

## Genetically Modified (GM) Rice : Exploring University Students' Awareness and Acceptance in Malaysia

N. Saripudin<sup>1,\*</sup>, A. Sulaiman<sup>1</sup>, A. Awal<sup>1</sup> and N. Mat Nor<sup>2</sup>

<sup>1</sup>Centre of Postgraduate Studies, Faculty of Plantation and Agrotechnology, Universiti Teknologi MARA, 40450 Shah Alam Selangor.

<sup>2</sup>Arshad Ayub Graduate Business School | Universiti Teknologi MARA, Universiti Teknologi MARA, 40450 Shah Alam Selangor.

\*Corresponding author. Tel.: +60168300487, Email: noraini.saripudin@gmail.com

### Abstract

*The adoption of genetic engineering in agriculture has made a strong impact. It not only resulted in positive implications but also raised controversies across the continents leading to further research on consumers' awareness, acceptance and perception on GM food. This study was conducted to explore the awareness and the acceptance of GM rice among students in Universiti Teknologi MARA (UiTM) Selangor as there has been no similar study on students in Malaysia. A qualitative approach was adopted in this study; focus group discussions among UiTM students from two campuses and semi structured interviews with representatives from different fields. Findings from data collected revealed that a majority of the students in UiTM Selangor were neutral regarding GM rice and the public in general have low awareness and negative acceptance towards GM food in Malaysia. Educational background have made an impact on awareness; science students showed higher level of awareness compared to non-science students. Several recommendations could be made to the relevant government bodies to enhance the current scenario. These include exposure of genetic engineering technology to students from primary to tertiary level in Malaysia, formulating strategic agricultural policies and plans to benefit the farmers and engagement of appropriate GM awareness programmes for the public.*

**Keywords:** GM rice, Students, Acceptance, Awareness

### Introduction

Genetic engineering has gained recognition among the scientific community as a powerful tool to offer better quality traits in crops such as having enhanced resistance against certain diseases (Pandey et. al, 2013). This state-of-the-art technology allows the modification or exchange of genetic components from one organism to another. It aims to improve certain traits in that organism to benefit the entire population. The application of genetic engineering in agriculture has resulted in the emergence of genetically modified (GM) crops or food. GM crops varieties were first commercialized in mid 1990s in US and had since experienced steady growth as farmers were gradually introduced to and became ready to adopt to this new technology due to its significance in increasing their crop yield while reducing the production costs at the same time (Cowan, 2011). Among the first commercialized GM crops were potato, cotton, maize, soybean and canola (Basu et. al, 2010)

The emergence of genetic engineering technology in agriculture have been a heated topic of discussion amongst scientists, politicians and the public, and this have given rise to a variety of different perceptions. The perceptions of these group of people have been the focal point of numerous studies by researchers in several countries around the world for the past decades since GM crops had been introduced. The majority of people from most countries in the world have different perceptions about GM crops as well as GM food. Numerous studies have been conducted in several countries

across different continents to determine the acceptance of students on genetically modified food and the factors which influence their awareness and attitudes. Students are an interesting cohort to study because they are the younger generation who will become the primary consumers in the future, and they will become the future leaders and policy makers. Results from a study done in Tennessee State University revealed that students in the biological sciences had better knowledge and hence less fear of biotechnology. In addition to that, respondents with backgrounds in agriculture seemed to favour biotechnology products compared to others (Tegegne et al, 2013). Data from Higher Learning Institutions in Kenya demonstrated that GM foods purchasing decisions, moral values and awareness are factors which have correlation with consumer choices of GM food (Bett et al, 2014). One theory of awareness and acceptance is that the more people know about a biotechnology, the more intense their support or opposition will be for this topic (Fischhoff, 1995).

Previous studies have been done among the public in Klang Valley as well as in Johor regarding the awareness and acceptance of GM foods. However, study on similar matters on different cohorts, particularly students, are absent. As such, there is a gap in the recent studies concerning GM foods in Malaysia. There is a need to understand the level of students' acceptance on genetic engineering technology specifically towards GM crops which will be used to produce GM foods and if knowledge in genetic engineering and modification technology

would influence their perception. By knowing their acceptance and awareness level, it will greatly help to gain a better understanding on the readiness and the intention of future Malaysian generations to purchase GM rice as well as providing a clearer picture to the relevant parties to formulate a better strategy to commercialize GM rice as well as providing some input to the policy makers on the regulations for GM food. Rice has been chosen in this study because it is the staple food of the people in the country and GM rice might be one of the options available in the future to accommodate the increasing population.

