

Islamic Ethical Principles to Protect Environment Affected by Modern Biotechnology

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ABSTRACT

The Malaysian government strongly promotes research and development in modern biotechnology since it has the potential to bring economic benefits to the nation. Modern biotechnology has been associated with several ethical issues related to the environment. This leads to the need for having appropriate laws and guidelines for governance purposes. There is a legal vacuum in the existing Biosafety Act 2007. This Act focuses on scientific risk assessment concerning modern biotechnology and does not contain any provision in terms of the social and ethical aspects of modern biotechnology. The objective of this article is to identify and select the core ethical principles that are both acceptable, and capable of protecting the environment. By using a qualitative approach, a series of focus group discussions (FGD) were conducted consisting of four groups of stakeholders in biotechnology. The discussions were recorded, transcribed and analyzed thematically. The research findings show that the stakeholders strongly agree on the importance of three ethical principles for protecting the environment. They fully support the adoption of these ethical principles as the guiding principles for developing Malaysian Ethical Guidelines for Modern Biotechnology in the future. This research links Islamic and Western-based ethical principles in relation to the environment and its protection.

Keywords: Modern biotechnology; environment; ethical principles; Islamic perspectives; precautionary principle; animal welfare.

The government of Malaysia is aware of the long-term benefits of investing in modern biotechnology (Yusof 2016). This explains the launching of the National Biotechnology Policy on 28th April 2005 by none other than the fifth Prime Minister, Abdullah bin Ahmad, Badawi, himself. The importance of modern biotechnology to the Malaysian economy was strengthened further when the sixth Prime Minister, Mohammad Najib bin Tun Haji Abdul Razak, regarded modern biotechnology as the catalyst and engine for national economic growth (Najib 2009). The policy focuses on three major fields, namely agriculture, healthcare and industry (Khan et. al. 2017). This strategy was logical and practical, since Malaysia is inherently strong in those three fields. For example, the Malaysian agriculture sector contributes about 9.7 percent to the national gross domestic product (GDP) (Economy of Malaysia 2015).

In Malaysia, society tends to think of and define modern biotechnology in a general and broad context, and does not necessarily limit their thinking to genetic engineering (Hasim et al. 2019). It is well known that biotechnologists can alter and manipulate the DNA of as many genetic sources as they desire (Khan et. al. 2017; Yusof 2013). Over time, many developed and developing

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countries have developed an equal desire to join the modern biotechnology bandwagon, especially after seeing the capabilities of modern biotechnology in terms of improving the quality and quantity of agricultural produce, medicines, healthcare services, heavy industry and industrial manufacturing output (Mokhtar & Mahalingam 2010; Idris et al. 2020). This has led to technological and economic growth nationally. Unfortunately, the very fact that biotechnologists can manipulate DNA as desired, means that the source of genetic materials, the nature of modern biotechnology processes and its end products, and the relatively unknown side effects of modern biotechnology on life, the environment or human well-being, have inadvertently exposed modern biotechnology to controversy (Hasim et. al. 2020).

The threats of modern biotechnology with regard to life, the environment and communities are seemingly growing. Even in 2020, scholars are still voicing their concerns and fears with regard to the possibility of unscrupulous parties abusing the technology made available by modern biotechnology for the sake of profit (Brito et. al. 2020). In view of the above, this article agrees with the call for a better mechanism of governance when it comes to regulating and monitoring the release and dissemination of transgenic organisms into the environment. To date, there is only one document in Malaysia dealing with guidelines on environmental biosafety. This is known as the Biosafety Guidelines on Environmental Risk Assessment of Genetically Modified Plants (Biosafety Guidelines 2012). The Biosafety Guidelines contain provisions with regard to the Environmental Risk Assessment (ERA) of Genetically Modified (GM) plants in terms of cultivation, the production of GM plants, and the importation of GM food and feed. Unfortunately, the Biosafety Guidelines have a narrow and limited scope. They only address and cater for the potential environmental risk of GM plants. The document neglects to include other equally-critical bioethical and socio-economic issues relating to modern biotechnology (Biosafety Guidelines 2012). For example, the Biosafety Guidelines are silent on the degradation of the environment, the depletion of biodiversity, or bioethics. Bioethics needs particular attention here as it could balance up the needs of protecting the societal wellbeing on the one hand and the rapid advancement of modern biotechnology on the other (Jonsen 1998; Isa et. al. 2014). Apart from potentially serving as the basis for human moral responsibility towards the environment (Yaacob 2012), bioethics also provides a moral defense and ethical inspiration in the drive towards the protection of the environment globally (Yang 2006).

