FOOD
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# Consumers' preferences and willingness-to-pay for traceability systems in purchasing meat and meat products

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## Abstract

At present, consumers are more concerned and cautious with their food intake, especially regarding food safety. Considering the majority of headlines of food safety controversies involving the meat industries, the calls for traceability systems to protect consumers from potential health risks while assuring the quality and safety of the food are deemed necessary. This requires the prompt establishment of comprehensive food traceability systems in the meat industries. Thus, this study aimed to determine consumers' preferences and willingness-to-pay (WTP) for traceability systems while purchasing meat and meat products. Primary data was collected using a structured questionnaire with 503 respondents that were selected through random sampling in Klang Valley, Malaysia. Data collected was analyzed using the contingent valuation method (CVM) and binary logistic regression analysis. More than half of the respondents (290; 57.7%) indicated their WTP at a higher price for traceable meat and meat products. Out of the 290 (57.7%) respondents that are willing to pay at a premium price for traceable meat and meat products, the majority (182) indicated their WTP a premium price of less than 5%, followed by 62 respondents with an indication of WTP between 5-10% premium prices. Further analysis using binary logistic regression to predict the most influential factors on consumers' WTP for meat and meat products with traceability systems revealed that gender, income, Halal certificate, and transparency are significant with positive relationships. The results showed that a traceability system will be accepted by consumers as a mechanism that enhances food safety as well as meets their demand for a consistent supply of high-quality meat and meat products. In an effort to increase consumers' preferences for safer meat and meat products, the relevant stakeholders need to execute the practice of traceability systems in the meat supply chain.

## 1. Introduction

The Codex Alimentarius Commission defines traceability as the "ability to follow the movement of food through various levels of production, processing, and distribution". According to European Law (2007), the traceability system is capable of tracking any food, feed, food-producing animal, or any medium that will be used for consumption at all stages of production, processing, and distribution. The concept of food safety entails a system, namely traceability that is capable of tracking the status of each product from farm to fork. It also encompasses the crucial participation of all stakeholders in the supply chain towards meeting the consumer's demands for a consistent supply of high-quality, healthy and nutritious food products (Khasturi and Sriprada, 2009) as well as trust (Liu *et al.*, 2019). The system will be beneficial to the consumers as it

warrants confidence and assurance during the purchase and food consumption, particularly for meat and meat products. Besides, the system is also able to resolve food safety problems and foodborne illnesses (Giraud and Halawany, 2006). The concept of traceability and its implementation in the supply chain has captivated the sights of many global organizations that are involved in the food processing industries (Kehagia *et al.,* 2007). Theoretically, the traceability system consists of two elements, namely tracing and tracking. Tracing is characterized as the recording ability of all the upstream operations in the supply chain that enables the identification and recognition of the origin of a product or group. Tracking, on the other hand, is characterized by the process of following the path of a product as it moves downstream from the beginning to the end of the supply chain (Mat Aris and Soon, 2014). Nowadays, the

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traceability system is incorporated into animal health, disease, and food safety control. The adoption of traceability systems is fast-tracked by the rapid development of hardware-software and information technology as well as rising health and safety consciousness among consumers (Downey, 1996).

Traceability systems have been adopted and implemented in many countries such as China, the United States of America (USA), and Japan (Lichtenberg *et al.*, 2008). However, this system has not been developed in Malaysia. Nowadays, the awareness of food safety particularly of meat and products are highly increasing among consumers. However, there are also certain consumers who do not have any knowledge about food safety and traceability systems, and these consumers also lack awareness about the food that has been purchased and consumed (Samsi *et al.,* 2012). Meanwhile, the demand for meat and meat products in Malaysia is significantly increasing year by year, especially for chicken meat, beef meat and lamb meat (DVS, 2020). Based on the point of the consumer's view, it is important to know the slaughtering method, the source origin of meat, the ingredients inside the meat products, and the most important part is Halal certification for every meat and meat product that has been purchased.

