

Hydroponic on the Rise: A Study of Consumer Behavior and Purchase Intentions

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ABSTRACT

This study aims to analyze buyer behavior in selecting hydroponic vegetable items. The sample consisted of 100 respondents who had previously purchased hydroponic vegetables. The investigation was conducted using Structural Equation Modeling (SEM) based on variance, particularly employing the Partial Least Squares (PLS) approach. The results show that cost positively influences purchasing decisions, product quality positively affects consumer characteristics, and consumer taste has a positive and significant effect on purchasing decisions for hydroponic vegetables. In contrast, the relationships between cost and consumer characteristics, product quality and purchasing decisions, consumer characteristics and purchasing decisions, consumer taste and consumer characteristics, as well as trends with both purchasing decisions and consumer characteristics, were found to be negative or statistically insignificant, indicating no meaningful impact on the decision to buy hydroponic vegetables. Consumer taste was found to be shaped by specific factors such as personal health consciousness, prior experience with hydroponic products, and exposure to healthy lifestyle trends on social media. Data were collected through a structured questionnaire consisting of multiple indicator statements related to price perception, product quality, consumer preferences, and demographic attributes. However, this study has several limitations, including a relatively small sample size limited to 100 respondents, a geographically restricted research area (Pekanbaru City), and the use of self-reported data, which may introduce response bias. Future studies are recommended to use larger and more diverse samples and to incorporate additional variables such as environmental awareness, marketing exposure, and cultural influences to strengthen the generalizability of the findings.

Keywords: *hydroponic product, marketing strategy, supermarket*

BACKGROUND

Hydroponic vegetables are a type of horticultural crop with relatively high economic value when cultivated intensively and commercially. They serve as a source of income for farmers and traders, while also creating broader employment opportunities. In addition, hydroponic vegetables

provide environmental benefits such as freshness, comfort, greenery, aesthetic value, and improved environmental health. Plants also play a vital role as sources of oxygen, which is essential for life. To better understand hydroponic vegetable production in Pekanbaru City during 2023–2024 by crop type, see Figure 1.

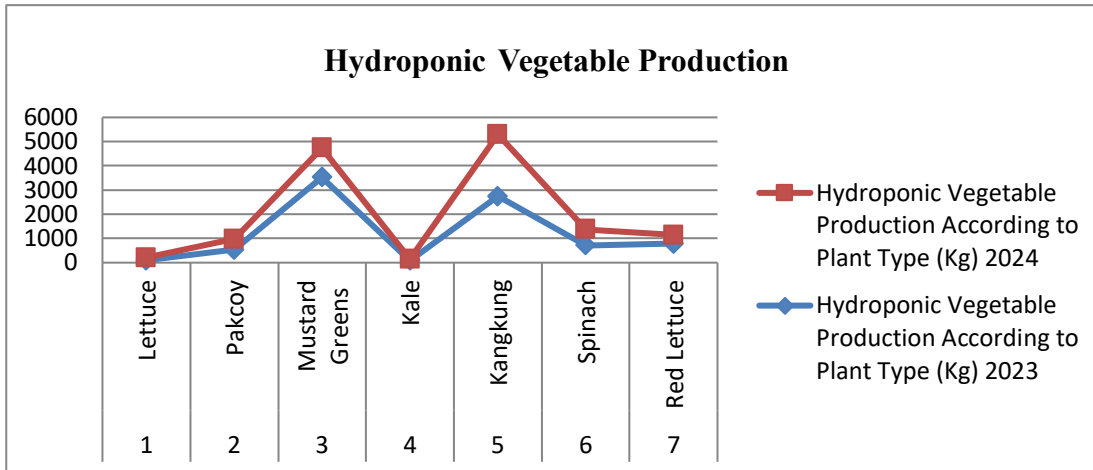


Figure 1: Hydroponic Vegetable Production According to Hydroponic Vegetable Type in Pekanbaru City 2023-2024