### Materials and methods

For this study, two focus group discussions were organized in two UiTM campuses in Selangor and two semi-structured interviews were done with two individuals representing different field. Quoting Halcomb et al. 2007, Cleary et al. (2014) reported that if the number of focus group discussion is fewer than two, this may lead to questionable true representation especially when the representativeness is the core element in the study. In this study, each session of the focus group discussion comprised of eight students, male and female, from various faculties. The campuses involved are UiTM Shah Alam and UiTM Sungai Buloh. Respondents in UiTM Shah Alam were recruited by direct approach at the campus library as well as at the faculty while respondents from UiTM Sungai Buloh campus were recruited by direct approach at the Institute of Medical Molecular Biotechnology and Faculty of Dentistry. All sixteen respondents were mixture of male and female students. The sessions were recorded for data analysis.

The sampling method was based on purposive sampling in which it allows selection of respondent based on the characteristics of each individual and therefore the sample size was not the fundamental matter in the study (Wilmot, 2005). For interviews, one person was invited from one of the agricultural research institutes in the country and another from the academic field. A set of questions with three sections were discussed among the respondents during the sessions. The first section includes the engagement questions, the second section consist of exploration questions and the third section are the exit questions. Below were the questions discussed during the focus group discussion.

Engagement questions:

1. What does the term GM evoke?
  - a) What do you understand about GM?
  - b) How do we feel about GM food
2. From where have you obtained information regarding GM food and GM rice?

- a) Do you trust the current information available?

Exploration questions:

1. Do we read food labels, and why do you do so?
  - a) What do we read on labels.
2. What is your opinion or impression on GM labelled rice if you come across with one?
3. When you decide to purchase GM rice, what do you look for?
4. What are the risk and benefits do you think you gain from GM rice.
5. How would you describe your attitude towards GM food, particularly GM rice.

- a) Can you explain further why is your attitude towards GM rice is like that?

Exit questions:

1. What do you think about the future of GM rice in the country?
2. How do you prefer the information about GM food, particularly GM rice to be disseminated to the public?

These were the questions asked during the focused interview.

1. What is your opinion on the awareness and acceptance of GM food among our general public?
2. What is your opinion on the study of awareness and acceptance of GM food among students in Malaysia?
3. What do you think are the contributing factors to the current situation?
4. How do you see the future of GM food and GM rice in Malaysia?
5. Do you think it is necessary to inform and educate the general public, and why? What do you think is the best way to educate the public?
6. What do you think of early education exposure?

In this study, the recorded data for both focus group discussions and semi-structured interviews were transcribed using the Nvivo12 software. Data coding is a very fundamental stage in data analysis. Generally, it is carried out in two phases. According to Charmaz (2006), the first phase is known as initial coding in which a list of all arising ideas, diagrams or mind maps is prepared by the researcher as well as running query over the data to find any words that commonly raised

by the respondents. The second phase is known as focused coding giving emphasis on removal, merging or subdivides all the coding groups generated in the first phase. It is also very crucial to identify the recurring themes which link all the codes (Charmaz, 2006; Krueger, 1994; Ritchie and Spencer, 1994) in Nyumba et al., (2017). The transcripts from the two focus group discussions were saved in the Nvivo12 software to ensure the

data is systematically stored and easier to retrieve for processing. Initial coding was initiated by highlighting all the emerging ideas from all the transcripts followed by grouping these ideas into several categories. In the second phase, comparison among these categories was done to establish the

links between all groups and individual, resulting in the emergence of the themes for the discussions. Themes were the main issues, or the key points that were being discussed frequently among the respondents during the discussions and was classified as the findings of the study.

### Results and discussion

There were two interview sessions and two focus group discussions that were carried out in this study. The focus group discussions were conducted at two UiTM campuses in Selangor, namely Shah Alam and Sungai Buloh. Eight respondents were recruited for each of the sessions, comprising of both males and females, undergraduates and postgraduates from a variety of faculties. Each respondent in the focus group discussions was tagged as R1 up to R16, while the individuals being interviewed were labelled as individual 1 and individual 2. Three different sections of questions were asked; the engagement questions, exploration and the exit questions. All questions were open ended, and the respondents were encouraged to express their opinions and feedbacks freely. All sessions had visual and auditory recording in place. Below are the respondents' profiles for the study.