Various studies have demonstrated the incorporation of several tools of information technology in the traceability system such as Radio Frequency Identification Detection (RFID), Barcode System, Electronic Data Interchange (EDI), and Geographic Information System (GIS) along the production process (Fenu and Garau, 2009). The computerized system of traceability demonstrates how a medium is used to determine the flow management of traceability information. As a result, the traceability system promotes transparency along the supply chain of products and is capable of tracing the history, application, or location of an item or activity by identifying the records stored in the system (Dickinson *et al.*, 2003). Besides, a traceability system acts as a mechanism that specifies the obligations of suppliers at various supply chain nodes and is very useful for improving the quality of food, especially meat and meat products. The system also enables the meat industries to warrant the consumers with confidence in the sources of a product as well as the residue monitoring and disease control (Wilson and Clarke, 1998) as well as providing additional quality assurance to the consumers in terms of the safety consumption of the meat and meat products (Liddell and Bailey, 2001). Presently, a traceability system has become one of the most valuable assets and an essential mechanism adopted by the food industry, as it helps to enhance the chances and prospects by adding value to the products, as well as attaining customers' trust in food safety issues.

Generally, traceability concerns the health, quality, control, and safety of consumers as it is also associated with trust and confidence. The system specifies the obligations of a supplier at various nodes of the supply chain. The context of traceability, when viewed from an uninformed perspective, tends to produce a less favourable perception. That is, the system does not provide a significant role on the part of consumers because it does not offer an impact and value to their lives. Such perception transpires because of a lack of knowledge and understanding of the fundamental of the traceability system. Consequently, the advantages of traceability systems are only apparent at the industry level but remain unclear at the consumer level. Furthermore, a traceability system is often associated more with the food industry as a valuable asset that provides plenty of value and advantages to food producers and manufacturers. According to Fearne (1998), a traceability system is incredibly helpful in terms of enhancing brand development by adding value to the products because the system also meets the requirements of labelling regulations. Besides, it helps to minimize the transaction cost of the whole supply chain with greater accuracy because it can identify and detect systems that have broken down and problems in the supply chain without causing any damage to others (Simpson *et al.,* 2007). Thus, implementing meat traceability in Malaysia will help consumers to regain their confidence in food safety and quality. Other than the apparent function of a traceability system for disease control and residue monitoring in meat and meat products, food safety-related issues such as the misuse of veterinary medicines and hormone growth can also be prevented (Zhou *et al.,* 2009).

Essentially, the traceability system is useful for monitoring most of the main and vital meat attributes that also function as a backup of product statements such as origin and quality labelling where all the information along the meat production has to be delivered to the consumers (Verbeke and Ward, 2006). A previous study by Gregory (2000) revealed that consumers are interested in quality, designated origin, production, and fair trade. Consumers tend to prefer the origin of a product from their own country when they make a purchase (Hobbs, 2004). Hence, in order to attain consumers' confidence in meat and meat products, a traceability system can be one of the valuable assets in establishing the authenticity status of meat and meat products by verification and support of the statements made by producers about their meat and meat products

(Wilson and Clarke, 1998). Therefore, the government along with the producers of meat and meat products should be able to recognize the benefits of traceability systems to consumers as a mechanism that provides information in compliance with their requirements. Ultimately, consumers will be able to build confidence in food safety and quality, especially meat and meat products.

Cox and Grether (1996) define the consumer as a specific individual taste that can be measured by the utility of various bundles of goods. In terms of consumers' preferences towards the traceability system, information regarding the labels, indication of origin, and production methods are to be provided to the consumers. With the information available in the traceability system, consumers will be able to trace the purchased food with convenience (Hansstein, 2014). Studies conducted in Spain highlighted the positive reception among the consumers as an essential attribute towards the traceability system with origin and safety. It also indicates that consumers, especially Europeans, are in favour of simple and understandable symbols rather than lengthy descriptions and labels of the meat and products (Kehagia *et al.,* 2007).

