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Research Article

Implementing the Quality Function to Improve the Organic Vegetable Quality

Maulina Yuanita[a,1,*], Noor Harini[b,2], Adi Sutanto[c,3]

[a] Master Program of Agribusiness, Directorate of Master Program, Universitas Muhammadiyah Malang
[b] Department of Food Science and Technology, Faculty of Agriculture and Animal Sciences, Universitas Muhammadiyah Malang
[c] Department of Animal Science, Faculty of Agriculture and Animal Sciences, Universitas Muhammadiyah Malang
[1] maulinayuanita@gmail.com*; [2] harini@umm.ac.id; [3] sutanto@umm.ac.id
* corresponding author

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ABSTRACT

This research delves into the pivotal role of quality management in sustaining organic vegetable production, underscoring its profound connection to consumer satisfaction and subsequent impact on purchasing decisions. Within the organic market, predominantly catering to the upper to middle-class demographic in Batu, East Java, Indonesia, consumer preferences dictate heightened product specifications and, consequently, necessitate a focus on quality. To fortify market presence, this study advocates for the direct involvement of organic farmers throughout the entire production-to-marketing continuum, transforming them into not just cultivators but entrepreneurs. In the face of escalating competition, product quality emerges as a paramount subsystem requiring prioritization. The study employs the quality function method for planning and developing pertinent organic vegetable products aligned with consumer interests, identifying areas for improvement. The primary objective is to ascertain consumer demands and devise corrective measures to augment satisfaction. Employing the online survey method, participants were limited to consumers who had purchased organic vegetable products from Batu-based farmers in East Java at least twice. Analyzing the data revealed that consumer prioritized quality attributes encompassed vegetable cleanliness, product pricing, and ease of accessibility. Notably, technical interventions such as the implementation of Good Handling Practices, Internal Control System (ICS), and enhancing service quality during organic vegetable cultivation significantly influenced consumer interest attributes, fostering heightened satisfaction. This study contributes valuable insights for organic farmers and stakeholders seeking to optimize product quality in response to evolving consumer demands.

INTRODUCTION

The burgeoning potential for the development of organic vegetable agribusiness in Batu, Malang, East Java, Indonesia, has generated considerable interest among practitioners in this agricultural domain. According to statistical data from the Statistics Center of Batu, illustrated in the accompanying figures, the agriculture,

forestry, and fisheries sector in Batu held the second position in the economy in 2020. Over the period spanning 2012 to 2021, a total of 22 organic areas were established. The recorded count of organic farmers in Batu reached 461 individuals in 2021, marking an increase from 365 individuals in the preceding year. An inspection conducted by LeSOS revealed that, as of 2021, 84 distinct crop types are cultivated organically within the designated farming areas in Batu. This growth underscores the thriving landscape of organic agriculture in the region.

Presently, the organic market is predominantly associated with the middle to upper class market segment, where consumer preferences demand superior quality and consistent adherence to product standards. The Indonesian Organic Agriculture Statistics Survey (2019) delineates several factors influencing consumers' inclination toward organic vegetable consumption, encompassing the absence of synthetic pesticides, health and nutritional benefits, non-existence of Genetically Modified Organisms (GMOs), heightened food safety, enhanced taste, and environmental friendliness. Furthermore, consumers envisage organic vegetables possessing commendable attributes, unblemished quality, and sustained availability, all while ensuring product safety (Yuarini et al., 2015). Regarding the consumption of organic products, the embracement of a health-oriented lifestyle is emerging as a pervasive global trend. The proliferation of organic products has prompted individuals to adopt a more discerning and judicious approach in selecting the commodities they incorporate into their consumption patterns (Teng & Wang, 2015).

Consumer attitudes toward purchasing organic vegetables are shaped by factors such as health awareness, knowledge, price considerations, availability, and subjective norms. Additionally, socio-demographic characteristics, including age, education, and income, indirectly impact the acquisition of organic products (Singh & Verma, 2017). The visual appeal of organic vegetables has been identified as a significant factor influencing consumer purchasing decisions (Tangkulung et al., 2015). Notably, the year 2020 witnessed a substantial increase in demand for organic rice and vegetable products compared to the preceding year, attributed to the impact of the COVID-19 pandemic in Indonesia (Firman & David, 2019).

This surge in demand has led to a growth in the organic vegetable industry, resulting in heightened competition among businesses. Amidst this intensified competition, the imperative of prioritizing product quality becomes evident. Assessing customer satisfaction necessitates the examination of various attributes and metrics, as consumer satisfaction significantly shapes their mindset and attitude toward future purchases. In this dynamic market environment, manufacturers must prioritize both quality and price to ensure customer retention (Engel et al., 1993).

The assessment of product quality involves evaluating the overall capacity of a product to align with consumer needs, as perceived by customers (Gaspersz, 2003). Consumer-perceived quality stands as a pivotal criterion in gauging satisfaction among consumers. To enhance the quality of organic fresh vegetable products at CV. Peternakan Daun Emas Bali, research on consumer expectations and satisfaction levels was conducted (Yuarini et al., 2015). Anggiasari et al. (2016) explored the impact of consumer evaluations of organic vegetable attributes on purchasing decisions in Bandar Lampung, Lampung, Indonesia. Similarly, Astuti et al. (2019) investigated consumer attitudes toward organic vegetables in Supermarkets in Surakarta, Central Java, Indonesia, focusing on attributes such as quality, freshness, cleanliness, durability, and price.

