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Original Research Article

Pilot Testing on The Level of Knowledge and Perception of Green Practices in Livestock Sector Among Local Consumers

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Abstract: The livestock sector is vital to the global food chain. The demand for livestock products increases proportionally with the global population. Rearing livestock animals comes with inevitable environmental impacts. Adopting green practices in the livestock production chain may help lessen the impact. This pilot study aims to identify local consumers' level of knowledge and perception of adopting green practices in the livestock sector. A questionnaire consisting of three sections (Demography, Knowledge, Perception) was developed. Thirty-two respondents who are the primary decision-makers for household grocery shopping participated in the study. The respondents comprise 50.00% private sector employees, 28.13% government servants, and the rest are unemployed. The education level of the respondents is 40.63% with a diploma or equivalent, 34.38% with a higher degree, while the rest completed either secondary or primary education. The majority of the respondents (75.00%) chose price as the main criteria they considered when buying livestock products, followed by quality (68.75%), origin (46.88%), certification (31.25%), and only 12.55% included environmental impacts in their decision making. An average of 73.61% of the respondents have general knowledge of the green practices in the livestock sector. About 78.65% of the respondents positively perceive the idea of adopting green practices in the livestock sector. The correlation between education level and the respondents' knowledge and perception of green practices in the livestock sector was also evaluated. Overall, the study revealed a strong positive correlation between education level and green practices knowledge and education level with positive perception towards adopting green practices in the livestock sector. Based on the data collected, it is recommended that the study be conducted with a larger population to give a more accurate representation of the livestock consumer in Malaysia.

Keywords: environmental impact; green practices; livestock consumption; livestock production; sustainability

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1. Introduction

The livestock sector is an integral part of the global food chain as it provides us with an essential source of proteins. The demand for food will likely affected by population growth, among other factors (OECD/FAO, 2021). (OECD/FAO, 2021). With increasing population growth, the demand for livestock products also increases. The individual demand for red meat, dairy milk, and poultry meat and eggs is estimated to increase by 14% within the year 2020 to 2050 (Komarek *et al.*, 2021)

With an estimated population of 9.8 billion people by the year 2050, the number of livestock animals will surpass the human population significantly. By the year 2050, the number of livestock animals (cattle, buffaloes, goats, sheep, pigs, and poultry) is projected to reach 43 billion (Alexandratos & Bruinsma, 2012). Rearing livestock animals comes with inevitable environmental impacts. With that large livestock population, about $46{,}731\times10^3$ metric tons of manure would be produced daily (Zayadi *et al.*, 2022). Dealing with that much waste and other environmental issues related to livestock activities, such as greenhouse gas emissions and land-use change, would be challenging.

Adopting green practices in the livestock production chain may help lessen the impact. Besides the stakeholders' collective actions, consumers must also understand and support the green initiative in sustainable agriculture. A survey of 26,395 European citizens reveals that 77% of the respondents feel responsible for controlling climate change (EU, 2022). Consumers can influence livestock practices, which may decide how livestock animals are raised through legislative initiatives, market forces or shifting their demand for livestock products (Rezai *et al.*, 2012). However, not all consumers are aware of environmental issues. The consumers' environmental knowledge is essential in influencing positive green perception (Kamalanon *et al.*, 2022).

Environmentally conscious consumers may be inclined to purchase green or environmentally friendly products. In the livestock segment, consumers have started looking for green foods made under environmentally friendly conditions while being safe for consumption and quality (Rezai *et al.*, 2012; Rezai *et al.*, 2013). While green products are

suitable for the environment, their sales might not be as encouraging. The factors that may influence consumers in opting for green products are individual factors (natural environmental orientation, perceived risks and inconvenience of buying green products, perceived benefits of buying green products), product qualities, social influence, a company's perceived green image, and marketing (Barbu *et al.*, 2022; Rustagi & Prakash, 2022). Green marketing and advertising should be implemented to increase public awareness, especially among the youth (Abd Rahim *et al.*, 2012). This will benefit the industry players as we move towards sustainable livestock practices because the consumers who have good knowledge on the issue will have a positive perception and support the initiative.

This pilot study was conducted to collect preliminary data to identify local consumers' level of knowledge and perception of adopting green practices in the livestock sector. The correlation between the education level of respondents and the studied parameters is also evaluated to provide a better insight into the subject matter.