Source: BPS, Pekanbaru City in figures, 2024

Based on Figure 1, it can be observed that in 2023, mustard greens were the most widely cultivated hydroponic crop among the community, while in 2024, water spinach became the dominant commodity. Hydroponic vegetables are preferred due to their high economic value and promising business prospects. Overall, the development of hydroponic farming in Riau, particularly in Pekanbaru City, has progressed rapidly, as indicated by increased production, improved availability of raw materials and community consumption, as well as rising household income. The existence of hydroponic farming not only benefits farmers but is also expected to contribute to regional development in Pekanbaru (Pekanbaru, 2024).

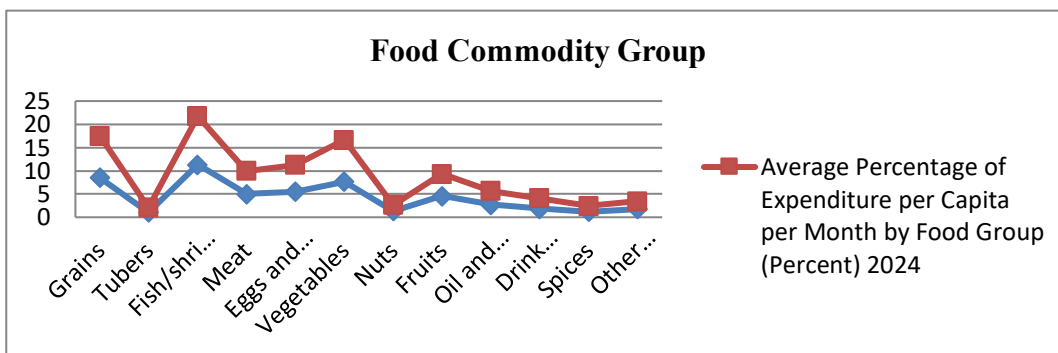


Figure 2: Average Percentage of Expenditure per Capita per Month by Food Group (Percent) in Pekanbaru City 2023-2024

Source: BPS, Pekanbaru City in figures, 2024

Previous studies have highlighted several influencing factors, such as increasing public awareness of health, leading consumers to prefer hydroponically grown vegetables since the cultivation process avoids chemical pesticides. Moreover, consumers perceive hydroponic products Hydroponic on the Rise: A Study of Consumer Behavior and Purchase Intentions (Putri et al., 2026) 339

as fresher and healthier compared to conventionally grown vegetables. In Riau Province, especially in Pekanbaru, consumers are also more inclined to purchase hydroponic vegetables due to their packaging. Another phenomenon observed is that consumers in Pekanbaru tend to buy hydroponic vegetables in supermarkets, as these serve as “one-stop” shopping centers where all necessities can be purchased in one place.

Based on expenditure data (Figure 2) of the people of Pekanbaru City for daily needs, it can be seen that vegetables are the most consumed commodity after fish and rice. From these data, it can be concluded that vegetables represent one of the most widely consumed commodity groups by the people of Pekanbaru (Pekanbaru, 2024). The graph further shows that vegetable consumption is relatively high because the community has begun to understand the health benefits of vegetables. In addition, this trend also supports government programs to address stunting issues by encouraging the consumption of healthy and nutritious foods. A proper balance of carbohydrates, proteins, fats, and fiber contained in vegetables is essential for improving nutritional quality (Riau, 2024).

RESEARCH METHODS

This research was conducted in Pekanbaru City, in several markets that offer hydroponic products. The population includes a very large number of consumers, so the researchers used sampling to facilitate the processing of research data. Samples are part of the number and characteristics of the population (Sugiyono, 2018), so the number of samples taken must be able to represent the population in the study. The method used in sampling is accidental sampling. Given that the population is unknown, the number of samples was determined using the Lemeshow equation. Therefore, in this study, sampling was carried out on 100 respondents who had purchased hydroponic vegetables at the research location. Data analysis in this study used the SmartPLS software. The analysis methods used are descriptive analysis and partial least square methods (Ng et al., 2019).