The potential surge in demand for organic vegetables hinges on customers' willingness to pay the expected price for such products. Thus, adopting a consumer-centric approach is imperative to comprehend the organic food product market effectively, supervise organic farming, and enhance the management of organic food products (Sriwaranun et al., 2015). This study aligns with prior research by emphasizing the utilization of product features to enhance the competitiveness of product quality. However, what distinguishes this study from previous ones is its coverage of the initial stage of product planning, combining intrinsic and extrinsic quality aspects. Employing the concept of Quality Function Deployment (QFD), this study analyzes consumer desires and formulates strategies to elevate consumer satisfaction with organic vegetable products sourced from farmers in Batu. The study draws on theoretical foundations and insights from previous research.

To meet consumer expectations, enhancing product quality necessitates rigorous control over the production process—from seeds, irrigation water, and post-harvest storage warehouses to harvesting methods, transportation vehicles, and distribution storage warehouses. In the era of Industry 4.0, farmers are envisioned as productive and competitive entities, crucial in addressing the demands of the global market. Digitalization serves as a transformative force, reshaping farmers' perspectives to leverage technology and communication for innovation and creativity in agriculture. This transformation enables farmers to actively participate throughout the entire production and marketing continuum, assuming roles not only as farmers but also as entrepreneurs. The aspiration is for organic farmers in Batu to emerge as formidable players, both as contributors and products, in comparison to other regions and even against imported goods from foreign

nations. This forward-looking objective underscores the necessity of formulating strategies geared towards aligning organic product offerings with market demands.

METHOD

This study was conducted from July to September 2022. Consumer survey observations were conducted as an initial assessment to identify the quality characteristics of organic vegetables to be quality checked. Research participants consisted of consumers who have purchased organic vegetables at least twice. Because the exact population of organic vegetable consumers is unknown, the Lemeshow and Levy (1997) formula is used to obtain the sample size, with the following formula:

$$n = \frac{z^2 \times P\,(1-P)}{d^2}$$

$$n = \frac{1{,}96\ 2x\ 0{,}5}{(0{,}1)^2}$$

$$n = \frac{3{,}8416 \times 0{,}25}{(0{,}01)}$$

$$n = 96{,}04 = 100 \text{ (rounded to 100 respondents)}$$

Where:
n = number of samples
z = z score at 95% confidence = 1.96
p = maximum estimate = 0.5
d = alpha or sampling error = 10% = 0.1

A hundred consumers were purposefully sampled based on specific criteria, namely, individuals who purchase organic vegetables from Batu farmers at least twice and reside in East Java. Concurrently, 12 farmers were selected as technical respondents using a purposive sampling method. These 12 respondents, who are organic farmers from Batu, are instrumental in enhancing production parameters to elevate the quality of organic vegetables in accordance with consumer expectations. The chosen farmers are those engaged in cultivating organic vegetables and have successfully obtained organic certification from Lesos. Organic certification is a procedural step to validate that the cultivation process and the resulting organic products adhere to established organic standards and regulations. Upon compliance with these principles and regulations, farmers or producers receive an organic certificate, permitting them to affix the organic label on their products.

The distribution of the questionnaire occurred via an online survey utilizing the Google Form format, disseminated through the WhatsApp social media platform. This distribution was conducted in Batu, East Java, the designated market for locally produced organic vegetable products. Quality Function Deployment (QFD) serves as a valuable tool in the advancement of organic vegetable product development, facilitating the acquisition of crucial insights pertaining to consumer preferences, producer requisites, and product specifications. Figure 1 depicts the research framework.

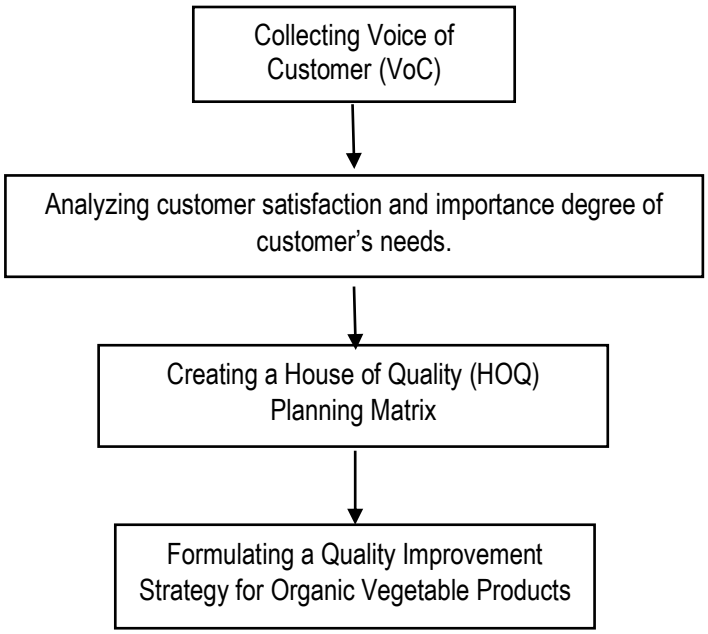


Figure 1. Research Framework

QFD Implementation Stages

Voice of the Customer (VoC)