Willingness-to-pay (WTP) can be explained as the maximum price an individual is willing to pay to procure the goods and services offered (Brown *et al.,* 2005). The concept of WTP perceived by the consumers for traceable meat and meat products varies with different countries in terms of knowledge, acceptance, and preferences as well as the WTP a premium price for the traceability function. Information regarding the process attributes of meat and meat products is likely to be emphasized from the consumer's point of view. This is because the traceability system is strongly associated with food safety, and hence, the consumers will be assured that their meat is safe for consumption. According to Hansstein (2014), the implementation of traceability systems in European countries has received favourable feedback and consumers are willing to pay for it. Based on the previous studies, the preferences for traceable meat and meat products can be attributed to several characteristics, namely transparency, quality, food safety, Halal certification, country of origin, confidence, knowledge as well as socio-demography.

Transparency is one of the factors that can influence the consumer's preference and WTP for traceable meat and meat products. It is defined as the availability of information on the production of meat at each point of the supply chain. In China, Chinese consumers are inclined to purchase traceable pork meat if product information and government certification are available (Ortega *et al.,* 2011). Furthermore, Dickinson *et al.*

(2003) revealed that consumers in both the European Union and the United States are more concerned about traceability information for meat and meat products because they pay a premium price. This shows that most consumers are willing to spend a significant amount of money provided that records of information on the purchased meat and meat products are available in the systems of the food chain. Such transparency will enable consumers to acquire the knowledge and information they deserve when purchasing meat and meat products.

Quality is considered to be a key factor that affects consumers' preferences and WTP for meat and meat products since the traceability system also monitors and regulates the process in the supply chain through product tests and audits (Dickinson and Bailey, 2002). This is to ensure the safe and high-quality production of meat and meat products upon delivery to the consumers. The tracing activities along the meat supply chain could help enhance the quality of meat and meat products since any potential issue occurring at a certain phase of meat production can be conveniently identified in the system. Consumers will be guaranteed assurances of the meat and meat products purchased with the information collected during the production. The additional quality assurance offered by producers and manufacturers would, therefore, increase the WTP for traceability among consumers (Giraud and Halawany, 2006). Interestingly, a study conducted by Hansstein (2014) has identified that well-educated consumers in Beijing appear to be more concerned about the quality of pork meat and they are willing to pay a higher price given their high level of awareness towards food safety and a healthy lifestyle. Hence, the willingness to pay for traced pork meat in Beijing is positively related to education and income in socio-economic groups.

Global consumers, especially in developed countries, have lost their confidence in mass-produced food with numerous food crises and issues that reduced its rate of consumption. Consequently, food markets and industries are struggling with sales and marketing difficulties in order to regain confidence in their food products (Dickinson and Bailey, 2002). Naturally, consumers often demand and expect safer and wholly guaranteed food as their concerns towards food safety are growing (Angulo and Gil, 2007; Walaszczyk and Galinska, 2020). Therefore, the food safety issue has inherently become one of the main factors that influence consumer preferences and WTP for traceable meat and meat products. A survey conducted in China found that a vast majority (97.3%) of the respondents paid attention to food safety, whereas 36.9% of respondents make an effort to read the labels when they are buying pork meat (Hansstein, 2014). Dickinson and Bailey (2002)

examined and compared the traceable meat systems between the United States, Canada, and Japan. The study showed that consumers are willing to pay for the traceability system if additional meat safety and humane animal treatment were also guaranteed. However, there are other divergent points of view among consumers. Although some acknowledged and were concerned about meat safety, they appeared to be reluctant to pay extra because traceability was deemed incompetent of guaranteeing meat safety (Lichtenberg *et al.,* 2008). Hence, traceability would be more valuable if food safety can be explicitly validated upon distribution to the consumers (Hobbs *et al.,* 2005).

