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Consumer Acceptance, Trust, and Perceived Risk Regarding Genetically Modified (GM) Foods: A Survey-Based Study in Bangkok, Thailand

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ABSTRACT

Genetic modified (GM) is a rapidly evolving technique that can help farmers increase their production and profitability. The study looked at consumer acceptance of genetically modified foods in Bangkok, Thailand. The effect of several parameters on consumer acceptance of GM foods was estimated using a qualitative choice (Logit) model. The findings revealed that over 90% of respondents had heard or read anything about genetically modified foods, showing a high degree of awareness among respondents in Bangkok. The findings also revealed that 72% of those polled were willing to accept genetically modified goods. According to the logit model, consumers in the study area between the ages of 31 and 50 were more likely to accept GM foods, whereas male respondents were less likely to accept GMFs. Furthermore, individuals with a secondary or university degree were more likely to embrace genetically modified goods. Consumer acceptance of genetically modified foods in Bangkok was also influenced by household size (ranging from 1 to 5 members), product label reading, and knowledge of science and technology. Public awareness and education are required conditions for GM food acceptance. This study's recommendation is to enhance effective education about the benefits of GM foods to raise the likelihood of adoption.

Keywords

Genetic modified (GM), Bangkok, Thailand, Food, Logit

Introduction

Genetic modified (GM) Food is a term used to describe a sort of plant or animal food that has been made through biotechnology. Supporters of this method believe it will enhance food production efficiency. Biotechnology's ability to improve food production efficiency and nutritional quality is generally recognized [1-3]. As the world's financial resources are employed to develop new and improved products, its use has become more widespread. Agricultural firms can benefit from biotechnology [4, 5]. It can also help to cut down on the usage of pesticides and antibiotics and provide a healthier and more nutritious food source [6-8]. Despite the hype, the public and regulators have had conflicting reactions to genetically modified food (GMF) [2, 4, 9]. The consumer response has been mixed as more products have been released. Many non-governmental organizations and consumer groups have expressed worries about the safety of genetically modified foods, according to research by Kimenju et al. Also mentioned is the absence of consumer choice as a result of inadequate labeling [10]. The idea of unknown long-term health dangers lies at the root of worries

about GM food safety. The usage of genetically modified organisms may have detrimental environmental consequences[9, 11].

Despite the potential benefits of genetic engineering in agriculture and food production, many individuals remain skeptical of their widespread use[12]. The majority of them are concerned about concerns such as the environment, safety, and ethics. Policies governing the use of biotechnology have the potential to cause international trade disputes [1, 13]. The operation of agricultural commodity markets in underdeveloped nations may be harmed due to this issue. Due to traces of genetically modified soybeans, the UK barred the export of processed food products to the country in 2000. These crops have improved their resistance to pests and diseases, as well as their profitability. Researchers are focused on breeding for qualities that consumers want with the development of the second generation of genetically altered crops[5]. Golden Rice is one example of this, as it has been developed to have higher levels of vitamin A. The purpose of introducing genetically modified crops is to improve the health of underprivileged people who eat rice as their primary source of nutrition. If underdeveloped countries are open to foreign trade, they can employ this technology[4, 10].

The use of genetic modified rice will help improve people's health in developing countries. As with the first-generation technology, the benefits of this new crop will be shared by the consumers and producers [2, 13-15]. This paper explores the potential impact of introducing genetically engineered rice into an international market. It also reviews consumer attitudes toward the use of genetically engineered food. The paper also discusses the various international regulations currently being developed to prevent the introduction of genetically engineered crops. It also discusses labeling schemes to address the concerns of consumers. The features of Golden Rice are then compared to commercial cultivars of soybeans and maize. Costa-Font et al. investigated the uptake of genetically modified foods and the various mechanisms involved. The study revealed three types of people who are more inclined to accept or reject GM food: anti-GM food, risk-tolerant people, and risk-averse people [4, 5, 9, 10].

According to the survey, consumers like free food until they can pay for it. According to the report, their preference could also be linked to the numerous qualities and benefits of GM food. According to the study, consumer views toward the commercialization of GM food may be influenced by the costs of GM food and knowledge about it [15, 16]. Kalee and Napasakintuwong employed multinomial logit regression approaches to investigate the factors influencing Thai consumers' desire to buy non-GM food for their research[5, 10]. The findings demonstrate that non-GM labeling rules are a suitable answer to consumer concerns. Huffman studied how willing people are to pay for food containing genetically modified (GM) features. According to the study, they do not respond to a single type of information. According to a study, farmers' readiness to accept new livestock technologies is influenced by several factors. The researchers discovered a link between agricultural income and the readiness to adopt new technology. The study discovered that social, technological, and individual characteristics influence households' propensity to adopt new yam technologies.

The amount of consumer awareness of genetically modified foods in Bangkok was investigated using a Logit regression technique. The elements that determine its acceptability were then modeled.