Voice of the Customer (VoC) pertains to the systematic identification of customer needs, essential for shaping the quality elements incorporated into the questionnaire. This process involves conducting interviews with 25 customers who regularly purchase organic products, including edible plants. The primary aim at this stage is to gather data pertaining to customer needs, specifically focusing on product attributes. Data on the varying levels of product attributes is acquired through consumer surveys or qualitative market research, conducted via direct interviews with customers.

Identification of Customer's Needs

The initial and paramount step in the Quality Function Deployment (QFD) process is the identification of customer needs (Tjiptono & Diana, 1995). These needs are systematically addressed and prioritized in the planning cycle. Tjiptono (2011) posits that quality, as an attribute, permeates all dimensions of a product offering, ultimately yielding benefits for consumers. The determination of a product's quality is contingent upon the various dimensions of its quality attributes.

Importance level of customer's need and satisfaction

The significance of product quality for each consumer's needs is reflected at the customer level. Customer satisfaction hinges on the evaluation of the extent to which existing goods fulfill their requirements (Ridwanda, 2020). A sample of 100 respondents participated in the study, providing data through a consumer questionnaire. The survey, employing a Likert scale ranging from 1 to 4, involved assessing consumer expectations and their perceptions of product satisfaction. A score of 4 on this scale indicates a high level of significance or satisfaction, while a score of 1 represents the lowest level, signifying insignificance or dissatisfaction. The data obtained from the questionnaire were utilized to complete the House of Quality (HoQ) planning matrix.

Creating a House of Quality (HOQ) Planning Matrix

The House of Quality (HoQ) illustrates the voice of the customer, representing customer needs and wants (Voice of Customer) in the left matrix. Simultaneously, the top matrix displays the development and response of the technical team in addressing these needs and wants. The reference matrix comprises multiple sections or submatrices that collaboratively convey interrelated information. Figure 2 visually outlines the connections between these matrices.

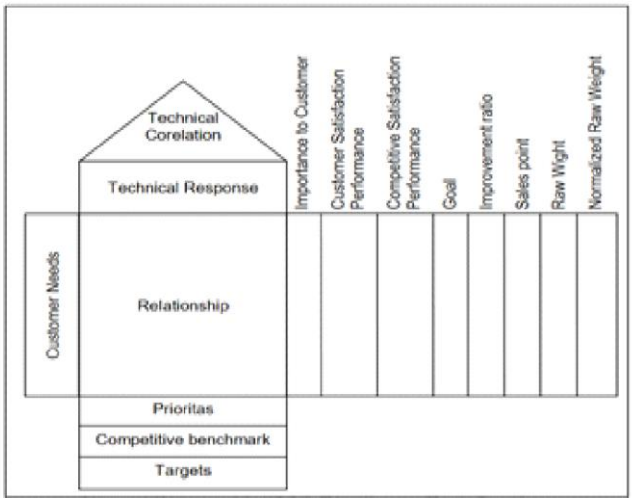


Figure 2. Relationship Between Matrices in HoQ (Source: Cohen, 1995)

Overall, the QFD method has four stages, where each stage produces a matrix (Cohen, 1995). The four stages are product planning, design planning, process planning, and production planning. However, this research was carried out until the first stage, namely the product planning stage so the stages in this study were based on the steps required in making the HoQ matrix.

RESULTS AND DISCUSSION

Identification of Customer's Needs

The aim of quality identification is to ascertain the necessary quality attributes essential for formulating the questionnaire. This phase involved conducting interviews with 25 customers who regularly purchase organic vegetables to discern their expectations regarding the quality of the produced organic vegetables. The identification of customer needs revealed eight dimensions of product quality specific to organic vegetables, as detailed in Table 1.

Table 1. Identification of quality attributes of organic vegetables

Dimensions		Quality Attributes	Indicator
Performance	Intrinsic Quality	The freshness of vegetables	The physical appearance of organic vegetables is fresh and good when they are marketed to consumers
		Vegetable cleanliness	The appearance of vegetables is clean from dirt, pests, and grass
		Uniformity of vegetable size	The appearance of vegetables has a uniform size
		The color of the leaves	Appearance bright leaf color or fresh green
		Perfect condition and shape	Good appearance of vegetables without defects and damage such as holes, torn, spots
Features	Extrinsic Quality	Food safety	Labeled organic logo display according to product characteristics
		The product packaging contains SNI Organic Standards (6729-2016)	Information listed on the packaging
Reliability	Extrinsic Quality	Include a registration number stating that the product has been certified organic by an organic Certification Agency	Information listed on the packaging
Conformance	Extrinsic Quality	Willing to pay more expensive following the quality provided	Prices match the quality of vegetables
Durability	Intrinsic Quality	It does not quickly wither	It does not quickly wither, turn yellow and rot when marketed to consumers
Serviceability	Extrinsic Quality	Available and easy to get	The availability of many organic vegetables and easy to find in the market
		Available service channels (via calls and social media)	Listed order number, criticism and suggestions
Aesthetics	Extrinsic	Attractive packaging design	Neat product packaging