The global reception towards the concept of halal has grown in part of its high quality and safety measures in food processing. This is largely due to the labelling of Halal certification that propels the worldwide demands and consumption of Halal products. Not only it is not limited to Islamic countries, but the attraction also appeals to non-Islamic countries. The increasing Muslim population globally will create a new and potentially prosperous market for Halal products, especially food products. This emerging trend has attracted countries all over the world into producing more Halal producers of food and products. As the awareness of the concept of Halal continues to grow, so are the demands for Halal processing, along with Halal products (Omar and Jaafar, 2011). There are other issues associated with the Halal concept, such as food cleanliness, food ingredients, poultry, and meat slaughtering, as well as storage in terms of food arrangement between Halal and non-Halal foods (Ibrahim, 2011). Such issues are not easily observable and even appreciated by consumers, particularly during purchasing (Grunert, 1997). Given the persistent and rising issues occurring in the food market, many consumers have turned to Halal, even demanding information on the manufacturing processes, especially those that concern Halal-related handling and storage of products (Verbeke and Ward, 2006). Thus, the production of Halal meat and meat products in Malaysia may require the development and implementation of a traceability system as a tool to cater to the consumers' demands. Therefore, a traceability system is vital for the issuance of Halal certification, which can affect warrants a wholesome process. A halal certificate was found as one of the factors that influence consumers' preferences in purchasing meat and meat products with traceability systems in Malaysia (Mohd Nawi *et al.,* 2018).

The sentiment on the source of production or manufacture of the meat and meat products appeared to have evolved as certain consumers have gotten very particular about the sources of the meat and meat products they are purchasing. For example, American consumers have higher preferences for imported meat with New Zealand and Australia being known as the two top countries and producers of high-quality meat (Umberger, 2004). The affordability and WTP for the premium can be attributed to the higher standard of living and earning income among Americans. However, a study by Mennecke *et al.* (2007) revealed that American consumers have grown more confident in their locally-produced meat. The finding is further corroborated by Lim *et al.* (2013), where consumers are in favour of domestic steaks and are willing to pay compared to imported ones. The preference for the source of origin can be influenced by several factors, but the economic aspect in terms of the price between local versus imported meat and meat products prevails. Besides, consumers will be brimmed with confidence if the details regarding the source of production i.e., origins are provided on the meat and meat products. Hence, labelling the source of origin on the products can proffer a decent marketing advantage for the producers.

The traceability system of meat and meat products is fundamentally comprised of all relevant information that includes country of origin, ingredients, nutrients as well as Halal certification (Gracia and Zeballos, 2005). Nonetheless, a traceability system is useful to consumers that can guide decision-making in the purchase of good quality meat in the market. This way, the safety of consumption will be guaranteed. Presently, public confidence in healthy food is growing more than ever before, as their awareness of food safety issues continues to expand. Most of the foodborne illnesses and outbreaks occurring in Malaysia are associated with unsanitary and improper food handling practices with food poisoning accounting for more than 50% of the cases reported (Soon *et al.,* 2011). Persistent occurrence of the outbreak incidence can be attributed to the lack of adherence or violation of food safety and hygiene guidelines, lack of quality control in food services as well as lack of systematic inspection and supervision by authorities on foodborne diseases where most of the outbreaks often went undetected (Beattie and McCabe-Sellers, 2004). This highlights the importance of enforcing strict regulations on safety in food processing. Hence, actors involved in the supply chain, namely producers, manufacturers, and marketers must work in solidarity on the implementation of traceability systems towards ensuring the safety of the public against the hazards of foodborne outbreaks (Morrison *et al.,* 1998). The traceability system is one of the key strategies in enhancing food safety standards as well as producing safe and wholesome meat and meat products. It also can be one of the important tools for the prevention of food poisoning among consumers in Malaysia.

Consumer age, gender, education, occupation, and earning income are commonly associated with the WTP for meat and meat products. Findings by Burton *et al.,* (2001) and Loureiro and Umberger (2004) indicated that food preferences among consumers are affected by individual and social traits. The study by Lim *et al.* (2013) indeed demonstrates the interaction variables of socio-economic significantly influenced consumers' choices and WTP for meat with different countries of origin as well as other safety attributes. Similar variables were also found to affect substantially consumers' WTP for traceable food (Zhigang and Yongguang, 2013). These studies have shown that the socio-demographic profile is one of the major attributes that influence preferences, purchasing, and WTP for traceable meat and meat products. Therefore, this study aimed to evaluate consumers' preferences and WTP for the use of a traceability system in purchasing meat and meat products.