Table 1: Respondents' profiles in the interview

Profession	Gender	Industry
Individual 1: Professor	Male	Academic
Individual 2 : Senior research officer	Female	Biotechnology and agriculture research

Table 2: Respondents from UiTM Shah Alam

Respondent	Gender	Faculty	Age
R1	Female	Applied Science	21
R2	Female	Applied Science	21
R3	Female	Applied Science	21
R4	Male	Chemical Engineering	25
R5	Male	Plantation and Agrotech	32
R6	Male	Plantation and Agrotech	24
R7	Female	Plantation and Agrotech	24
R8	Female	Arshad Ayub Graduate Business School	23

Table 3: Respondents from UiTM Sg. Buloh

Respondent	Gender	Faculty	Age
R9	Female	Dentistry	20
R10	Female	Dentistry	20
R11	Female	Institute of Medical Molecular Biotechnology (IMMB)	22
R12	Female	IMMB	22
R13	Female	IMMB	23
R14	Female	IMMB	23
R15	Female	IMMB	22
R16	Female	IMMB	22

Table 4: Awareness towards GM rice among students

Awareness on GM rice	Group 1	Group 2
Modify gene/DNA	12.5%	37.5%
Genes transfer	25.0%	-
Change the gene	25.0%	-
Improved rice quality	25.0	12.5%
Better crops	-	12.5%
Something new, unfamiliar	12.5%	-
Secondary school exposure	-	25.05%
Tertiary education exposure	50.0%	75.0%
No exposure	12.5%	-

Table 5: Acceptance towards GM rice

Acceptance towards GM rice (%)		Determinants
Indifferent	50%	Concerned on safety. Concerned on trade monopoly Increased rice yield. Improved rice quality.
Positive	31.25%	Increased food supply.
Negative	18.75%	Unknown health risk. Not natural, not original rice.

Response from the respondents in this study reflected that students from science background have a higher awareness towards GM food compared to non-science student. They were able to describe gene modification technology and what genetically modified food is all about in general. The table presented the results relating to the awareness towards GM rice based on what the students understand about GM rice. It was demonstrated that 25% of respondents in UiTM Shah Alam group mentioned the word “gene transfer”, 25% mentioned “change the gene” and another 25% mentioned “improved rice quality” when asked about their understanding regarding GM food and GM rice. One (12.5%) mentioned “modify gene or DNA”. This showed that the respondents have certain extent of awareness towards GM food and GM rice. One respondent who was a non-science student (12.5%) mentioned that the term genetically was something new and was not familiar with it. This was the statement of the respondent.

***“From my opinion, it is new to me. First time I heard about GM rice so from my perspective GM rice is not original rice.” [R8, Business School student]***

The study also revealed that most of the students gained their knowledge on genetically modified food during their tertiary education. While some have heard of GM food during their secondary school education, there was a respond stating that GM was unheard of. This might be due to the absence of genetic modification subject in the learning syllabus. When asked regarding their perceptions towards GM rice, mixed response were given by the respondents.

Results showed that most of them have a neutral stance towards GM rice, while some felt positive and few were having negative perceptions. Eight from sixteen respondents were neutral, five were positive and another three rejected the idea of GM rice. The majority of students in the study were neutral because they have the impression that GM rice have valuable traits but the technology itself

might pose unknown risks to consumers and to the environment in the long run. The fact that they are from science background indicates that knowledge per se is not a key factor in shaping a positive attitude towards GM rice. However, it does help to stimulate a fair and receptive perception, giving an indication that the GM rice acceptance might be possible in the future. Respondents who perceived GM rice negatively are from both science and non-science background. Their reason for being sceptical towards GM rice was that this rice is not natural, not from the land and will not have equivalent characteristics as compared to the normal rice. It is human nature to feel unsafe or sceptical or to doubt something new or “alien” to them. This has been highlighted in some studies previously pertaining to consumer perception and attitude towards GM food. In the case of golden rice perception in Malaysia, a previous study revealed that Muslim respondents in Klang Valley did not reject the idea of transgenic rice entirely because it was basically a plant to plant gene transfer and the health benefits carry some weights (L. Amin et al., 2010). Similar perception is also shared with the public as suggested by the respondents during the in depth interview sessions. A study among academicians regarding their perceptions and attitude towards GM food revealed that they are sceptical due to unknown risks especially towards human health, ecological risk and safety (Kaya et al., 2013).

These were some of the responds from the students about their perceptions.

***“I will eat it if they can prove on the safety” [R5, Agrotech student]***

***“As for me, it goes both the consumer and producer, The positive thing is nutritional Aspect of it there’s a lot of increase in nutrition that we can get from GM rice and the price is cheaper because the production can be increased and as for the negative effect, the concern is also on environmental, since Malaysia is a biodiverse country we have a lot of rice species we have to protect so what happen if cross pollination happen***

*between the GM and we going to lose a lot of the native species and that is why I feel neutral about GM” [R15, Female science student]*

*“...I will be scared to purchase the GM rice too because it is modified. My impression is that it is not natural and I don’t feel it is safe.”[R13, Female science student]*

Several issues were discussed during the focus group discussions relating to their acceptance towards GM rice. According to the students, there are few benefits GM rice could offer to consumers which significantly influenced their perceptions and attitude towards GM rice. Perceived benefits have been reported in many studies previously to be influential in people’s attitude and willingness to consume or to purchase certain food. The present study has demonstrated similar tendency among the respondents.