Dimensions		Quality Attributes	Indicator
	Quality	Safe and environmentally friendly packaging	Product packaging materials are guaranteed safe
Perceived quality	Extrinsic Quality	Own a brand	The packaging contains the product name or trademark
		Product price	The affordability of organic products

Source: Processed data (2022)

Table 1 underscores the pivotal role of performance as a crucial component within the spectrum of quality attributes associated with organic vegetable commodities. Consumers, when making vegetable purchases, predominantly prioritize the freshness of vegetables, as it serves as an indirect indicator of nutritional content. The freshness of vegetables correlates with a shorter post-harvest age and less maturity, leading to minimal nutrient loss attributed to physical damage and prolonged storage. These findings align with the conclusions drawn by Rahayuningsih and Anas (2021), emphasizing consumers' willingness to pay premium prices for superior quality and benefits associated with organic vegetables. Additionally, Astuti et al. (2019) revealed that buyers of organic vegetables in Surakarta's supermarkets emphasize the importance of aspects such as quality, freshness, cleanliness, durability, and price. Septiadi and Mundiyah's (2020) research affirms the significant role of high-quality vegetables as an internal element in organic vegetable farming. Santoso (2012) identifies appearance quality, taste quality, nutritional quality, texture, and product safety as the five primary components constituting the quality of horticultural products, including vegetables.

Importance level of customer's need and satisfaction

Determining the importance to customers and evaluating customer satisfaction performance involves multiplying the number of respondents indicating a specific level of importance by the corresponding performance score, then dividing this product by the total number of respondents who received the questionnaire. Table 2 presents the calculated values of customer interests and customer satisfaction performance, highlighting attributes starting from those with the highest values.

Table 2. Importance level of customer's need and satisfaction

Attributes	Quality attributes	Importance to customer	Customer satisfaction performance
1	Vegetable cleanliness	3.93	3.30
2	The freshness of vegetables	3.91	3.66
3	Product price	3.88	3.37
4	Available and easy to get	3.79	3.25
5	It does not quickly wither	3.77	3.52
6	Safe and environmentally friendly packaging	3.77	3.23
7	Perfect condition and shape	3.69	3.32
8	The color of the leaves	3.66	3.54
9	Available service channels (via calls and social media)	3.66	3.34
10	Include a registration number stating that the product has been certified organic by an Organic Certification agency	3.63	3.26
11	Food safety	3.59	3.37
12	The product packaging contains SNI Organic Standards (6729-2016)	3.57	3.27
13	Attractive packaging design	3.42	3.18
14	Willing to pay more per the quality provided	3.42	3.29
15	Uniform size of vegetables	3.37	3.07
16	Own a brand	3.18	3.00

Source: Processed data (2022)

Table 2 illustrates the correlation between the importance value of quality attributes and consumers' choices of organic vegetables for consumption. The calculation outcomes reveal that pivotal quality attributes for consumers include the cleanliness of vegetables, freshness at the point of sale, vegetable pricing, and the availability and ease of access. Higher values of these attributes correspond to greater consumer satisfaction

with the quality of the organic vegetables. Notably, the most satisfactory performance among organic vegetables from Batu farmers is observed in the cleanliness attribute. This aligns with previous research emphasizing consumer interest in the physical appearance of organic vegetables, as demonstrated by the hygiene variable earning the highest value (0.799) in the decision-making process (Rahayuningsih and Anas, 2021).

Consistent with studies by Anggiasari et al. (2016), which highlight the significant role of cleanliness and freshness in influencing consumer decisions to purchase organic vegetables, our study finds that consumers in Batu prioritize vegetable hygiene (score 3.93), vegetable freshness (score 3.91), and product price (score 3.88). These factors collectively influence their purchasing decisions. Additionally, the research by Aufanada et al. (2017) concurs, revealing that the price of organic vegetables impacts customer behavior, influencing purchasing decisions and their willingness to pay higher prices. The strong influence of quality characteristics on consumer willingness to pay for organic vegetable products is consistent with Rodriguez et al.'s (2007) findings, indicating that customers are willing to pay higher prices for organic food products due to their superior quality and inherent superiority.

In line with Saidi et al.'s (2021) assertion regarding prioritized quality attributes, this study affirms that the cleanliness, freshness, and leaf color brightness of leaf vegetables collectively define their overall quality.

Creating House of Quality (HoQ) Planning Matrix

The planning matrix encompasses objectives, improvement ratios, sales points, raw weights, and normalized raw weights for 16 attributes based on the determination of customer needs. The target value for all attributes is set at 4, indicating a satisfactory level of consumer satisfaction with the produced organic vegetables. This perfection in consumer satisfaction serves as the goal value for each attribute. The Improvement Ratio is employed to prioritize consumer needs, offering insight to farmers on the immediate focus areas for meeting customer requirements. A higher Improvement Ratio signifies an elevated level of improvement in addressing customer satisfaction. Notably, the 15th attribute, the presence of a brand, exhibits the highest improvement ratio at 1.33. The absence of a brand in most organic farmer products, primarily sold through intermediaries, underscores an underutilization of resources in establishing a distinctive brand image. Creating a recognizable brand image is essential for facilitating consumer recognition and recall, aligning with the efforts of organic producers to enhance marketability, as emphasized by Hasan et al. (2019).