It is of the utmost importance for the proposed ethical guidelines to be suitable, applicable and acceptable to all. There are various ethnic groups, religions and cultures in Malaysia. The proposed bioethical guidelines cannot afford to ignore, offend or sideline any differing values or views. Instead, they must harmonize and integrate them. For example, the proposed guidelines will have to balance the needs of the Muslim and non-Muslim populations. This paper highlights the opinions of experts, collected as a result of a series of focus group discussions (FGDs) among various stakeholders with regard to protecting the environment from the possibly negative consequences of modern biotechnology. They include members of the scientific community, policy makers as representatives of the government, researchers, industry representatives and religious scholars. The discussion of ethical principles contained in this article is from an Islamic point of view.

Methods and Materials

Participants: The research adopts a purposive technique in terms of identifying the research sample and maximizing its diversity. The participants were selected based on the appropriateness of their background and the characteristics of this study. As a mark of respect, equality and fairness, scholars from all the main religions of Malaysia were invited. Their disagreements, comments, praise or suggestions were duly recorded and noted. Twenty-one participants attended the FGDs. The participants were separated into four different groups, namely academics and NGOs, researchers and industrialists, religious scholars, and policy makers. The personal details of the participants were removed to ensure anonymity. Each participant was assigned a code, details of which are as shown in Table 1.

Table 1: Participants' Profile

Group of code	Participant code	Institution	Gender
G1 (Academicians and NGOs)	P1	University of Teknologi Mara (UITM)	Female
	P2	University of Malaya (UM)	Male
	P3	Malaysian Plant Protection Society	Female
	P4	GRASS Organization	Male
	P5	University of Malaya (UM)	Female
G2 (Researchers and industries representatives)	P6	Malaysian Agricultural Research & Development Institute (MARDI)	Male
	P7	Malaysian Genome Institute (MGI)	Male
	P8	Bioeconomy Corp	Male
	P9	Agro-Biotechnology Institute (ABI)	Female
	P10	Rubber Industry Smallholders Development Authority (RISDA)	Female
	P11	University of Putra Malaysia (UPM)	Female
G3 (Religious scholars)	P12	University of Kebangsaan Malaysia (UKM)	Male
	P13	Young Buddhist Association Malaysia (YBAM)	Male
	P14	Church of St Francis Xavier	Female
	P15	Malaysian Hindu Sangam	Male
G4 (Policy makers)	P16	Malaysian Agricultural Research & Development Institute (MARDI)	Female
	P17	Department of Veterinary Services (DVS)	Male
	P18	Forestry Research Institute of Malaysia (FRIM)	Female
	P19	Ministry of Health (MOH)	Male
	P20	National Resources Environment (NRE)	Female
	P21	Ministry of Science, Technology & Innovation (MOSTI)	Female

Data Collection: This study was conducted within the Klang Valley. All participants were firstly contacted through email or by phone to obtain their consent and agreement. They were asked to fill in a consent form upon agreement. Arrangements for the time, date and venue for the FGDs were then set. All FGDs were conducted in the Innovation Room, Quality Assurance Center, Universiti Kebangsaan Malaysia (UKM). FGDs techniques were used and the participants were presented with list of structured questions in the form of a self-developed research instrument. The questions were designed in such a manner to extract as much information from the participants as possible while at the same time enabling them to share their practical experience and opinions on ways to protect the environment and ensure biodiversity for sustainable purposes.

Apart from demographic information, the instrument contained questions on the constructs of the ethical principles extracted from the literature review and from secondary data. The research team discussed, debated and deliberated each proposed principle, item, construct, definition or concept of the instruments before agreeing on the final version. Subsequently, the data collection instrument underwent a verification and validation process to ensure they it was valid and reliable and would be able to extract the necessary information in order to fulfil both the research questions and the objectives. Each discussion lasted between three and four hours. Discussions were recorded using audio and video recording devices as well as handwritten notes.