2. Methodology

A questionnaire consisting of three sections was developed. The sections include Section A (Demography), Section B (Knowledge), and Section C (Perception). The questions in Section A are open-ended and closed-ended to characterise the respondents' demography, including gender, race, age, education level, and occupation. The section also includes questions to understand their purchasing patterns, such as the livestock products consumed by the respondents and the criteria they consider upon purchasing livestock products. Sections B and C comprised close-ended questions with dichotomous answers (Yes or No) to understand their knowledge and perception of green practices in the livestock sector.

The questionnaire was distributed to adult respondents, the primary decision-makers in household grocery shopping. A total of 32 respondents completed the questionnaire. The data collected was analyzed using the OriginPro (version 2019b) statistical program. Descriptive statistics was used to summarize the data, while Pearson's correlation coefficient was calculated to evaluate the relationship between the parameters.

3. Results

3.1. Background of Respondents

Of 32 respondents who participated in the questionnaire, 62.50% were males, and 37.50% were females. They were from various age groups, as summarized in Table 1. The most extensive age range is 30–39, which accounts for 34.38% of the respondents. Most

respondents (75.00%) acquired tertiary education (diploma/equivalent or higher degrees), while 6.25% finished primary education, and another 18.75% completed secondary education. Half of the respondents are private sector employees, 28.12% are government servants, while the rest, 21.88%, are unemployed or still studying.

All respondents consumed at least one type of livestock product in a week. The most popular livestock products the respondents consume more than once weekly are poultry, eggs and meat, followed by beef, dairy milk, mutton, and pork. When purchasing livestock products, most respondents (75.00%) considered price the main criterion, closely followed by quality (68.75%). The least considered criterion is environmental impacts, which only 12.50% of respondents chose.

Table 1. Demographics of respondents (N = 32).

Variables	Frequency	Percentage (%)
Gender		
Male	20	62.50
Female	12	37.50
Age		
20–29	8	25.00
30–39	11	34.38
40–49	9	28.13
50–59	3	9.38
60 above	2	6.25
Education		
Primary school	2	6.25
Secondary school	6	18.75
Diploma/equivalent	13	40.62
Higher degree	11	34.38
Occupation		
Student	3	9.38
Unemployed	4	12.50
Public sector	9	28.12
Private sector	16	50.00
Livestock products consumed more than once a week		
Poultry eggs	25	78.13
Poultry meat	21	65.63
Beef	15	46.88
Mutton	4	12.50
Pork	3	9.38
Dairy milk	8	25.00
Criteria considered when buying livestock products		
Price	24	75.00
Quality	22	68.75
Origin	15	46.88
Certification	10	31.25
Environmental impacts	4	12.50

3.2. Knowledge of Respondents

In Section B, ten questions were developed to assess respondents' knowledge of green practices in the livestock sector. Respondents were to choose between "Yes" or "No" for the questions. For statistical analysis, the correct or positive answers were scored "1", while wrong or harmful answers were scored "0". Table 2 shows the summary of the respondent's knowledge of the issue. Question B1 showed that 93.75% of the respondents agreed they know about green practices and technologies in the livestock sector. From question B2, all 32 respondents agreed that green practices in the livestock sector aim to produce environmentally friendly livestock products. Less than 70.00% of the respondents answered correctly about the greenhouse issue related to livestock activity, as shown in questions B3 and B4. Questions B5 and B6 touched on the wastewater issue in livestock farming. About 84.38% of the respondents agreed that livestock farms produce wastewater containing animal fecal waste. In question B6, only 50.00% of the respondents agreed that the treated livestock wastewater can be reused. Questions B7 to B10 asked about the fecal waste related to livestock animals. About 90.63% of the respondents agreed that livestock fecal waste can be converted into organic fertilizer and used to enhance plant growth. Furthermore, 81.25% of the respondents agreed that livestock fecal waste can be converted into biogas to generate electricity.

Table 2. Respondents' knowledge of green practices in the livestock sector (N = 32).