Methodology:

The Logit framework:

This model was used to estimate the effect of socioeconomic, sensory, and psychographic variables on customer preferences for GM foods [9, 15]. The evidence-based hypothesis asserts that the probability of a customer consuming (accepting) genetically modified food is high., P_i is reliant on a vector of independent variables (X) associated with consumer i and variable j , as well as a vector of unknown factors [6, 10, 17].

$$P_i = P(Z_i) = F(\alpha + \beta X_i) = \frac{1}{[1 + \exp(-Z_i)]} = \frac{1}{[1 + \exp - (\alpha + \beta X_i)]}$$

Empirical Logit Model

The probability of an individual consumer accepting or consuming a food product containing genetically modified organisms is predicted using a statistical model [5, 13].

$$\begin{aligned} WACCEPT = & \beta_0 + \beta_1 Price + \beta_2 Sex(Male) + \beta_3 Age_{(31-40)} + \beta_4 Age_{(41-50)} + \beta_5 Age_{(>50)} + \beta_6 Edu_{(C2)} \\ & + \beta_7 Edu_{(C3)} + \beta_8 Edu_{(C4)} + \beta_9 HH_size_{(1-5)} + \beta_{10} HH_size_{(6-10)} + \beta_{11} HEARD + \beta_{12} ReadL \\ & + \beta_{13} ReL_{CON} + \beta_{14} SafCON + \beta_{15} Ethi_{conc} + \beta_{16} UNDC_{Tech} + \beta_{17} Regul + \varepsilon \end{aligned}$$

Statement of hypotheses

The following hypotheses were tested for equation based on a priori expectations:

1. H0: Price does not affect consumers' willingness to adopt genetically modified foods. H1: Price has a detrimental effect on people's willingness to embrace genetically modified goods. The following characteristics are tested: age, ethical issues, safety concerns, and religious considerations.
2. H0: Education does not affect one's readiness to embrace genetically modified foods. H1: Education has a beneficial effect on one's willingness to embrace genetically modified foods.
3. H0: Government regulation has little effect on people's willingness to embrace genetically modified foods. H1: Government regulation has a beneficial effect on people's readiness to embrace genetically modified goods.
4. H0: Sex does not affect a person's readiness to embrace genetically modified foods. H1: Sex affects one's readiness to embrace genetically modified foods positively or negatively. This procedure is performed for the subsequent variables: Label reading, awareness (knowledge of genetically modified organisms), and household size

Validation of hypothesis:

The Z statistic indicates the level of significance for the independently calculated coefficients. The McFadden R-square test is then used to confirm the Z's significance. The test statistics are based on the chi-square distribution and are used to predict the predictive capability of the model.

Data Collection:

Respondents were selected from three local government regions in Bangkok, Thailand. The subjects were selected based on their level of education. Although the respondents were asked to provide some level of education, some of them could not provide sufficient details for the survey. The data was analyzed by interviewing individuals online and face to face. Through the experiences of the previous researchers, we were able to gather a comprehensive understanding of consumer views on genetically modified food. Through the interviews, the researchers gathered a comprehensive understanding of the Bangkok's consumer views on genetically modified food. The translated questionnaire was presented in both English and national languages.

Results and discussion:

Demographic characteristics of respondents

As per the data collection, male respondents form the most significant proportion of the total respondents, with 62.22% female respondents 37.78%. In less than 30, 52.44% of the respondents are within the age group. Most of the respondents were younger or in their youthful age (Table-1). The household sizes were grouped into 1-5, 6-10, and 11-15. The large family sizes of the respondents indicated that most of them have formal education levels ranging from basic to tertiary [10, 11, 15]. As for the educational levels, most of them had attained secondary education. Only a small number of the respondents indicated that they did not have a formal education[7, 13].

Table 1: Respondents' Distribution by Socio-Economic Attributes.

Characteristics		
Gender	Frequency	Percent
Male	280	62.22
Female	170	37.78
Total	450	100.00
Age		
20-30	236	52.44
31-41	89	19.78
41-50	67	14.89
Above 50	58	12.89
Total	450	100.00
Household size		
41644	145	32.22
41800	218	48.44
41958	87	19.33
Total	450	100.00

Consumer awareness of genetically modified foods:

Approximately 71.11% of those polled said they were unaware of genetically modified foods. About 450 people stated they were unaware of genetically modified foods. The media's coverage of the food's safety has contributed to this level of ignorance (Table-2). The educated respondents are also more knowledgeable about these products[14, 15]. Consumers' trust in scientists performing studies on the use of gene technologies, according to Boccaletti and Moro, has a significant impact on their perceptions of dangers and advantages[5, 8]. A survey question asked regarding the safety and effectiveness of introducing genetically modified foods to Thailand[17].

Table 2: Acceptance of genetically modified foods under the condition that their manufacture and importation are regulated by a government agency.