Data Analysis: All the data collected from the audio recordings were transcribed verbatim by the researcher. Transcribing the recordings manually allowed the researcher to gain familiarity and a deeper insight into the data (Barrat et. al. 2015). The transcribed data was analyzed using thematic analysis in order to capture the views, emotions, experiences and concerns of the participants. Three themes eventually emerged from the verbatim transcriptions and analysis. These were trustees, precautions and animal welfare.

Results

Generally, all the experts who participated in the FGDs were in full agreement on the need to protect the environment and biodiversity from the negative impact of modern biotechnology. They were also in agreement with the fact that ethical principles could be used as protective measures in terms of protecting the environment and biodiversity. This is in sync with the findings of Maxwell and Hirsch (2020). According to these authors, ethical and religious discourses are needed in order to promote a more harmonious, sensitive and respectful community. These are the basic elements and fundamental ingredients for a peaceful society or nation.

The experts believe that the three ethical principles are important, need to be taken seriously, and to be complied with. They serve as proactive steps in terms of protecting the environment and, in turn, biodiversity, against the possible negative impact of modern biotechnology. The summary of the result of this research can be seen in Table 2.

Trustees

The first ethical principle relates to the concept of trusteeship. Generally, trust and trusteeship are two principles that are not limited or solely applicable to modern biotechnology but also relate to other areas and contexts. The term 'trustee' stems from the word trust. By definition, a trustee is someone who is appointed and entrusted to do something on behalf of, and in the interest of, a second person (Yaacob 2012). According to Shomali (2008), a trustee has a responsibility to uphold and execute the trust according to the wishes of his bestowal at all times. In the context of the article, mankind is seen as the trustees in his relationship with Planet Earth, the environment and biodiversity. Although mankind can enjoy bountiful natural resources, they are not without limits (Mohamed 2012). Mankind has the obligation to be compassionate and protective towards the environment, its biodiversity, flora and fauna, for the sake of others and of future generations (Loubser 2005). Based on the above, the research team proposed the following description of the term 'trustee' for the consideration of the experts:

"A trustee takes on a trust and must hold it in harmony with the wishes of his/her creator, making human beings vicegerents and not lords and masters of the earth in a dictatorial sense. They have the responsibility to live in kindness, compassion and justice with all of creation and to care for the gift of nature in accordance with the laws of his/her Bestowal. The principle of trusteeship portrays humans as trustees who are provided with bounties that should be enjoyed within limits, thus should avoid selfishness and be concerned with regard to the various elements of nature such as the environment, flora, fauna and others."

All panelists then agreed to adopt the trustee principle as part of the bioethical guidelines. However, they suggested a number of amendments in order to improve and contextualize the terminology in terms of the needs of modern biotechnology, and the suitability for the diverse communities that exist in Malaysia. P2 stated that:

"A trustee is more than a practitioner who is involved with modern biotechnology. I mean it must refer to the ones who have power to implement, approve, do research, and so on."

P2 added, "*We can mention scientist, regulators and etc.*" (P2). The rest of the panelist did not have any objections to P2's comments and suggestions. In fact, they wanted the role of stakeholder or practitioner in modern biotechnology to be professionally-linked for a clearer description and understanding of the trustee principle.

All of them were concerned with the choice of the word 'God' in describing the bestowal or creator of the environment. They feared that such a term might cause confusion. P13 felt that the terminology "God" is one of many parables to describe the Creator, Bestowal or Grantor. P13

added that, in Buddhism, the concept of 'God' does not exist. *"I think perhaps we can standardize the use of 'Creator' to refer to 'God' in this description of a trustee."* (P12)

P13 commented:

"I do not know how to explain this. In Buddhist practice compared to Islam, Hinduism and Christianity, it is the only religion that is an atheistic religion in that there is no concept of 'God'. We believe things happen by the law of nature, the law of interdependence origination in *Pratityasamutpada*. For our society, I think perhaps we can add a word like 'and' or 'or' regarding the 'law of nature'. Which means either you believe in a 'Creator God' or in a 'Law of Nature.'" (P13)

Both suggestions were accepted and agreed by the other panelists. Therefore, the definition of trustee would include the words 'Creator or Law of Nature' to make the definition more universal. P15 commented about the need to restructure and shorten the first sentence by dividing it into two parts.