Statement	Mean	Standard deviation	Percentage of correct answer (%)
1. I know about green practices and technologies in the livestock sector.	0.94	0.24	93.75
2. Green practices in the livestock sector aim to produce environmentally friendly livestock products.	1.00	0.00	100.00
3. Livestock animals produce greenhouse gases.	0.63	0.48	62.50
4. Greenhouse gases cause climate change and global warming.	0.66	0.47	65.63
5. Livestock farms produce wastewater that contains animal fecal waste.	0.84	0.36	84.38
6. Treated wastewater from livestock farms cannot be reused.	0.50	0.50	50.00
7. Livestock fecal waste can be converted into organic fertilizer.	0.91	0.29	90.63
8. Organic fertilizer from livestock fecal waste can be used to enhance plant growth.	0.91	0.29	90.63
9. Livestock fecal waste can be converted into biogas to generate electricity.	0.81	0.39	81.25
10. The fecal waste produced by the human population is far greater than that produced by the total livestock population worldwide.	0.38	0.48	37.50

Note: 1 – correct answer; 0 – wrong answer

To determine respondents' knowledge level in the subject matter, the average scores of respondents for questions B1 to B10 were calculated. The scores based on the percentage of positive or correct answers for Section B are shown in Figure 1. The score distribution for respondents' knowledge follows a standard distribution curve ranging from 50.00% to 100.00%. Overall, the average score is 75.63%, which indicates that respondents' knowledge of green practices in the livestock sector is quite good.

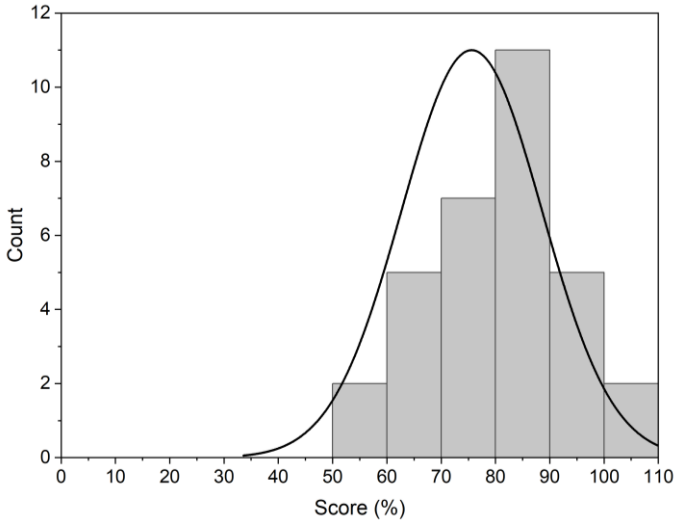

Figure 1. The distribution of the respondents' scores on their knowledge related to green practices in the livestock sector is based on questions in Section B.

3.3. Perception of Respondents

In Section C, six questions were constructed to determine respondents' perceptions of green practices in the livestock sector. Respondents were to choose between “Yes” or “No” for the questions. For statistical analysis, positive perceptions were scored “1” while negative perceptions were scored “0”. Table 3 shows the summary of the respondent’s perception of the issue. Most (96.88%) of the respondents are interested in livestock products from a farm that implements green practices. About 93.75% of the respondents perceived that livestock products utilizing green practices are healthier. However, the finding from question C3 revealed that only 25.00% of the respondents gave positive answers. This means 75.00% of the respondents thought livestock products utilizing green practices are more expensive. Most respondents (87.50%) believed livestock products utilizing green practices have less environmental impact. From question C5, only about 78.13% of respondents are willing to pay more for livestock products with less environmental impact. Many of the respondents (90.63%) preferred to be able to recognize a livestock product that adopted green practices based on its packaging or brand.

The average scores of respondents from questions C1 to C6 were calculated to determine the perception level of respondents on the subject matter. The scores of positive

perceptions based on Section C range from 50.00% to 100.00%, as shown in Figure 2. Most respondents have a positive perception, with a score above 80.00%. Overall, the average score is 78.65%, which signifies respondents' relatively good perception of green practices in the livestock sector.

Table 3. Perception of respondents on green practices in the livestock sector (*N* = 32).

Statement	Mean	Standard deviation	Percentage of positive perception (%)
1. I am interested in livestock products from a farm that implements green practices.	0.97	0.17	96.88
2. Livestock products utilizing green practices are healthier.	0.94	0.24	93.75
3. Livestock products utilizing green practices are more expensive.	0.25	0.43	25.00
4. Livestock products utilizing green practices have less environmental impact.	0.88	0.33	87.50
5. I do not mind buying livestock products with less environmental impact, even though they are more expensive.	0.78	0.41	78.13
6. I would prefer it if I recognized that a livestock product adopted green practices based on its packaging or brand.	0.91	0.29	90.63