Attributes such as price, physical perfection, vegetable freshness, and vegetable color are also significant considerations for consumers when purchasing organic vegetables. Tjiptono (2011) supports the notion that brands serve as promotional tools, enhancing product attractiveness, distinguishing identity from competitors, and building an image by assuring quality to consumers. Conversely, the lowest value, pertaining to vegetable freshness as the first attribute, is 1.09. Customer evaluations in Batu reveal satisfactory findings regarding the freshness of organic vegetables, indicating that this attribute does not necessitate immediate attention. Quality improvement in vegetable freshness correlates with the application of Good Handling Practices throughout the stages of harvesting, collection, transportation, packaging, storage, and delivery. As asserted by Saidi et al. (2021), maintaining vegetable freshness involves morning harvesting to avoid sun exposure, shaded collection and transportation, and immediate transport to the production site. Subsequently, packaging serves the dual purpose of shielding organic vegetables from physical and mechanical damage while facilitating the distribution process.

The development of the House of Quality (HoQ) matrix involves the creation of a planning matrix table, as illustrated in Table 3.

Table 3. Planning matrix values

Attributes	Customer needs	Goal	Improvement ratio	Sales point score	Raw weight	Normalized raw weight
1	Vegetable cleanliness	4	1.21	1.5	7.15	0.07
2	The freshness of vegetables	4	1.09	1.5	6.41	0.06
3	Product price	4	1.19	1.5	6.91	0.07
4	Available and easy to get	4	1.23	1.5	7.00	0.07
5	It does not quickly withe	4	1.14	1.5	6.43	0.06
6	Safe and environmentally friendly packaging	4	1.24	1.2	5.60	0.06
7	Perfect condition and shape	4	1.20	1.5	6.67	0.07
8	The color of the leaves	4	1.13	1.5	6.20	0.06
9	Available service channels (via calls and social media)	4	1.20	1.5	6.57	0.07
10	Include a registration number stating that the product has been certified organic by an Organic Certification agency	4	1.23	1.2	5.34	0.05
11	Food safety	4	1.19	1.5	6.39	0.06
12	The product packaging contains SNI Organic Standards (6729-2016)	4	1.22	1.2	5.24	0.05
13	Attractive packaging design	4	1.26	1.5	6.49	0.07
14	Willing to pay more per the quality provided	4	1.22	1.2	4.99	0.05
15	Uniform size of vegetables	4	1.30	1.5	6.59	0.07
16	Own a brand	4	1.33	1.2	5.09	0.05

Source: Processed data (2022)

Table 3 reveals sales point values ranging from 1.2 to 1.5, indicating that the product holds a medium to strong selling position for each attribute of consumer interest. Discussions with farmers underscore those attributes such as fresh vegetables, cleanliness, uniform size, leaf color, perfect condition, food safety, longevity, availability, service channels (telephone and social media), packaging design, and pricing exhibit the highest selling point values at 1.5. Fulfilling these quality attributes with high values is crucial for achieving consumer satisfaction, subsequently elevating the selling value of organic vegetables. Anggiasari et al. (2016) support this notion, identifying characteristics like freshness, cleanliness, durability, vegetable type, color, leaf quality, packaging, and price as influencing consumer satisfaction and intent to purchase organic vegetables.

The raw weight value represents the level of consumer satisfaction fulfillment, and its order aligns with the normalized raw weight value. The higher the raw weight value for an attribute, the greater the priority for farmers to enhance and develop these attributes in meeting customer satisfaction. Notably, Table 3 highlights the largest raw weight value for the attribute of vegetable hygiene, reaching 7.15. This emphasizes the imperative for farmers to diligently enhance the quality attributes of vegetable cleanliness, a critical physical characteristic in preserving the overall quality of organic vegetables. The emphasis on vegetable cleanliness reflects buyers' prioritization of this aspect in their organic vegetable purchases. Astuti et al. (2019) note that visually appealing organic vegetables have the potential to foster consumer loyalty, as consumers prioritize quality and benefits over price. Hygiene variables, as found by Yuarini et al. (2015), play a crucial role in influencing customer purchasing decisions for organic vegetables. Rahayuningsih and Anas (2021) highlight the significant impact of quality aspects such as vegetable cleanliness, freshness, packaging, and color on consumer decisions to purchase organic vegetables. Furthermore, Hasan et al. (2019) affirm that customers express a preference for aesthetically pleasing organic vegetables. These findings echo consistent trends in organic vegetable consumption across diverse regions, providing a reliable reference for producers to assess and maintain the quality of organic vegetables, ensuring consumers can make informed and consistent decisions when purchasing organic products.