Response	Frequency	Percent
Yes	320	71.11
No	130	28.89
Total	450	100.00

The respondents also asked if they trusted the government institutions in charge of regulating such imports. The survey's findings indicate that the majority of respondents support genetically modified foods as long as government agencies oversee their safety and efficacy [5, 7, 18]. The results of the poll show that the agencies in charge of ensuring the safety of the food and pharmaceuticals that customers eat must be able to provide trust [14-16].

Factors influencing the consumer acceptability of GM foods.

The majority of respondents claimed they would accept genetically modified food if it were made available in the country. Some of them, however, raised doubts about the same. The Logit model was employed in the study (Table-3) to explore the effect of various factors on GMF acceptance[1, 18]. The model found that the most important characteristics impacting food acceptance were age, trust in regulatory authorities, and education level. Other parameters such as age, gender, education level, and household size were also considered to determine how they would affect the acceptability of genetically modified food [11, 15]. The study's findings suggested that introducing genetically modified food to the following age groups would reduce the likelihood of people accepting it. The level of education was also regarded important [4, 7, 8, 15].

Table 3: Results of Logit Analysis, Dependent Variable:

Variables	Coeff.	Marginal Effect	Probability
MALE	-0.68	-0.154	0.0956*
Age 31-40	-1.162	-0.278	0.0042***
Age 41-50	0.795	—	0.1785
Age >50	-1.1843	-0.512	0.0048***
Edu-C2	0.836		0.2879

Edu-C3	1.324	0.29	0.0869**
Edu-C4	1.213	0.285	0.1036*
HH size1-5	0.812	0.193	0.0824*
HH size 6-10	-0.154	—	0.7188
Price	0.049	—	0.8378
Heart	0.031	—	0.9231
UNDSC_TEC	0.715	0.178	0.0527**
READL	0.598	0.152	0.0598***
Ethic-GM	0.487	—	0.1891
Safe-CON	0.231	—	0.5821
REL-CON	-0.615	-0.165	0.1854*
Regular	0.978	0.249	0.0021***
C	-1.843	-0.483	0.0472
Dependent variable (Mean)	0.574254		0.514356
LR statistic (17 df)	57.98231		0.184352
Probability (LR stat)	0.00000435		

WACCEPT, Logit Analysis Method: ML-Binary Logit *Statistically significant at the 10% level; **Statistically significant at the 5% level; ***Statistically significant at the 1% level.

Higher levels of education were linked to greater acceptance of genetically modified foods. This research lends credence to the notion that people with a greater degree of education are more likely to accept food generated by genetically altered organisms[3, 8, 11]. The study also supports the idea that education allows consumers to evaluate and comprehend the many benefits of introducing new genetically altered items or services[1, 5]. Individuals are more likely to be exposed to knowledge about new products and services generated from genetically altered organisms as the population grows[4, 10].

According to the findings, male respondents were less likely to accept or purchase food manufactured by General Motors than those who were more willing to do so[7, 8, 18]. According to the study, the respondents' economic situation influenced their decision to accept or purchase food produced by GM [6, 10, 11]. The labeling is an essential component in a consumer's decision to accept or purchase food manufactured by GM. Consumer impression is influenced by this trait [3, 12]. Concerns raised by customers about religion have a negative ring to them. It implies that the assumption that the food production process derived from genetically modified organisms is incompatible with religious convictions is incorrect. The link between basic scientific principles knowledge and the acceptability of genetically modified foods was similarly optimistic. This implies that having a basic comprehension of the science eliminates the anxiety of prospective food business risks. Consumers have a high level of trust in the regulatory agencies that govern the food business. This implies that existing rules may impact the public acceptability of genetically modified foods.

Constraints and Opportunities:

Like other studies, the present study has limitations. This paper aims to analyze the current study's limitations by developing a theoretical model that will be used for future research. Researchers can also benefit from the cross-sectional data by studying the different dimensions of a country's sample size in the natural environment.

Although the data collected over a different period is the same, the methodology used for the study is limited to investigating the consumption of genetically modified food items. This study is also focused on the role of food technology phobia. For future studies, it is possible to explore the consumption intentions of different ethnic groups and different cultures through data collected from various sources.

Conclusion:

The study was carried out in Bangkok, Thailand. It focused on the acceptance of genetically modified food in the area. The main factors that affected the acceptance of the food were identified. This study serves as a vital step in developing a policy framework for the use of GM food in developing countries. Although this decision can be made without the end-user in mind, it is still essential that the research findings be considered when making the policy decision. Awareness about the benefits of GM food is also critical to the acceptance of the food in the study area. Trust and confidence in the regulatory bodies can also influence the acceptance of genetically modified food in the study area. Another factor that affects the acceptance of the food is the proper labeling of the products. This study aims to analyze the various factors that influence the acceptance of genetically engineered (GM) food in the country. It will help consumers make informed decisions before the introduction of these products. It is also suggested that policymakers promote electronic and print media to convince the public to accept genetically modified food. Aside from labeling, policymakers also need to consider using other marketing techniques to make sure that consumers are aware of the difference between genetically engineered food and non-GM food.

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