Findings during the interviews have pointed out some notable remarks regarding the acceptance of GM food among the members of public in Malaysia. The acceptance level of GM food among the public is still very low and the perception is negative. One factor that contribute to this is the lack of knowledge about the science behind GM food. As such, people always have sceptical thinking towards GM food. One of the individual interviewed has shared his view on this as below.

*“The situation is always exacerbated make things more difficult because of lack of knowledge, lack of awareness, lack of proper information like a proper understanding and of course well we have to accept that media maybe not the official media but the social media they tend to blow things out of proportion and come out with stories like myth or even Frankenstein related stories like this is Frankenstein like food. These are all uproars which are not true reflection of the actual findings.”*

#### **Conclusion:**

Formal education plays an important role in acquisition of knowledge. Introducing genetic engineering technology in the syllabus of secondary educations could also help to give better understanding to the students about the science behind genetically modified food. Knowledge has been emphasized in a number of previous studies before relating to better understanding, better perception and increased of positive acceptance towards GM food. Engagement of GM awareness program to improve current awareness level among student populations as well as the public is very important. Lack of awareness have been reported to

be one of the key factors for negative perceptions and rejection of GM food in other places.

In Malaysia, organizations like Malaysian Biotechnology Information Centre has play a very important role in promoting biotechnology to the general population. It aims at providing correct information regarding biotechnology to the society. This organization has carried out awareness programs such as roadshow as well as workshop to increase awareness and to help educate people about biotechnology. Similarly, education institutions or research institutions should come up with similar effort. Studies revealed that students and the public trust the educators and university scientists in disseminating correct information. Therefore, any GM awareness programs organized by universities and research institutions can strengthen the trust among the lay people and promote better understanding and perceptions about GM rice.

#### **References:**

- Bett, E. K., Nyairo, N., Ayieko, D. M. O., and Amolo, J. O. (2014). Determinants of Consumer Perception towards Genetically Modified ( GM ) Foods in Higher Learning Institutions in Kenya, 5(24), 35–45.
- Cleary, M. , Horsfall, J. and Hayter, M. (2014), Data collection and sampling in qualitative research: does size matter?. J Adv. Nurs, 70: 473-475.
- Cowan, T. (2011). Agricultural biotechnology: background and recent issues. CRS Report for the Congress, 7–5700, 46.
- Fischhoff, B. (1995), Risk Perception and Communication Unplugged: Twenty Years of Process1. Risk Analysis, 15: 137-145.
- Kaya, I. H., Poyrazoglu, E. S., Artik, N., and Konar, N. (2013). Academicans ’ Perceptions and Attitudes toward GM-Organisms and – Foods. International Journal of Biological, Ecological and Environmental Sciences, 2(2), 2–6.
- L. Amin, N.A.A. Azlan, J. Ahmad, A.L. Samian and M.S. Haron (2010). Ethical Perception of Golden Rice in Malaysia, 11(2), 71–78.
- Ochieng NT, Wilson K, Derrick CJ and Mukherjee N. The use of focus group discussion methodology: Insights from two decades of application in conservation. Methods Ecol Evol. 2018;9:20–32
- Pandey, P., Singh, A., Yadav, P., Kumar, P., and Deepti, B. (2013). Role of biotechnology in plant diseases management : An overview, 1(3), 215–221.
- S. K. Basu, M. Dutta, A. Goyal, P. K. Bhowmik, J. Kumar, S. Nandy, S. M. Scagliusi and R. Prasad (2010) Is genetically modified crop the answer for the next green revolution?, GM Crops, 1:2, 68-79
- Tegegne, F., Aziz, A. N., Bhavsar, H., and Wiemers, R. (2013). Awareness of and Attitudes towards Biotechnology by Tennessee State University

- Students with Different Backgrounds and Majors, (January), 16–23.
- Wilmot, A. (2005). Designing sampling strategies for qualitative social research: with particular reference to the Office for National Statistics' Qualitative Respondent Register. *Survey Methodology Bulletin-Office for National Statistics*, 1–14.
- Wunderlich, S., and Gatto, K. A. (2015). Consumer Perception of Genetically Modified Organisms and Sources of Information. *Advances in Nutrition*, 6(February), 842–851.
- Zhu, X., & Xie, X. (2015). Effects of knowledge on attitude formation and change toward genetically modified foods. *Risk Analysis*, 35(5), 790–810.