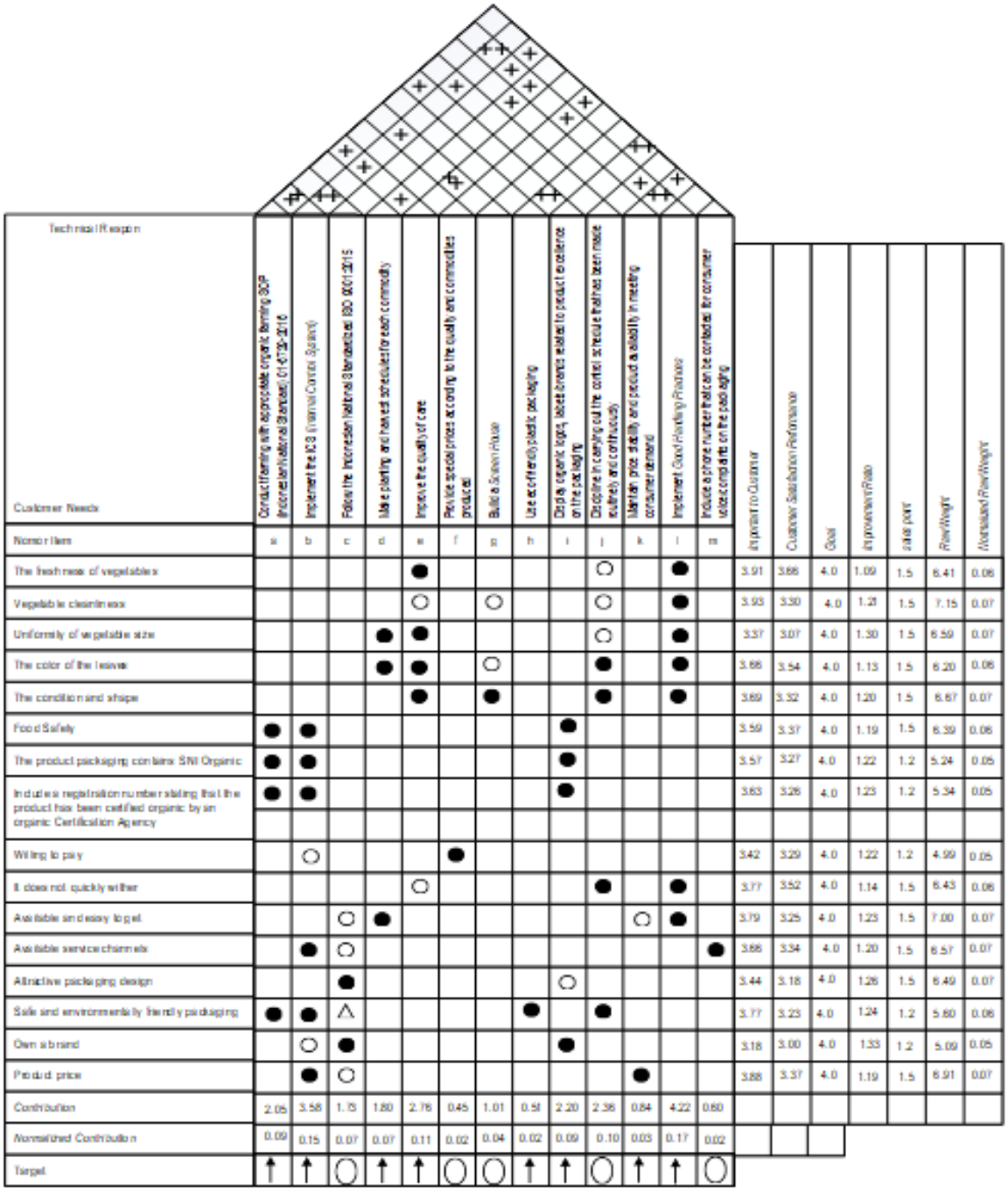
The technical response is a strategic approach employed by organic vegetable producers to align their products with consumer preferences, utilizing available farmer resources. Through an identification process, 13 distinct technical responses were identified, aiming to meet the quality attributes aligned with consumer needs. These responses include adherence to organic agriculture standards (SOP/SNI 01-6729-2016),

implementation of the Internal Control System (ICS), compliance with SNI ISO 9001:2015, development and adherence to planting and harvest schedules for each commodity, enhancement of care quality, provision of special prices based on quality and produced commodities, construction of bulkhead houses, utilization of environmentally friendly plastic packaging, incorporation of organic logos, labels/brands reflecting product excellence on packaging, disciplined execution of control schedules, maintenance of price stability, and ensuring product availability to meet consumer demand. Additionally, the implementation of Good Handling Practices and the provision of contact information for consumer feedback are crucial aspects, as depicted in Figure 3.

