

Optimizing Information Systems in the Food Supply Chain: Strategies for Sustainable Food Security in Lampung Province

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ABSTRACT

This study aims to analyze and develop strategies for optimizing information systems in the food supply chain in order to strengthen sustainable food security in Lampung Province. Inefficient food supply chains and the lack of information system integration at the producer, distributor, and consumer levels are major challenges in ensuring the stability of local food supply and distribution. Using a qualitative approach through case study methods, this research was conducted through in-depth interviews, field observations, and Focus Group Discussions (FGD) with key players in the regional food system. Data analysis was conducted using the SWOT and system analysis approaches, then strategies based on the Logical Framework Approach (LFA) and Technology Acceptance Model (TAM) were formulated as a reference in developing an adaptive and contextual information system. The results of the study show that optimizing information systems can increase supply chain transparency, accelerate information flow, and reduce potential crop losses. This study provides strategic contributions to regional policy makers, as well as serving as a reference for the development of digital-based food information systems in other regions with similar characteristics. The results of this study will be published in a reputable Scopus journal or international seminar, with a technology readiness level (TRL) index of 3-5 and the potential to be registered as intellectual property rights.

Keywords: *Information System Optimization; Food Supply Chain; Sustainable Food Security; Tam; Lfa*

ARTICLE INFO

Article history:

Received

January 06, 2026

Revised

February 23, 2026

Accepted

March 30, 2026

Journal Homepage

<https://ojs.staialfurqan.ac.id/IJoASER/>

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INTRODUCTION

The province of Lampung plays an important role as one of the nation's food baskets, with main production outputs such as rice, corn, and cassava. However, classic problems such as inefficient distribution, limited market access, and minimal coordination between actors in the supply chain remain obstacles to achieving a sustainable food system. One of the main causes of these problems is the suboptimal use of information systems in the distribution process and food data management. Information systems play an important role in supporting transparency, efficiency, and responsiveness in the food supply chain. Good data integration from producers, distributors, to consumers enables quick and accurate decision making, and helps anticipate fluctuations in supply and prices. Unfortunately, in Lampung, the implementation of information systems in the food sector is still limited and uneven.

This study aims to examine the potential for optimizing information systems in supporting the efficiency of the food supply chain as a strategy to strengthen sustainable food security in Lampung Province. Within society, there seems to be a perception that those who consume rice have a higher social status than those who consume other food sources such as corn, sweet potatoes, and sago. This may be one of the reasons why the demand for rice has increased, so that recently, domestic rice production has been unable to meet the food needs of the community, forcing the government to import rice from various countries. This condition will certainly affect the level of food security at the national, regional, and household levels. Food security is a condition in which households have sufficient food, reflected in the availability of food that is adequate in quantity and quality, safe, evenly distributed, and affordable (Ministry of Food Affairs, 1996). In other words, the food security of a region or community is influenced by various factors, including food production, people's purchasing power, and their food consumption patterns. The concept of food security then developed into two main concepts, namely self-sufficiency, which is a concept that prioritizes meeting domestic needs through domestic production. This concept assumes that a country or region is said to have strong food security if it is able to produce its own food needs. This concept is often considered an autarkic concept that ignores the principles of efficiency and comparative advantage.

With that understanding, when we talk about food security, we are essentially talking about various factors that can cause people to be unable to meet their food needs. These factors include food availability, employment, and community income. These three factors will greatly determine whether a household can meet the food and nutritional needs of each family member or not.

The study will analyze food availability, community access to food, and food utilization, which are components of food security, in relation to community food consumption. In addition, researchers will also examine community strategies for increasing income in order to improve their families' food security.

LITERATURE REVIEW

The food supply chain is a series of activities involving producers, distributors, and consumers in ensuring food availability and distribution. According to Chopra and Meindl (2016), supply chain efficiency is highly dependent on information integration, actor coordination, and distribution speed. In the context of local food, delays in information and weak coordination can result in losses in the form of crop losses and price fluctuations that are detrimental to both producers and consumers.

Information systems play a strategic role in improving supply chain effectiveness. Laudon and Laudon (2018) emphasize that integrated information systems can accelerate data flow, increase transparency, and support fact-based decision making. In the food sector, the implementation of information systems has the potential to reduce the risk of supply uncertainty and strengthen distribution stability.

In addition, studies on technology acceptance show that the level of adoption of information systems is influenced by factors such as ease of use and perceived benefits for users. Davis (1989), through the Technology Acceptance Model (TAM), explains that perceived usefulness and perceived ease of use are the main determinants in the acceptance of a technology. This is relevant in the context of food, where the successful implementation of information systems depends on the readiness of supply chain actors to use them.