"I want to suggest the words 'human beings are vicegerents and not lords and masters of the earth in a dictatorial sense' be taken from the first sentence and put into the second sentence for the description of this principle. I just feel that the first sentence is quite long." (P15)

All panelist seconded the changes as suggested by P2, P13 and P15. The final version of the definition for trustee as agreed by the panelists is as shown in Table 2.

Precautions

The principle of a precautionary approach could be found in the Rio Declaration on Environment and Development (1992). Conceptually, the Rio Declaration 1992 wants member states to introduce precautionary measures in protecting the environment within their capabilities. The UK Interdepartmental Liaison Group on Risk Assessment (2012), shares the same stance and believes that such precautionary measures could be invoked, based on empirical evidence or plausible causal hypotheses that harmful things might occur, no matter how remote the possibility. Tentatively it should be invoked on a mandatory basis in the absence of scientific certainty, and it is impossible to assess potential risk with any great confidence. The definition of the precautionary principle used in Rio Declaration 1992 was proposed to the experts for evaluation. It is as follows:

"When there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation. The precautionary principle should be invoked when:

1. There is good reason, based on empirical evidence or plausible causal hypotheses. There is a belief that harmful effects might occur, even if the likelihood of harm is remote; and
2. A scientific evaluation of the consequences and likelihoods reveals such uncertainty that it is impossible to assess the risk with sufficient confidence to inform decision-making."

Without hesitation all the panelists agreed to accept and use the above principle as part of the bioethics guidelines, albeit with some improvements and contextualization so that it becomes more relevant, practical, and suitable for local conditions. P6 wanted the principle to be broad and sufficiently inclusive to embody other areas or fields, and not be limited solely to the environment. *"I think this principle should not be limited only to environmental issues, but should include modern biotechnology issues."* (P6). P10 added, *"Yes, I agree. Modern biotechnology can be a threat to human health. Both human health and environment issues are crucial issues in modern*

biotechnology.” (P10). In addition, P6 suggested: “I think we can include ‘biological diversity’ along with the word ‘environment’ in this description.” (P6). After much deliberation, the panelists agreed that the final description of the precaution approach principle would appear as stated in Table 2.

Animal Welfare

The research team proposed the following definition used by The National Framework of Ethical Principles in Gene Technology (2012) to the experts. This states that:

“Respecting animals used or generated for research involving genetic modification also requires consideration of the possible consequences associated with the welfare of genetically modified animals, as well as the possible effects on human and animal health and the environment.”

All panelists agreed that the principle of animal welfare must be included when developing bioethical guidelines for modern biotechnology in Malaysia. According to P6, such a move is in line with the Malaysia Animal Act (2015). The said Act mainly aims at the prevention of any misuse of animals before, during and after the process of biotechnology research. P6 stressed that: “I really think it is important for us to cover animal rights.” (P6). P8 supported P6: “The Animal Welfare Act should be included or mentioned in the description so that the user of these guideline can refer to it.” (P8).

All the panelists agreed that animal welfare is very important in modern biotechnology. They fully accept the description of this principle by mentioning the Animal Welfare Act (2015). The final result after the FGDs shall appear as stated in Table 2.

Table 2. Summary of ethical principles after FGDs harmonized by the stakeholders

No	Ethical principles after FGDs	Comments from the stakeholders	Practical uses for the harmonized ethical principles
1	<i>Trustee</i> Trustee refers to scientists, industry and government regulators who take on a trust and must hold it in harmony with the wishes of his/her Creator or Law of Nature. Human beings are vicegerents and not lords and masters of the earth in a dictatorial sense. This principle portrays humans as being provided with bounties that should be enjoyed within limits. A trustee should avoid selfishness and be more concerned with various elements of nature such as the environment, flora, fauna and others. A trustee has a responsibility to live in kindness, compassion and justice with all of creation, and to care for the gift of nature in accordance with the laws of his/her Creator.	<ol style="list-style-type: none"> To point out that a trustee refers to the stakeholders who are involved with modern biotechnology Standardize all the word that refer to God as ‘Creator’ in order to avoid confusion. Add ‘Law of Nature’ alongside ‘God’ in order to show respect for those who do not believe in a Creator such as Buddhist. To restructure the description by dividing the first sentence (quite a long sentence) into two separate sentences. 	The harmonized description focuses particularly on modern biotechnology and is universal to both believers and non-believers and is reader friendly.
2	<i>Precautionary</i> Where there are threats to human health or serious or irreversible damage to the environment and biological diversity, a lack of full scientific certainty shall not be used as a reason for postponing cost-	<ol style="list-style-type: none"> To include human health issues on the description To use ‘environment and biological 	The harmonized description is not solely focused on environmental impact but the emphasis also covers the other