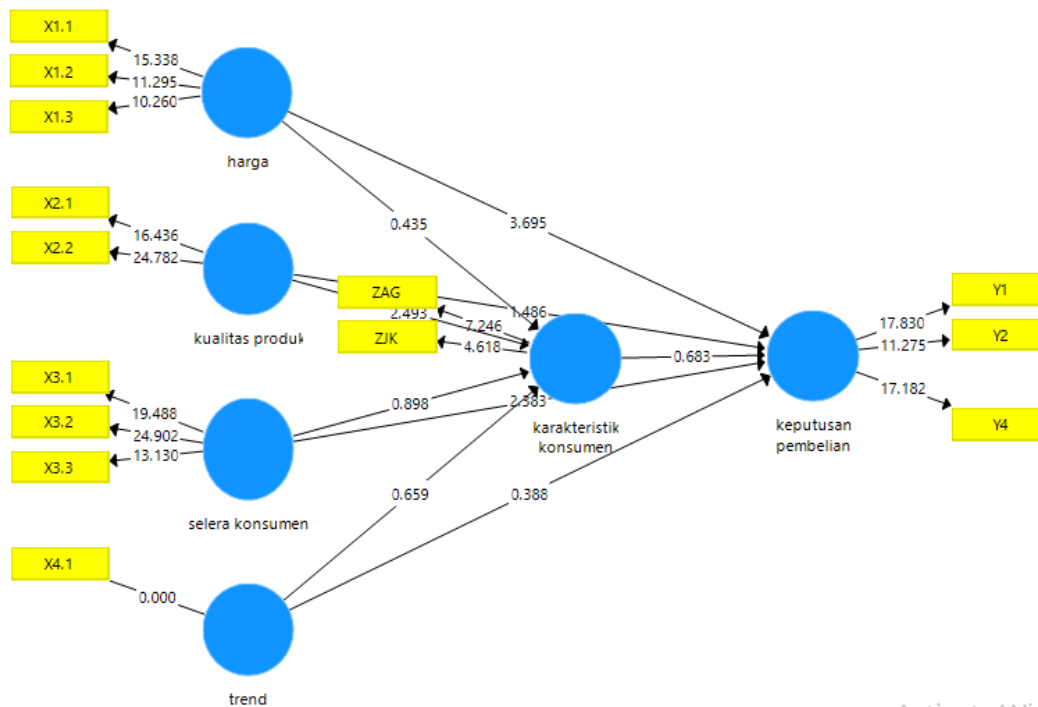
To collect the data, respondents were given structured questionnaires consisting of several sections: (1) demographic questions (age, gender, education, income level, and household size), (2) consumer behavior questions (frequency of purchasing hydroponic vegetables, preferred types of vegetables, purchase locations), (3) perception-based questions measured using a Likert scale (price perception, product quality, consumer taste preferences, and awareness of market trends). To ensure data reliability, the questionnaire was pre-tested on 20 respondents to evaluate clarity and consistency, and necessary revisions were made before full deployment. Additionally, internal consistency was tested using Cronbach's Alpha to verify the reliability of each construct. In terms of demographic factors, the sampling considered age, gender, education level, and monthly income, aiming to capture a diverse range of consumer profiles that could represent the broader population of hydroponic vegetable buyers in Pekanbaru City.