Note: 1 – positive answer; 0 – negative answer

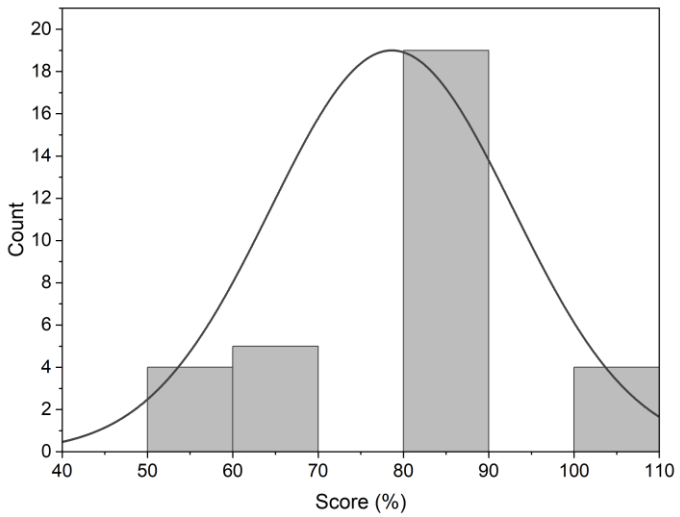

Figure 2. The distribution of the respondents' score on their perception of green practices in the livestock sector is based on questions in Section C.

4. Discussion

The results obtained from this pilot study provide a preliminary assessment of consumer's readiness for the green industry, which may benefit the related stakeholders. The

respondents in this study are influenced by several factors when buying livestock products. The two main factors are price and quality, while environmental impact is the least influential. Price is a cardinal factor in consumer decision-making regarding animal-based food, especially for those with lower purchasing power (Font-i-Furnols & Guerrero, 2014). However, among consumers with higher environmental consciousness, other elements such as origin, feeding system, animal welfare, and environmental aspects are also essential (Stampa *et al.*, 2020).

Besides that, based on the results, the respondents considered the other two factors, origin and certification, somewhat necessary. Consumers consider the country of origin of animal-based food as associated with the product's perceived quality and traceability, ensuring food safety (Burnier *et al.*, 2021; Font-i-Furnols & Guerrero, 2014). Moreover, information on the country of origin may favour those who try to shop sustainably. This is because it will help them select local products with lesser environmental impacts than imported products. Respondents who had chosen certification as the decision-making factor may also have more awareness regarding food safety. Consumers who expect good quality livestock products also refer to certification labelling such as veterinary stamps or certified quality brands (Font-i-Furnols & Guerrero, 2014).

The study also obtained the respondents' basic consumption patterns of livestock products. The data on the livestock products consumed more than once a week from Section A is analogous to the consumption of livestock commodities in Malaysia. The respondents utilized more protein from poultry, followed by beef, mutton and pork. Malaysian consumed 48.2 kg of poultry (chicken and duck) meat, 5.6 kg of beef, 17.9 kg of pork, and 1.2 kg of mutton based on the average from 2016 to 2021 (DVS, 2022).

Based on the respondents' scores in Sections B and C, the knowledge and perception of respondents on green practices in the livestock sector can be considered relatively good, with the mean score for both constructs being above 70.00%. This indicates that the respondents may have a basic understanding of green practices and sustainability. Consumers must understand the importance of sustainable development as this will help transition towards a sustainable livestock sector that supports the global food chain.

Generally, one of the factors that may contribute to the awareness of the green industry is education. A study by Rezai *et al* (2013) concluded that education level, income, age, and marital status are among the principal factors affecting consumers' perception of green concept (Rezai *et al.*, 2013). The correlations between education level with knowledge

and respondents' perception of green practices in the livestock sector were also analyzed, as tabulated in Table 4. All the statements in the knowledge construct strongly correlate with the respondent's education level. Overall, the relationship between education level and respondents' knowledge of green practices in livestock sector shows a strong positive correlation (average $r = 0.9780 \pm 0.02$).

Table 4. Correlation between education level with knowledge and correlation between education level and respondents' perception.

Statement	Correlation, *r*
Education level with knowledge	
B1. I know about green practices and technologies in the livestock sector.	0.9989
B2. Green practices in the livestock sector aim to produce environmentally friendly livestock products.	1.0000
B3. Livestock animals produce greenhouse gases.	0.9814
B4. Greenhouse gases cause climate change and global warming.	0.9601
B5. Livestock farms produce wastewater that contains animal fecal waste.	0.9524
B6. Treated wastewater from livestock farms cannot be reused.	0.9878
B7. Livestock fecal waste can be converted into organic fertilizer.	0.9819
B8. Organic fertilizer from livestock fecal waste can be used to enhance plant growth.	0.9976
B9. Livestock fecal waste can be converted into biogas to generate electricity.	0.9900
B10. The fecal waste produced by the human population is far greater than that produced by the total livestock population worldwide.	0.9300
Education level with perception	
C1. I am interested in livestock products from a farm that implements green practices.	0.9954
C2. Livestock products utilizing green practices are healthier.	0.9936
C3. Livestock products utilizing green practices are more expensive.	0.6170
C4. Livestock products utilizing green practices have less environmental impact.	0.9892
C5. I do not mind buying livestock products with less environmental impact, even though they are more expensive.	0.9547
C6. I would prefer it if I recognized that a livestock product adopted green practices based on its packaging or brand.	0.9954