## 2. Materials and methods

The sample was acquired through random interception at shopping malls and supermarkets with a sizable market of meat and meat products in the Klang Valley. Primary data was collected from 503 respondents using structured questionnaires via face-to-face interviews. Collected data were subsequently analyzed using the contingent valuation method (CVM) and binary logistic regression analysis. CVM is used to estimate the quantitative responses for WTP at a premium price by bid value for traceable meat and meat products. Binary logistic regression was employed to predict the most influential factors on consumers' WTP for traceability systems. The model was developed to determine the most influential variables in the purchase decision of traceable meat and meat products. The following equation was utilized in predicting the outcome:

$$\text{Log} \ (\pi / 1 - \pi) = \alpha + \beta_1 X_{age} + \beta_2 X_{gender} + \beta_3 X_{income} + \beta_4 X_{educationlevel} + \beta_5 X_{occupation} + \beta_6 X_{halalcertificate} + \beta_7 X_{transparency} + \beta_8 X_{confidence} + \beta_9 X_{quality} + \beta_{10} X_{foodsafety} + \beta_{11} X_{knowledge} + \beta_{12} X_{countryoforigin} + \varepsilon i \quad (1)$$

Where $\alpha$ = constant, $\beta_i$ = regression coefficient of $X_i$ and $\varepsilon i$ = error term

WTP for traceable meat and meat product constitutes the dependent variable of the study with "willing" coded as 1 and "not willing" coded as 0. Socio-demographic profiles and factor attributes, on the other hand, constitute the independent variable. Based on a previous study by Govindasamy and Italia (1999), age, gender, education level, and income may influence WTP. The logistic regression was utilized by Hanemann (1984) and Capps and Kramer (1985) to estimate WTP using the

dichotomous method of maximum likelihood estimation. Respondents were queried whether they were willing to pay a maximum price for traceable meat and meat products. Categorical value constitutes the dependent variable, whereas the nature of both categorical and continuous constitutes the independent variable. The codes derived from the scores of factor analysis account for the factor attributes (Mlote *et al.,* 2013). According to Hair *et al.* (1998), the mean scores of the factor are also known as composite measures that indicate the degree to which individual scores highly for a specific factor based on their response to the variables included in that factor.

## 3. Results and discussion

In accordance with the results of demographic profiles among 503 respondents in Klang Valley areas using descriptive analysis, the majority of the respondents are below 40 years of age, had a university education, full-time working and are married. From the analysis, the highest frequency of the respondents received household monthly income with a range of less than RM3000. The following sections will discuss consumers' WTP and the influential factors which impacted the most meat and meat products with traceability systems.

*3.1 Consumer's willingness-to-pay response towards meat and meat products with traceability systems by bid value*

Table 1 shows the outcomes of the frequency analysis for respondents' WTP at two different prices for meat and meat products with and without traceability systems. More than half of the respondents (290; 57.7%) indicated their WTP a higher price for traceable meat and meat products compared to 42.3% (213 respondents) that indicated otherwise.

Table 1. Responses on WTP for meat and meat products with traceability systems if the price is higher than without traceability systems

| WTP If the Price higher | Frequency | Percentages |
|---|---|---|
| Yes | 290 | 57.7 |
| No | 213 | 42.3 |
| Total | 503 | 100 |

CVM was employed to estimate respondents' percentage premium price WTP responses by bid value for meat and meat products with traceability systems where the outcomes of the analysis are depicted in Figure 1. Out of the 290 (57.7%) respondents that are willing to pay at a premium price for traceable meat and meat products, the majority (182) indicated their WTP a premium price of less than 5%, followed by 62 respondents with the indication of WTP between 5-10% premium prices. Meanwhile, 22 respondents indicated 11