RESULT AND DISCUSSION

Hypothesis Testing

Hypothesis testing aims to determine whether a hypothesis is accepted or rejected. If the Original Sample (O) value > 0 indicates that the hypothesis has a positive effect, conversely if the Original Sample (O) value < 0 indicates that the hypothesis has a negative effect (Ariadi Yudi et al., 2021). The T-Statistics value in hypothesis testing must produce a value > 1.96 and the P-Values

value in hypothesis testing must produce a value < 0.05 can be said to have a significant effect (Handranata et al., 2019). The following are the results of hypothesis testing using the bootstrapping procedure:



Picture 3. PLS Bootstrapping Test

Table 1. Direct Influence

	Original Sample (O)	T Statistics (O/STDEV)	P Values
price -> consumer characteristics	0.072	0.435	0.664
price -> purchasing decision	0.389	3.695	0.000
consumer characteristics -> purchasing decision	0.070	0.683	0.495
product quality -> consumer characteristics	-0.429	2.493	0.013
product quality -> purchasing decision	0.177	1.486	0.138
consumer tastes -> consumer characteristics	-0.110	0.898	0.370
consumer tastes -> purchasing decision	0.228	2.383	0.018
trend -> consumer characteristics	0.095	0.659	0.510
trend -> purchasing decision	0.040	0.388	0.698

Source. Data processed by SmartPLS, 2024

The analysis of direct effects (table 1) reveals relationships between various factors and consumer behavior. Price significantly influences purchasing decisions with a positive and strong impact (p-value = 0.000), while its effect on consumer characteristics is weak and statistically insignificant (p-value = 0.664). Consumer characteristics do not significantly affect purchasing decisions (p-value = 0.495). Product quality negatively impacts consumer characteristics (p-value = 0.013), but its effect on purchasing decisions is not significant (p-value = 0.138). Consumer tastes have a statistically significant positive effect on purchasing decisions (p-value = 0.018), but only a weak negative effect on consumer characteristics (p-value = 0.370). Trends show no significant

impact on either consumer characteristics or purchasing decisions (p-values = 0.510 and 0.698, respectively). Overall, price and consumer tastes emerge as the most influential factors on purchasing decisions, while product quality affects consumer characteristics without directly influencing purchasing behavior.

Tabel 2. Specific Indirect Effects

	Original Sample (O)	T Statistics (O/STDEV)	P Values
price -> consumer characteristics -> purchasing decision	0.005	0.233	0.816
product quality -> consumer characteristics -> purchasing decision	-0.030	0.637	0.524
consumer taste -> consumer characteristics -> purchasing decision	-0.008	0.408	0.683
trend -> consumer characteristics -> purchasing decision	0.007	0.344	0.731

Source. Data processed by SmartPLS, 2024

The analysis of indirect effects (table 2) reveals that none of the examined pathways significantly impact purchasing decisions. The effect of price on purchasing decisions through consumer characteristics is very weak and statistically insignificant (p-value = 0.816). Similarly, the indirect effect of product quality on purchasing decisions through consumer characteristics is also weak and not statistically significant (p-value = 0.524). The consumer taste pathway shows a negligible negative impact on purchasing decisions through consumer characteristics, with a p-value of 0.683, indicating no significant influence. Finally, the trend also has an insignificant and very weak indirect effect on purchasing decisions through consumer characteristics (p-value = 0.731). In summary, none of the indirect relationships between these variables significantly influence purchasing decisions.

The table over appears the backhanded impact with the nearness of characteristic factors as interceding factors. The impact of cost on acquiring choices through buyer characteristics as intervening factors with a unique test of 0.005, t-count of 0.233 and p values of 0.816 clarifies that the impact that happens is positive but not critical (Muhtarom et al., 2022). This implies that the characteristic factors don't intervene the impact between cost and acquiring choices. The impact of item quality on acquiring choices through shopper characteristics as a mediating variable with the first test -0.030, t-count of 0.637 and p values of 0.524 clarifies that the impact is negative and not noteworthy. This implies that the shopper characteristic variable does not intervene the impact between item quality and acquiring choices (Zhang et al., 2018). The impact of shopper tastes on obtaining choices through consumer characteristics as a interceding variable with the first test -0.008, t-count of 0.408 and p values of 0.683 clarifies that the impact is negative and not noteworthy. This implies that the buyer characteristic variable does not intervene the impact between buyer tastes and acquiring choices (Srienieng & Thapa, 2018). The impact of patterns on acquiring choices through customer characteristics as a intervening variable with the first test 0.007, t-count of 0.344 and p values of 0.731 clarifies that the impact is positive but not critical. This implies that the characteristic

variable does not intercede the impact between patterns and acquiring choices (Ariadi Yudi et al., 2021).