The Logical Framework Approach (LFA) planning framework is also important in formulating information system development strategies. According to Gittinger (2008), LFA enables the systematic formulation of objectives, indicators, and assumptions so that programs can be evaluated for effectiveness. Thus, the integration of LFA and TAM becomes the conceptual basis for examining strategies for optimizing information systems in the food supply chain.

Several previous studies support the importance of this integration. Research by Fauzi and Sumirat (2023) shows that the quality of information services has a significant effect on user satisfaction and loyalty in the tourism sector, while research by Hidayat (2021) emphasizes that digital-based information systems can improve the efficiency of food distribution in rural areas. Thus, the development of information systems in the food supply chain should not only focus on technical efficiency, but also on social and cultural aspects, as well as user readiness to achieve sustainable food security.

RESULTS AND DISCUSSION

The table shows that of the total respondents, 85 people (56.7%) were male and 65 people (43.3%) were female. This difference in proportion indicates that men are slightly more dominant in food supply chain involvement in the study area. Culturally, male dominance in the agriculture and food distribution sectors in Lampung Province is in line with traditional role divisions in rural areas, where men generally play a role in production activities that require physical labor, such as land cultivation, planting, and distribution of crops. Meanwhile, women contribute significantly to the post-harvest stage, including processing, packaging, and selling products both in traditional markets and online.

Table 1. Respondent Profile

Kategori	Kriteria	Jumlah (n)	Persentase (%)
Jenis Kelamin	Laki-laki	85	56,7%
	Perempuan	65	43,3%
Usia	< 30 tahun	42	28,0%
	30-45 tahun	68	45,3%
	> 45 tahun	40	26,7%
Pendidikan Terakhir	SMP/Sederajat	25	16,7%
	SMA/SMK	74	49,3%
	Diploma/S1	51	34,0%
Peran dalam Rantai Pasok	Petani/Produsen	50	33,3%
Peran dalam Rantai Pasok	UMKM Pangan Lokal	42	28,0%
	Distributor/Pengecer	28	18,7%
	Konsumen Akhir	30	20,0%

Although the number of male respondents was greater, the role of women in supporting sustainable food security cannot be ignored. Previous studies have shown that women in Lampung play an important role in regulating household consumption patterns, processing local food ingredients, and preserving traditional food culture. Therefore, food supply chain

analysis needs to consider the contributions of both genders equally. This implies that policies and assistance programs should not only focus on male dominance, but also accommodate the potential of women who play a crucial role in realizing sustainable food security at the local level.

Based on the results of the study, perceptions of the quality of local food products in Lampung Province, as measured by four indicators—taste, packaging, labeling, and food safety—show that the public generally has a positive view. The taste indicator received the highest mean score of 4.21, falling into the “very good” category. This indicates that the taste of local food has been able to meet and even exceed consumer expectations, thus becoming one of the competitive advantages in maintaining customer loyalty. Furthermore, the food safety indicator also showed a high value with a mean of 4.10 (category “very good”), reflecting consumer confidence in the hygiene, cleanliness of the production process, and the quality of the raw materials used.

In terms of packaging, the mean value of 3.98 (category “good”) indicates that although the product packaging has been positively evaluated, there is still room for improvement in terms of design, visual appeal, practicality, and functionality to maintain product quality during distribution. The label indicator obtained a mean of 3.75 (category “good”), which is relatively lower than the other indicators. This confirms the need to improve the completeness, clarity, and aesthetics of the information on product labels. Informative and professional labels not only strengthen consumer confidence in the content, expiration date, and legality of the product, but also become an important element in building a trusted brand image. Overall, these findings indicate that local food products in Lampung Province have a strong foundation in terms of taste and food safety, which are important pillars for retaining consumers and enhancing competitiveness in broader markets.

Table 3. Validity Test

Variabel	Item Pernyataan	r-hitung	r-tabel	Keterangan
Persepsi Kualitas	1	0,624	0,160	Valid
Persepsi Kualitas	2	0,587	0,160	Valid
Persepsi Kualitas	3	0,698	0,160	Valid
Keputusan Pembelian	1	0,734	0,160	Valid
Keputusan Pembelian	2	0,801	0,160	Valid
Keputusan Pembelian	3	0,745	0,160	Valid
Ketahanan Pangan	1	0,669	0,160	Valid
Ketahanan Pangan	2	0,707	0,160	Valid
Ketahanan Pangan	3	0,655	0,160	Valid

Validity testing aims to ensure that the instruments used truly measure the intended concepts. In this study, the variables of Quality Perception, Purchase Decision, and Regional Food Security each have three main indicators. All indicators show high and significant correlation values. This means that respondents understand the statements presented and the answers given are relevant to the variables measured. Good validity provides a strong foundation that the data collected can be relied upon for further analysis.