-20% premium price, 11 respondents indicated 21-30%, 9 respondents indicated 31-40%, 3 respondents indicated 41-50% and lastly, only 1 respondent indicated WTP for 50% and above. It shows that respondents are now aware of the importance of traceability systems for quality products with their WTP for a maximum price even if the price of meat and meat products that use the systems was higher than without it. This is probably because they feel more confident and safe to buy meat and meat products with this system since it will provide all the information required such as Halal certificate, county of origin, date of expiry, process information in the supply chain, slaughtering information and so on (Wang *et al.,* 2014). Besides, the higher the consumer's risk perception, the more likely they were willing to buy traceable meat and meat products.
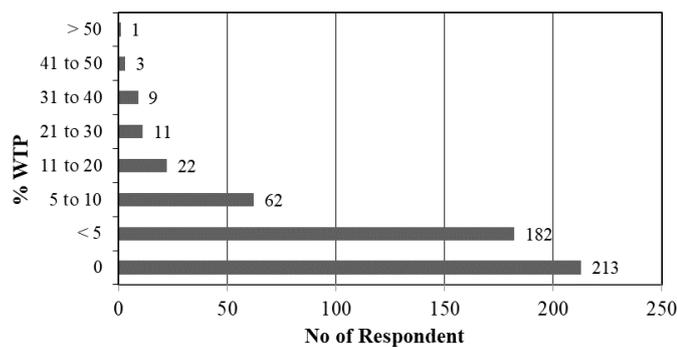


Figure 1. Respondents' percentage premium price WTP for traceable meat and meat products

### 3.2 Predicting willingness-to-pay based on selected preferences characteristics and socio-demographics using binary logistic regression analysis

Table 2 shows the significant value of Omnibus Tests of Model Coefficients (goodness of fit test) which is 0.000 (p-value < 0.05), indicating the fitness of the items. The Hosmer-Lemeshow test was also used to support the model as well as to assess the goodness of fit between expected and observed probabilities where a value greater than 0.05 is deemed insignificant (Pallant, 2005). The result shows the fitness of the items as the value 0.272 indicates its insignificance, and hence, a goodness of fit between the predicted and observed probabilities. The R square values of Cox and Snell (0.317) and Nagelkerke (0.629) indicate the amount of variation that can be explained in the dependent variable. The variables of gender, income, Halal certificate, and transparency are found to be significant at 10%, 10%, 5% and 5% levels of significance, respectively. Meanwhile, variables of age, education, occupation, confidence, quality, food safety, knowledge, and country of origin did not contribute significantly to the model.

The estimated coefficient of gender shows a positive relationship with females being 3.784 times more likely to be willing to fork out extra money for traceable meat and meat products compared to males. This finding is also supported by Dickinson and Bailey (2002) who revealed that females are more willing to pay a higher price for meat and meat products. Previous studies have indeed shown that gender has a significant influence on the decision to purchase food products (Govindasamy and Italia, 1999; Ahmad and Juhdi, 2010).

Income also showed a positive relationship with the respondents' WTP at a higher price for traceable meat and meat products. High-income consumers were 4.123 more likely to afford the premium price paid compared to low-income consumers. This highlights the possibility of additional factors such as price and availability, being weighed on the decision-making among low-income consumers. According to Liu and Chen (2015), the

Table 2. Binary regression analysis for factors influencing WTP for traceable meat and meat products