Table 3. Effects Total

	Original Sample (O)
price -> purchasing decision	0.394
product quality -> purchasing decision	0.147
consumer tastes -> purchasing decisions	0.221
trend -> purchasing decision	0.047

Source. Data processed by SmartPLS, 2024

The analysis results presented in Table 3 show that the direct and indirect effect between price and purchase decisions is 0.394, while the effect of product quality on purchase decisions is 0.147. Additionally, consumer taste was found to have a positive effect of 0.221 on purchase decisions, whereas the effect of market trends on purchase decisions was minimal, with a total impact value of only 0.047. These findings highlight that while price contributes to purchasing decisions, product quality—particularly in terms of cleanliness and hygiene—emerges as a more critical determinant. Consumers place high importance on the assurance that hydroponic vegetables are clean, fresh, and free from contamination. This perception directly influences their willingness to purchase despite the relatively higher prices of hydroponic products.

Product quality in this study was measured through a Likert-scale questionnaire comprising ten indicator statements. Among these indicators, the most influential statement according to respondents was: *“Hydroponic products are clean and hygienic.”* Several other indicators used to assess product quality included freshness (color, texture, aroma), cleanliness and physical appearance (absence of dirt, wilting, or damage), taste and perceived nutritional value, and shelf life after purchase. Consumer perception of these attributes often outweighs objective assessments in shaping purchasing behavior.

The results suggest that improving freshness and cleanliness has the strongest potential to increase consumer interest. This finding aligns with previous studies showing that visual appearance and hygiene significantly affect consumers’ perceived value of fresh produce. Demographic analysis revealed that education level and income were the most significant factors influencing consumer behavior. Consumers with higher education levels tend to have greater awareness of the health benefits associated with hydroponic vegetables and are more willing to pay premium prices. This was supported by the most frequently selected statement: *“My level of education influences my awareness of the importance of healthy eating patterns.”*

Income also played a notable role, as indicated by the statement: *“My income is sufficient to afford healthy products.”* Respondents with middle-to-high incomes were more likely to purchase hydroponic products regularly. Age was another contributing factor, with younger adults showing greater interest in innovative and health-oriented products such as hydroponic vegetables. Conversely, gender did not significantly influence purchasing behavior, suggesting that socio-economic and educational variables are more relevant than gender in shaping purchasing decisions.

Several unexpected findings emerged during the analysis. First, price was not the primary determinant in purchasing decisions, despite the fact that hydroponic vegetables are generally more

expensive than conventional alternatives. Many respondents perceived the health benefits and quality of hydroponic products as more important than cost considerations. Second, although social media was not a core research variable, it was found to have a strong indirect influence on purchasing behavior, particularly among younger respondents who are exposed to healthy lifestyle and modern agriculture content through digital platforms.

Lastly, purchase frequency did not always correlate positively with income levels. Some high-income respondents purchased hydroponic vegetables only occasionally as a consumption variation rather than a daily necessity. These findings imply that consumer behavior toward hydroponic products is not solely driven by economic capacity, but also by perceived value, lifestyle orientation, and social-digital influences. This highlights the need for hydroponic producers and marketers to emphasize quality, health benefits, and social media engagement to strengthen consumer interest and purchasing decisions.