Consumer emphasis on the cleanliness of purchased organic vegetables is evident, aligning with the findings of Astuti et al. (2019), emphasizing the visual appeal's role in fostering consumer loyalty. Consumers prioritize the quality and benefits derived from organic vegetables over price considerations. Hygiene variables, as highlighted by Yuarini et al. (2015), play a pivotal role in shaping customer purchasing decisions for organic vegetables. Rahayuningsih and Anas (2021) underscore the significant influence of quality attributes such as vegetable cleanliness, freshness, packaging, and color on consumer decisions when buying organic vegetables. Hasan et al. (2019) further support this, indicating that customers exhibit a preference for aesthetically pleasing organic vegetables. Consistent patterns in organic vegetable consumption decisions among respondents across various regions suggest a uniform decision-making process in opting for organic products. This consistency provides producers with a reliable reference point for evaluating the quality of organic vegetables, enabling consumers to make informed and consistent decisions when purchasing organic products.

The House of Quality (HoQ) serves as the foundational framework for enhancing the quality of organic vegetable products, aligning with consumer preferences in the selection of organic vegetables. Consumer-driven improvements are directly derived from the preferences of individuals who consume organic vegetables sourced from farmers in Batu. Subsequently, Batu farmers employ technical responses to enhance attribute satisfaction, thereby ensuring the production of high-quality organic vegetable products. The formulation of technical responses is guided by the specific needs articulated by consumers for the organic vegetables they consume.

To establish a coherent connection between consumer needs and technical responses, a comprehensive analysis is conducted to determine the relationships between each consumer need and the corresponding technical response. These relationships are portrayed on a scale, with weak connections denoted by (1), moderate connections by (3), and strong connections by (9). The strength of these relationships directly influences the effectiveness of technical responses in fulfilling consumer desires (Abuzid, 2017). The matrix depicting these relationships is an integral component of the House of Quality framework, exemplified in Figure 3.



Technical Response / Customer Needs	Conduct farming with appropriate organic farming SOP (Incorporation National Standard) 01-6729-2016	Implement the ICS (Internal Control System)	Follow the Indonesian National Standard ISO 9001:2015	Make planting and harvest schedules for each commodity	Improve the quality of care	Provide special prices according to the quality and commodities produced	Build a Screen House	Use eco-friendly plastic packaging	Display organic logos, labels/evidence related to product excellence on the packaging	Discipline in carrying out the control schedule that has been made routinely and continuously	Maintain price stability and product availability in meeting consumer demand	Implement Good Handling Practices	Produce a phone number that can be contacted for consumer voice complaints on the packaging	Importance to Customer	Customer Satisfaction Performance	Goal	Improvement Ratio	Sales point	Raw Weight	Normalized Raw Weight
Number Item	a	b	c	d	e	f	g	h	i	j	k	l	m							
The freshness of vegetables					●					○		●		3.91	3.66	4.0	1.09	1.5	6.41	0.06
Vegetable cleanliness					○		○			○		●		3.93	3.30	4.0	1.21	1.5	7.15	0.07
Uniformity of vegetable size				●	●					○		●		3.37	3.07	4.0	1.30	1.5	6.59	0.07
The color of the leaves				●	●		○			●		●		3.66	3.54	4.0	1.13	1.5	6.20	0.06
The condition and shape					●		●			●		●		3.69	3.32	4.0	1.20	1.5	6.67	0.07
Food Safety	●	●							●					3.59	3.37	4.0	1.19	1.5	6.39	0.06
The product packaging contains SNI Organic	●	●							●					3.57	3.27	4.0	1.22	1.2	5.24	0.05
Includes registration number stating that the product has been certified organic by an organic Certification Agency	●	●							●					3.63	3.28	4.0	1.23	1.2	5.34	0.05
Willing to pay		○				●								3.42	3.29	4.0	1.22	1.2	4.99	0.05
It does not quickly wither					○					●		●		3.77	3.52	4.0	1.14	1.5	6.43	0.06
Available sin classy to get			○	●							○	●		3.79	3.25	4.0	1.23	1.5	7.00	0.07
Available service channels		●	○										●	3.66	3.34	4.0	1.20	1.5	6.57	0.07
Attractive packaging design			●						○					3.44	3.18	4.0	1.26	1.5	6.49	0.07
Safe and environmentally friendly packaging	●	●	△					●		●				3.77	3.23	4.0	1.24	1.2	5.60	0.06
Own a brand		○	●						●					3.18	3.00	4.0	1.33	1.2	5.09	0.05
Product price		●	○								●			3.88	3.37	4.0	1.19	1.5	6.91	0.07
Contribution	2.05	3.58	1.75	1.80	2.76	0.45	1.01	0.51	2.20	2.36	0.84	4.22	0.60							
Normalized Contribution	0.09	0.15	0.07	0.07	0.11	0.02	0.04	0.02	0.09	0.10	0.03	0.17	0.02							
Target	↑	↑	○	↑	↑	○	○	↑	↑	○	↑	↑	○							

Figure 3. HoQ of Organic Vegetable Products Produced by Farmers in Batu

Information:

: Strong Relationship (9)
: Moderate Relationship (3)
: Weak Relationship (1)
++: Positive Strong Relationship
\+ : Positive Moderate Relationship
-- : Negative Strong Relationship
\- : Negative Moderate Relationship

The relationship matrix, situated within the framework of the House of Quality, delineates the intricate connections between consumer-centric attributes and the strategic technical responses executed by farmers in Batu. This analytical depiction elucidates the strengths and weaknesses inherent in the relationship matrix, derived from comprehensive discussions and brainstorming sessions with local farmers. The findings of this analysis underscore that attributes such as cleanliness, freshness, size uniformity, leaf color, adherence to standardized shapes, and durability significantly benefit from the implementation of Good Handling Practices, enhanced quality care, and disciplined adherence to regular and continuous control schedules. Conversely, attributes related to food safety, packaging compliance with Organic SNI Standards (6729-2016), inclusion of a certified organic registration number, attractive packaging design, and appropriate branding are strongly influenced by the adoption of organic farming SOPs in accordance with (SNI) 01-6729-2016, the implementation of Internal Control Systems (ICS), and the prominent display of organic logos and labels/brands in the product packaging section.

