term development toward sustainable agriculture (Raymond et al., 2022; Aslam and Gul, 2020).

Findings

From the above discussion, it is found that in Malaysia, to protect farmers rights in relation to GMOs farming, the ethical tool that need to be developed must pay attention to several factors: the economic, political, institutional, social, cultural, safety, religious, common morality and environmental factor. Even though some factors may be of more importance than the other, each one plays significant role in shaping farmer’s perception and treatment of GM crops. Economic factors indeed place farmers in vulnerable position due to unequal bargaining force. To reduce this gap and eliminate inequality, an appropriate political and institutional measures must be in place. The multi-cultural and multi-religious of Malaysian

farmers and community requires high degree of respect of others to learn to give and accept similarity and embrace differences. Thus, ensuring the protection of farmers' rights involve collective cooperation of the government, the business entities and the people, which requires ethical tools as a guidance.

Recommendations

The above findings reflect the importance of ethical consideration to act as a buffer in the advancement of GM technology vis-à-vis farmers as the ultimate actor in the agriculture industry. Indeed, sustainable agriculture via the use of GM crops technology promotes socio-economic advantages for society and farmers by yielding higher farm profitability, fewer crop losses, more stable revenue, simpler operations, lower labour and pesticide use, time savings, and lower exposure to hazardous chemicals. This can be maximised upon considering all ethical indicators above in decision-making and policy-making involving GM crops. Intellectual property rights, the power of giant seed companies, balancing the infrastructure of food distribution with production output, commercialization of relevant products with profit considerations, the possibility of a negative impact on trade with traditional trading partners, accessibility and affordability of planting materials and accompanying technologies, suitability of high-tech crop systems for smallholder farm operations and resource-poor farmers, and all of the above are among them must be reanalysed in the context of ethical indicators above. The distribution of costs and benefits among farmers, food producers, retailers, and technology developers will indeed complicate the evaluation. Socio-economic assessments find the most advantageous option by comparing the costs and advantages of introducing a given GMO to those of alternative options. This study aims to generate moral indicators that will advance our understanding of the study and growth of the agricultural business for genetically modified crops toward sustainable agriculture.

Conclusion

Disproportionate discourse on GMOs reveals that more regard has been given to the natural scientific and technological aspects of the use and release of GMOs than to the socio-economic and cultural factors. Ethical principles serve as criteria for the evaluation of policies' practises. For the protection of farmers' rights, it is necessary to have an ideal ethical tool that consists of indicators of ethical principles to protect farmers in GMO-related policies. Proper government interventions through ethical tools are insurance that guarantees societal equality, fairness, and equity. This can ensure that the agricultural development in Malaysia can move forward sustainably.

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