	<p>effective measures to prevent human health problems and environmental degradation arising.</p> <p>The precautionary principle should be invoked when:</p> <p>i) There is good reason, based on empirical evidence or plausible causal hypotheses. There is a belief that harmful effects might occur, even if the likelihood of harm is remote; and</p> <p>ii) A scientific evaluation of the consequences and likelihoods reveals such uncertainty that it is impossible to assess the risk with sufficient confidence to inform decision-making</p>	<p>diversity' instead of 'environment'</p>	<p>important impact of modern biotechnology on human health.</p>
3	<p><i>Animal welfare</i></p> <p>Respect for animals is reflected in the Animal Welfare Act (2015). This is designed to prevent cruelty to animals. Respecting animals used or generated for research involving modern biotechnology, requires consideration of the possible consequences associated with the welfare of genetically-modified animals.</p>	<p>1. To mention the Animal Welfare Act (2015) (Malaysian Law)</p>	<p>The harmonized description is more comprehensive</p>

Discussions

Several important features emerged from the research. It is acknowledged that for centuries human beings have over-exploited nature. These irresponsible activities have caused and had severe negative impacts on the environment and on biodiversity (Bagader et. al. 1994; Gada 2014). On a positive note, there is evidence of emerging concerns on the part of global communities for the protection of the environment and of biodiversity. This research, for example, is one small contribution from Malaysia. It is truly believed that the invocation of ethical principles in the proposed bioethics guidelines for modern biotechnology could assist Malaysia specifically, and the rest of the world generally, in achieving the same noble objectives (Hasim et. al. 2020).

Discussions on bioethics inevitably have to include ethical principles, and these must also be viewed and assessed from a religious point of view. As a concept, ethics refers to moral values, principles or good conscience (Webster 1988). Ethics are known to have a religious origin as God, as the source of moral authority, teaches mankind to be good people and do things correctly (Oxford Dictionary 2018; Al-Quran: Baqarah, 2: 31). This is in line with the opinion of Yaacob (2012) who described mankind's greed and disregard for others as the main source of the environmental crisis. According to him, God, as stated in Al-Quran; Baqarah 2: 21, has entrusted mankind with the responsibility to act as vicegerent or trustee of Planet Earth for future generations. Unfortunately, man as a trustee has failed to discharge that responsibility responsibly. On the other hand, Shomali (2008) suggested that a sound religious understanding could help human beings to become better and more responsible when it comes to protecting the environment. Such a message can be found in al-Quran: al-Tin; 4, al-Isra' 11; 70. For example, man's religiosity and wisdom would guide him to review and adjust policies regarding the use of modern biotechnology that are potentially harmful to nature, the environment and biodiversity.

In the discussions, the experts deliberated the topic and compared the concept of trustee from Islam as well as from other religions' points of view, for harmonization and integration purposes. This is a very significant consideration. Legally the status of Islam as the official religion of Malaysia is enshrined in Article 3 of the Federal Constitution. However, the same provision gives equal freedom to believers of other religions to practice their religious beliefs peacefully and to express mutual respect for others. The same mandate is the manifestation of Al-Quran

which demands that Muslims respect other religions. "Do not abuse those whom they worship besides Allah" (Al-Quran, al-An'am 6:109). The same is reinforced and supported by a *hadith* of the Prophet Muhammad, which serves as secondary source of *Sharia* Law. According to this *hadith* "Beware! Whoever is cruel and hard on a non-Muslim, minority, or curtails their rights, or burdens them with more than they can bear, or takes anything from them against their free will; I (Prophet Muhammad) will complain against the person on the Day of Judgment." (Abu Dawod 1997)

Comparatively, Islam is known to have stricter requirements and more encompassing needs than other religions. Plausibly, one issue may be acceptable to all other religions but not to Islam and *vice versa*. Furthermore, the teachings of Islam are not limited to Muslims solely, but for the whole of mankind. Likewise, Islam never rejects but acknowledges and readily accepts any good teaching from non-Islamic sources as long as they are not contradictory to its requirements or in situations in which such principles could be modified to suit Muslim needs. This is the clear message sent by Prophet Mohamed when he said "O believers, do mingle with those of good behavior" (Abu Dawod 1997). He even encouraged his companions and Muslims in general to travel as far as China in order to learn from the Chinese (Ibn Majah n.d), at a time when not much was known about China, and China was a non-Muslim country.