This strategic approach aligns with the post-harvest handling practices observed by CV Kurnia Kitri Ayu Farm, as highlighted in the research conducted by Rahayuningsih and Anas (2021). The farm's hygiene measures encompass washing vegetables post-harvest, followed by meticulous sorting and packaging, thereby preserving the quality of the vegetables. Timely harvesting further ensures the maintenance of organic vegetable quality, instilling consumer confidence in the products offered. The influence of harvesting, cleaning, packaging, and storage on the color of vegetables is corroborated by Saidi et al. (2021), emphasizing that the adherence to proper procedures throughout these stages is pivotal in achieving the standard color expected for vegetables.

Moreover, the correlation matrix facilitates a comprehensive correlation analysis among technical responses situated atop the quality house. This matrix serves to unveil potential conflicts, enabling farmers to ascertain the optimal conditions for producing products with desired characteristics. The understanding and implementation of quality policies by all organic farmers are imperative, ensuring the sustainability of organic products through rigorous production quality control and adherence to comprehensive standards for maintaining the quality of organic vegetable products. The application of the Internal Control System (ICS) exhibits a close relationship with various other technical responses, such as adhering to organic farming SOPs (SNI) 01-6729-2016, complying with SNI ISO 9001:2015 standards, establishing planting and harvest schedules for each commodity, enhancing the quality of care, maintaining discipline in regularly and continuously executing control schedules, and adopting Good Handling Practices.

According to Wibowo and Husnain (2018), organic certification serves as a mechanism to ensure that the produced items align with stipulated regulations. Certification procedures encompass inspection stages, including food control activities for raw materials, processing, distribution, and product testing throughout the production process. In the realm of organic labeling, products endorsed with an organic certificate must feature the Indonesian organic logo. Practical application involves laboratory testing to determine the organic nature of products, serving as the basis for granting organic certificates. This includes investigations into alleged practices violating organic agriculture principles during the cultivation process, encompassing post-harvest procedures. Laboratory tests cover various elements, including water, soil utilized in cultivation, and materials involved in both cultivation and post-harvest processes. These tests occur at different stages and undergo annual reviews to ensure compliance with established standards.

The House of Quality matrix represents a synthesis of various matrices elucidating the intricate relationship between consumer preferences and the technical responses of farmers in fulfilling consumer satisfaction, as illustrated in Figure 3. The analysis reveals that the technical response with the highest contribution value, and thus requiring prioritization in the enhancement of organic products to augment consumer satisfaction, is the implementation of good handling methods. This is imperative because organic vegetables undergo rapid changes in physical quality, including wilting, yellowing, and leaf rot, without proper post-harvest handling.

The second pivotal technical response is the application of the Internal Control System (ICS). The ICS, besides serving as a liaison between farmer groups and certification bodies, assumes a vital role in overseeing the internal control system of the group. In comparison to prior research by Yuarini et al. (2015), the strategies employed for enhancing the quality of organic vegetables in this study place a greater emphasis on production processes such as harvesting, cleaning, sorting, packaging, and storage. This aligns with the perspective of Marimin and Muspitawati (2002), emphasizing the critical significance of raw material handling, storage, and packaging in achieving the quality of fresh vegetables in accordance with consumer expectations.

Saidi et al. (2021) underscore the association between the implementation of good handling practices and the quality and technical factors entailed at various stages of the process, encompassing harvesting, collection, transportation, cleaning, sorting, packaging, storage, and delivery. Furthermore, in line with the assertions of Wibowo and Husnain (2018), the cultivation, processing, storage, handling, and transportation of organic products must adhere to established organic product engineering standards and regulations. These regulations encompass specific technical requirements such as seed quality, pest control methods, plant nutrient management, input materials, product composition, product protection, pest control measures, packaging materials, and storage conditions.

CONCLUSION

Consumers prioritize certain quality attributes of organic vegetables, namely vegetable cleanliness, product price, and availability and ease of access. In enhancing the quality of organic vegetables to align with consumer expectations, the focal technical priorities for improvement encompass the implementation of Good Handling Practices, spanning activities such as cleaning, washing, sorting, grading, packaging, storage, and distribution to end-users. Additionally, technical enhancements should involve the application of the Internal Control System (ICS) and the refinement of care quality throughout the cultivation of organic vegetables, encompassing activities like weeding, grazing, fertilizing, and integrated pest or disease control.

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