Within the examination comes about contained in table 3, it can be seen that the coordinate and backhanded impact between cost and acquiring choices is 0.394, the impact of item quality on acquiring choices appears a esteem of 0.147. Moreover, the impact of customer tastes on obtaining choices is 0.221. Whereas the impact of patterns on acquiring choices for direct and roundabout impacts incorporates a add up to esteem of 0.047

The comes about of speculation testing on the relationship between cost builds and shopper characteristics have an Unique Test (O) esteem on the cost variable in theory testing getting a esteem of 0.072, for the T-Statistics esteem of 0.435 and after that for the P-Values esteem of 0.664. From these comes about it can be concluded that cost incorporates a positive and inconsequential impact on shopper characteristics (Faletar et al., 2021), (Surya & Aroquiaraj, 2019).

The comes about of theory testing on the relationship between cost builds and acquiring choices have an Unique Test (O) esteem on the cost variable in hypothesis testing getting a esteem of 0.389, for the T-Statistics esteem of 3.695, and after that for the P-Values esteem of 0.000. From these comes about it can be concluded that cost includes a positive and noteworthy impact on acquiring choices (Muhtarom et al., 2022), (Putri et al., 2023). The comes about of speculation testing on the relationship between item quality develops and buyer characteristics have an Unique Test (O) esteem on the item quality variable in speculation testing getting a esteem of -0.429, for the T-Statistics esteem of 2.493 and after that for the P-Values esteem of 0.013. From these comes about it can be concluded that item quality incorporates a positive and critical impact on buyer characteristics (Kusno et al., 2021), (Lestari, 2016).

The comes about of speculation testing on the relationship between the product quality develop and obtaining choices have an Unique Test (O) esteem on the item quality variable in hypothesis testing getting a esteem of 0.177, for the T-Statistics esteem of 1.486 and after that for the P-Values value of 0.138. From these comes about it can be concluded that item quality features a positive and immaterial impact on obtaining choices (Zhou et al., 2017). The results of theory testing on the relationship between the develop of the impact of customer behavior on purchasing decisions have an Unique Test (O) esteem on the consumer behavior variable as an interceding variable in speculation testing getting a esteem of 0.070, for the T-Statistics esteem of 0.683 and after that for

the P-Values esteem of 0.495. From these comes about it can be concluded that shopper characteristics have a positive and insignificant effect on obtaining choices (Iocola et al., 2018).

The results of hypothesis testing on the relationship between the construct of consumer taste and consumer behavior have an Original Sample (O) value on the consumer taste variable in hypothesis testing getting a value of -0.110, for the T-Statistics value of 0.898 and then for the P-Values value of 0.370. From these results it can be concluded that consumer taste has a negative and insignificant effect on consumer characteristics (Faletar et al., 2021). The results of hypothesis testing on the relationship between the construct of consumer taste and purchasing decisions have an Original Sample (O) value on the variable of consumer taste in hypothesis testing getting a value of 0.228, for the T-Statistics value of 2.383 and then for the P-Values value of 0.018. From these results it can be concluded that consumer taste has a positive and significant effect on purchasing decisions (Handranata et al., 2019).

The results of hypothesis testing on the relationship between the construct of trends and consumer behavior have an Original Sample (O) value on trends in hypothesis testing getting a value of 0.095, for the T-Statistics value of 0.659 and then for the P-Values value of 0.510. From these results it can be concluded that trends have a positive and insignificant effect on behavior (Bhattarai, 2019). The results of hypothesis testing on the relationship between trend constructs and purchasing decisions have an Original Sample (O) value on the trend variable in hypothesis testing with a value of 0.040, for the T-Statistics value of 0.388 and then for the P-Values value of 0.698. From these results, it can be concluded that trends have a positive and insignificant effect on purchasing decisions (Poyearleng et al., 2019).