The research uncovers several conceptual similarities between Islam and other religions, as discussed below. It also reveals the significance of understanding and sensitivity towards each other as part of the harmonization and integration process of accommodating the diverse requirements and needs of all others. For example, the use of the term "God", "Bestowal" or "Lord" in referring to the Creator is a non-issue to one group. Yet the same feeling is not shared by the others. It was therefore important for the research team to resolve such a situation amicably, without offending anyone or their religion, or to dilute the expressed opinions of the experts. For example, the term "God", "Lord" or "the Bestowal" is commonly acceptable to describe the Creator or Ruler of the universe by all the major religions in Malaysia. God refers to the Creator and Ruler of the whole world, the Supreme Being and the source of moral authority (Oxford Dictionary 2020). People most likely refer to God in explaining the presence of the 'Creator', even though this word is in no manner associated with scripture (Bartholomew & Goheen 2005). The Buddhists have a different perception. They believe more in the Law of Nature instead of a "Creator" due to the strong and powerful association between human morality and the natural environment. This notion was based on the theory of five natural laws of *pañca niyamadhamma*, representing the physical, biological, psychological, moral and causal as stated in Atthasalini (272-274). According to Vasconcelos (2017), the physical environment shall have direct influent on the evolution and organic progress of the development of biological components. Consequently, this will influence the psychology and the morality of people dealing with them. Consequently, the mutual influence of the laws to one another establishes the relationship between man and nature (De Silva 2013).

The broad ranging literature review carried out during the early stage of the research proved to be beneficial. This enabled the research team to cover and include the findings of previous researchers and, in turn, to enrich the research. As far as this research is concerned, the literature review covered a range of topics including religion, morals, ethics, the environment, social and economic features, biodiversity and modern biotechnology. As a result, the researchers were able to discover and reaffirm many similarities in terms of terminologies, concepts or principles with regard to the questions under consideration. The similarity was strengthened when discussing the three ethical principles. For example, the concept of trustee as found in other legal or administrative system (Jain 1988) is equivalent to the concept of human viceregency or *Khalifah* in Islam (Wartini 2016). From an Islamic perspective, every human is an appointed steward or trustee whose role it is to safeguard God's creation on earth. As stated in al-Quran:

"And lo! Your sustainer said to the angels: Behold, I am about to establish upon earth a Khalifa."
(Al-Quran, al-Baqarah 2:30)

"It is He who appointed you *Khalifs* on this earth" (Al-Quran, Al-An'am 6:167)

Mohamed (2012) explains the meaning and responsibility of a *Khalifa*. He or she is responsible and accountable to mankind in general, and God specifically, in using and managing Planet Earth and its resources. While he is allowed to benefit from such resources, he must never transgress this privilege. As intellectual animals, only human beings have the capacity to use their minds and knowledge in administering the world for the betterment of all (al Quran, al-Ahzab 33; 72; Faqih 1997). Thus, the trustee must strike a balance between rights and responsibilities (Musaji 2012). Yaacob (2012) opined that such values could guide a person to develop a penchant and appreciation with regard to nature and the environment. Both Quranic principles are shared and appear in the wise words of scholars who believe "The present generation is not inheriting the world from past generation, but they are borrowing it from future generations" (Yaacob 2012).

The principle and approach with regard to precautionary measure as embodied in the Rio Declaration (1992) is heavily embedded in Islamic teaching and history (Yusuf 2011). According to Islamic jurisprudence, the concept of precautionary measures relates to avoiding any potential harm to human health and the environment (al-Allaf 2010). The concept is applicable in any situation and not merely restricted to one particular issue or area. It is indeed a useful decision-making tool. Various major historical events in Islam have narrated the same concept. For example, in the *Hudaibiyah Treaty*, the Prophet Mohamed (pbuh) agreed to postpone that year's pilgrimage for another year in order to avoid calamity and war with the people of Mecca. So too was the suggestion of Salman Al-Parisi, the champion of Prophet Mohamed (pbuh), for the Muslim military to dig trenches far from the Medina city and dwelling areas during the *Khandaq* war. This was to protect the city, the inhabitants of Medina, and their property from being attacked and to prevent the unnecessary and costly destruction of their properties and lives. In Islam, the precautionary measure is applicable when it is essentially necessary (*maslahah al-dharuriyyah*), there is a need to do so (*maslahah al-hajiyah*) and for embellishment purposes (*tahsiniyyah*) (Laldin 2006).