| Variables | B | S.E | Wald | df | Sig. | Exp (B) |
|---|---|---|---|---|---|---|
| Age | 0.254 | 0.876 | 1.862 | 1 | 0.243 | 0.756 |
| Gender | 0.307 | 0.156 | 4.689 | 1 | 0.074* | 3.784 |
| Income | 0.785 | 0.239 | 2.763 | 1 | 0.053* | 4.123 |
| Education Level | 0.472 | 0.557 | 1.723 | 1 | 0.832 | 0.672 |
| Occupation | 1.635 | 0.604 | 3.987 | 1 | 0.987 | 0.925 |
| Halal Certificate | 2.965 | 0.723 | 4.892 | 1 | 0.00** | 4.578 |
| Transparency | 0.657 | 0.246 | 6.453 | 1 | 0.08** | 2.321 |
| Confident | 0.293 | 0.14 | 1.531 | 1 | 0.243 | 0.872 |
| Quality | 0.334 | 0.432 | 4.872 | 1 | 0.349 | 1.334 |
| Food Safety | 0.489 | 0.331 | 3.875 | 1 | 0.795 | 0.524 |
| Knowledge | 0.127 | 0.267 | 1.445 | 1 | 0.423 | 0.927 |
| Country of Origin | 0.369 | 0.672 | 2.573 | 1 | 0.561 | 0.993 |
| Constant | 11.762 | 6.894 | 4.506 | 1 | 0.00 | 0.065 |
| -2 log Likelihood | 235.984 | | Nagelkerke R² value | | | 0.629 |
| Cox and Snell R² | 0.317 | | Hosmer & Lemeshow R² value | | | 0.272 |

n = 503, ** Significant at 5% level of significance, * Significant at 10% level of significance

consumers' WTP is also impacted by the average per capita monthly income. That is, consumers are more likely to pay the maximum price for traceable meat and meat products if their average monthly income is higher. Soba and Aydin (2013) reported that consumers with a lower level of income are more price-sensitive, and they tend to purchase meat and meat products in the lower price range based on their affordability.

The strongest predictor for respondents' WTP for traceable meat and meat products was the Halal certificate with the highest estimated coefficient value of 4.578. This indicates that the majority of the respondents are four times more likely to report WTP at a higher price than those who are not. It also implies that potential consumers, specifically Muslims, could be targeted by marketers given the established association between Muslims and Halal to raise the WTP at a higher price for traceable meat and meat products. This finding is supported by the works of Rezai *et al.* (2012) that the belief in Halal food safety is primarily driving the intention to purchase among consumers. Otherwise, consumers are less likely to purchase Halal food, especially meat and meat products due to the concerns of halal haram in food that are meant for consumption. The estimated coefficient of transparency of 2.321 indicates that respondents are twice more likely to pay a higher price for traceable meat and meat products if the information regarding the production is provided. This finding is supported by numerous researchers with labelling information seen as a crucial strategy in efforts to regain the public's trust and confidence in food safety (Verbeke and Viaene, 2001). According to Roosen and Lusk (2003), traceability information of the meat and meat products, such as country of origin, is considered to be the most important factor that influences the consumer choice and decision to purchase beef, and it also affects consumer WTP in combination with other factors.

## 4. Conclusion

The result of WTP showed that most of the respondents were willing to pay a premium price even if the price of meat and meat products that used traceability systems were higher than without the systems. Consumers' WTP could be associated with their demands for a consistent supply of quality and safer meat and meat products. Besides, the risk perception of foodborne illness and food crises faced by consumers will lessen with the arrangement of traceability systems in the meat industry. Meanwhile, the unwillingness to purchase traceable meat and meat products at a higher price could be attributed to several reasons such as consumers' income and their belief that the

responsibility of food safety falls on the government and other stakeholders, not consumers. Furthermore, the Halal certificate indicated the greatest influence on the consumers' WTP for traceable meat and meat products followed by income, gender and transparency. Consumers' preferences and WTP for traceable meat and meat products are indeed influenced by the Halal certification obtained by the products as the majority of the consumers are Muslims. Tracing and tracking activities of the meat at all phases in the supply chain will be made convenient with the traceability system, and this would ensure the integrity of Halal attributes remain intact or protected. As a result, consumers' confidence in meat and meat products will increase with the transparency offered by the system that can promote the preparation of traceability systems in the marketplace. The results of this study could provide the government, meat producers, marketers, and retailers a better understanding of consumers' preferences and WTP towards traceability systems of meat and meat products. It also allows them to start planning for the implementation of traceability systems in the near future which could also enhance the quality production of meat and meat products at a higher standard.

## Conflict of interest

The authors declare no conflict of interest.

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