The relationship between education level and the perception of green practices in livestock sector also depicts a strong positive correlation with an average $r = 0.9242 \pm 0.1$. All the statements regarding respondents' perception have a strong positive correlation with respondent's education level except for statement C3, which has a moderate positive correlation ($r = 0.6170$). As most respondents had chosen price as one of the main criteria considered when purchasing livestock products, the correlation between price and statement C3 was also evaluated. The statement exhibits a strong positive correlation ($r = 1.000$) with price. This means that the respondents who considered price an essential factor when buying livestock products perceived that livestock products utilizing green practices are more expensive.

Kamalanon *et al* (2022) mentioned that even though many consumers are becoming more aware of environmental issues, the sales of environmentally friendly products are still not impressive (Kamalanon *et al.*, 2022). Based on the respondents' responses in Section C, it can be implied that they support the green initiative. However, due to their high price, most are not keen to purchase green products. The past survey also found that consumers supporting the sustainable livestock sector by purchasing local and organic products are not willing to pay higher prices since they believe they have done their part by making environmentally friendly decisions (Stampa *et al.*, 2020).

The correlation between age and willingness to pay more for environmentally friendly products (statement C5) was also evaluated. The parameters have a strong positive correlation (r = 0.9683), where older respondents are more willing to pay extra for green livestock products. This corresponds to a previous study where middle-aged respondents have higher purchase intention for environmentally friendly goods than youths, as they are the primary income source and are often the decision makers for household items Rustagi & Prakash, 2022). However, recent literature demonstrated that youths are more likely to purchase green products as they know more about environmental issues than older generations (Rusli *et al.*, 2022).

The findings gathered from this pilot study will help the authors make necessary improvements to the developed questionnaire before the large-scale testing. As mentioned in the literature, a pilot study aims to ensure the feasibility of a survey and data collection process by conducting it on a small scale with a group of respondents that represent the larger population intended in the study (Doody & Doody, 2015; Fraser *et al.*, 2018).

5. Recommendations

The authors found several issues from this pilot study that should be rectified to improve this study. Instead of using dichotomous options, the questionnaire can employ a Likert scale. It is suggested that Likert-scale data provides a more comprehensive evaluation compared to dichotomous data (Marco-Franco *et al.*, 2022). Some questions should be reworded to avoid confusion among the respondents. For instance, questions B3 and B10 had a low percentage of correct answers, 50.00% and 37.50%, respectively. This may be due to the sentence arrangement and the use of the word “not” that the respondents might miss and confuse (Australian Bureau of Statistics, 2022).

As a small number of samples limits this study, it is recommended that the questionnaire be further distributed to a larger population to provide a more accurate

representation of the livestock consumers in Malaysia. The recommended sample size is 385, with a 5% margin of error and 95% confidence level. The sample size was calculated based on the 22.9 million population in Malaysia aged 15 – 64 years old (DOSM, 2023). This age group was chosen as they are most likely involved in the decision-making of household grocery purchases.

This study has given us insights into consumers' perceptions of green livestock practices. Based on the data analyzed, respondents' knowledge and perception are significantly influenced by their education level. Therefore, the related parties and stakeholders should play their roles in increasing awareness of the green industry. This facilitates the transition from conventional livestock practices to sustainable alternatives that the consumers support. Green advertising can improve consumers' knowledge and perception, especially among the youth (Abd Rahim *et al.*, 2012). Early exposure of the youths to environmental awareness can help us to ensure sustainable agriculture and food security.

6. Conclusions

The knowledge and perception of respondents on green practices in the livestock sector are relatively good, with a strong positive correlation with their education level. Overall, the respondents showed a positive perception towards sustainable livestock practices. However, they are not inclined to pay a higher price for green livestock products. A larger-scale study should be conducted to obtain a fairer view of the population.

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