According to Mahmassani (2000) and Wartini (2016), the principle of precautionary principle is very much aligned with the concept and the five pillars of *Maqasid al-Shariah* of Islam which are meant to protect religion, life, wealth, progeny and intellect. In the context of modern biotechnology, precautionary measures are put in place to protect life in general and mankind in particular, to enable the society to live healthily, freely and with dignity and respect (al-Allaf 2010).

The interest in animal wellbeing is also included in the proposed guidelines or policies related to modern biotechnology. Apart from being part of the complex ecosystem of nature, animals are used as experimental subjects in many modern biotechnology labs. Consequently, animals have saved human being from being experimental 'lab rats' (Sira 2017). According to best practice, human beings must treat animals with dignity and humanely, before, during and after biotechnology research (Victoria 2006). Causing them unnecessary injury is totally prohibited (Saifuddeen et. al. 2014). Anyone who abuses, mistreats or is cruel towards animals, even for research purposes, can be fined up to a maximum of RM100000 or face three years of imprisonment under the Animal Welfare Act (2015). Comparatively speaking, this requirement is very much practiced in Islam. As a trustee, a man is expected to treat all living things, including plants and animals, with consideration and kindness (al-Quran, al-Ahzab 33:72) simply because, they too, like human beings, are the creation of the All Mighty. The prophet Mohamed's attitude and behavior towards animal are simply exemplary. His refusal to stir awake a cat that was sleeping on his robe not only exemplified such a good deed, but took everyone by surprise. Instead, he simply cut out a portion of the robe and let the cat continue to sleep! (Yusuf 2019).

The importance of engaging with a range of stakeholders as part of the process of obtaining direct primary data should not be underestimated. It is also important to identify and select the correct stakeholders. In this case the invited stakeholders were not limited to policy and decision makers from the public sector of government. They also included biotechnologists, scientists, industrial employees, health professionals, researchers, and government regulators (Aerni 1999; Amin et. al. 2013). Their inclusion is important because they could relate their first-hand practical experiences and observations to relevant parties, making them an expert in their field of work. Their expert opinions could influence the government's decision-making processes,

especially in designing, formulating, developing and enforcing policies and decisions. They could also affect society's response and the acceptance of society (Capalbo et. al. 2015).

Lastly, it is good practice for policy makers or any proponents to use simple terms and short sentences in designing the proposed bioethics guidelines. By so doing, the proposed work becomes more user-friendly and easier to understand. Whenever there are too lengthy sentences, it is best to simplify and shorten them. In a book on Research in Medical and Biological Sciences: From Planning and Preparation, Petter and Haakon (2015) pointed out best practice, and the advantages of reducing long sentences by adding full stops or commas. Furthermore, a reader-friendly sentence rarely exceeds 22-25 words. This is to cater for the diverse needs of people from multiple backgrounds.

To conclude, this research has successfully established the most appropriate definition for the principle of trusteeship, precautions and animal welfare. They would in turn be used as a reference when developing the proposed bioethics guidelines for modern biotechnology. These are achievable as the result of cross-referencing with many sources of information. This is possible due to the use of correct types of question posed to the experts. As expected, there are plenty of differing views on the part of all the stakeholders. This is normal and expected due to diverse socio-economic status, races, religions and cultures in Malaysia. Whatever the disparity or differences, they must be discussed and deliberated on further to make them acceptable to all. It is crucial for the research team to stay neutral and unbiased during the data collection and discussion. It is important to maintain the same attitude and outlook when the research team are asked to change the terms, as those suggestions are usually made for the purpose of making the work better and clearer for all. The FGDs were shown to be a useful platform and an important way in which participants can engage in deliberate discourses on selected issues, where they can explore, discuss and come to mutual decisions. The presence of experts is very useful for input and for validation purposes, in making the proposed bioethics guidelines more credible.

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