The findings of this study reveal several key relationships between the examined variables influencing hydroponic vegetable purchasing behavior. First, price shows a positive and significant effect on purchasing decisions, yet only an insignificant effect on consumer characteristics. This suggests that while pricing plays a crucial role in the final decision to purchase, it does not necessarily shape long-term consumer profiles or preferences. Conversely, product quality demonstrates a significant positive impact on consumer characteristics but an insignificant effect on purchasing decisions, indicating that perceived quality strengthens consumer attitudes and trust but may not immediately translate into purchase actions. Moreover, consumer taste significantly affects purchasing decisions, where as consumer characteristics as a mediating variable and trends as a construct both show no significant effects on purchasing decisions or behavior.

These results imply that price and consumer taste act as direct purchase drivers, while product quality shapes consumer attitudes and loyalty over time, rather than prompting immediate purchase.

Managerial and Practical Implications

1. Optimizing Pricing Strategies

Given the strong positive influence of price on purchasing decisions, sellers should adopt value-based pricing that aligns with consumers' willingness to pay for health-oriented products. Implementing tiered pricing models—such as offering smaller package sizes at lower price points and premium bundles with added freshness guarantees—could appeal to

both price-sensitive and quality-oriented consumers. Seasonal discounts or loyalty programs can also maintain demand consistency.

2. Recommended Quality Improvements

Product quality was strongly associated with consumer characteristics, suggesting that enhancing physical appearance, cleanliness, and freshness can build long-term loyalty. Farmers and retailers should implement stricter post-harvest handling protocols, including hygienic packaging, cold storage, and visible quality certification labels. Educating consumers about the nutritional value and safety assurance of hydroponic products can further reinforce quality perceptions.

3. Enhancing Consumer Taste Feedback Collection

To better capture evolving consumer preferences, producers can introduce regular taste-testing events, online feedback surveys, or QR code-linked feedback forms on packaging. Additionally, collaborating with influencers or nutritionists to collect and interpret consumer responses on social media can provide richer, real-time insights into shifting taste preferences, particularly among younger demographics.

Potential Impact of Additional Factors

Although this study did not examine factors such as marketing strategies and environmental awareness, they could substantially influence consumer behavior toward hydroponic vegetables.

- a. Marketing exposure, including digital campaigns, social media engagement, and point-of-sale promotions can increase consumer awareness and perceived value, potentially amplifying both purchase frequency and brand loyalty. Effective marketing can also bridge the knowledge gap for consumers unfamiliar with hydroponic cultivation methods.
- b. Environmental awareness may also act as a motivational driver: as consumers become more environmentally conscious, they may prefer hydroponic vegetables for their lower water use, reduced pesticide reliance, and smaller ecological footprint. This pro-sustainability mindset can enhance the perceived moral and social value of purchasing hydroponic produce, thereby strengthening purchase intentions beyond price and quality considerations.

CONCLUSION AND SUGGESTION

Based on the results and analysis of this study, it can be concluded that price has a positive and significant effect on purchasing decisions (P-Value = 0.000), product quality has a positive and significant effect on consumer characteristics (P-Value = 0.013), and consumer taste has a positive and significant effect on purchasing decisions (P-Value = 0.018) in the context of purchasing hydroponic vegetables at stores. In contrast, the relationships between price and consumer characteristics (P-Value = 0.664), product quality and purchasing decisions (P-Value = 0.138), consumer characteristics and purchasing decisions (P-Value = 0.495), consumer taste and consumer characteristics (P-Value = 0.370), trends and purchasing decisions (P-Value = 0.698), and trends and consumer characteristics (P-Value = 0.510) were found to be negative or statistically insignificant, indicating that these variables do not influence purchasing decisions for hydroponic vegetables.

Expanding the study to include respondents from various regions could reveal regional differences in consumer behavior, cultural influences, and market maturity levels that affect purchasing decisions. Variables such as environmental awareness, marketing exposure, lifestyle orientation, and social influence could be integrated to better capture the multidimensional nature of consumer decision-making. Increasing the sample size and employing stratified sampling could improve the statistical power and representativeness of the data, reducing sampling error and increasing the reliability of the conclusions.

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