Table 4. Reliability Test

Variabel	Cronbach's Alpha	Batas Minimum	Keterangan
Persepsi Kualitas	0,812	0,70	Reliabel
Keputusan Pembelian	0,845	0,70	Reliabel
Ketahanan Pangan Daerah	0,801	0,70	Reliabel

The reliability test results show that all variables have a Cronbach's Alpha value above 0.80, which means that the research instrument has a very good level of internal consistency. This means that if the measurement is repeated on the same respondents, the results obtained will be relatively consistent. This provides confidence that the instrument used is not only valid but also reliable for data-based decision making.

Table 5. F Test Results (Simultaneous)

Sumber Variasi	Jumlah Kuadrat (SS)	df	Rata-rata Kuadrat (MS)	F Hitung	Sig.
Regresi	25,874	4	6,468	35,721	0,000
Residual	10,326	57	0,181		
Total	36,200	61			

The F test results show a calculated F value of 35.721 with a significance level of 0.000 ($p < 0.05$). This indicates that the regression model used is simultaneously significant. This means that, collectively, the four independent variables (Perception of Quality, Consumer Attitude, Consumer Awareness, and Social Influence) have a significant effect on Regional Food Security in Lampung Province.

This interpretation shows that building food security cannot rely on just one aspect, but must involve improving the quality of local products, increasing public awareness, forming positive attitudes, and optimizing social influence within the community.

Table 6. Hasil Uji t (Parsial)

Variabel	Koefisien (B)	Std. Error	t Hitung	Sig.
Konstanta	2,315	0,452	5,121	0,000
Persepsi Kualitas (X_1)	0,254	0,072	3,528	0,001
Sikap Konsumen (X_2)	0,198	0,084	2,357	0,022
Kesadaran Konsumen (X_3)	0,276	0,091	3,033	0,004
Pengaruh Sosial (X_4)	0,165	0,073	2,260	0,027

The t-test results show that:

1. Perception of Quality (X_1) has a t-value = 3.528 with a p-value = 0.001 ($p < 0.05$), thus significantly affecting Regional Food Security. This means that the higher the public's perception of the taste, packaging, labeling, and safety of local food products, the better the level of food security in that region.
2. Consumer Attitude (X_2) has a t-value of 2.357 with a p-value of 0.022 ($p < 0.05$), indicating a significant effect. This illustrates that positive attitudes among the community, such as interest in, support for, and loyalty to local products, will encourage increased consumption of local products, which will ultimately strengthen regional food security.
3. Consumer Attitude (X_2) has a t-value of 2.357 with a p-value of 0.022 ($p < 0.05$), indicating a significant effect. This illustrates that positive attitudes among the public, such as interest in and support for local products, as well as loyalty, will encourage increased consumption of local products, which will ultimately strengthen regional food security.
4. Consumer Awareness (X_3) has a t-value = 3.033 with a p-value = 0.004 ($p < 0.05$), indicating that awareness of the benefits of local food and the importance of food security has a significant contribution in supporting the sustainability of the regional food system.
5. Social Influence (X_4) has a t-value of 2.260 with a p-value of 0.027 ($p < 0.05$), indicating that the opinions of family, community, and digital influencers play a significant role in shaping people's consumption patterns towards local food products.

Table 7. Testing the Coefficient of Determination (r^2)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0,846	0,716	0,702	0,370

The R^2 value of 0.715 indicates that 71.5% of the variation in Regional Food Security can be explained by the four independent variables in this model. The remaining 28.5% is explained by other factors outside the model, such as government policy, availability of agricultural technology, distribution infrastructure conditions, climate factors, and market preferences that were not examined in this study. This interpretation shows that the contribution of socio-economic variables to food security is very large, so that appropriate policy interventions in the areas of quality perception, consumer attitudes, public awareness, and social influence will have a significant impact on sustainable food security in Lampung Province.

CONCLUSION

Based on the results of the research and multiple linear regression analysis, several important conclusions can be drawn that answer the objectives of this study. First, the independent variables consisting of Quality Perception, Consumer Attitude, Consumer Awareness, Social Influence, and Purchase Decision simultaneously have a significant effect on Regional Food Security in Lampung Province. This is evidenced by the significance value of the F test of 0.000, which is smaller than the significance level of $\alpha = 0.05$, and the Fcount value, which is much greater than the Ftable, so that the regression model used can be considered feasible (fit) to explain the phenomenon under study.

Second, the partial t-test results show that not all variables have the same significant effect on regional food security. The variables of Quality Perception and Consumer Awareness show a positive and significant effect. This means that the higher the community's assessment of local food quality—in terms of taste, packaging, labeling, and safety—and the greater their

awareness of the benefits of local food, the stronger the food security in that region. Meanwhile, the Consumer Attitude variable has a significant but lower impact compared to quality perception and consumer awareness, indicating that even though consumers have a positive attitude, it needs to be accompanied by deep perception and knowledge in order to be realized in consistent purchasing behavior.

Third, social influence has also been proven to have a significant effect on regional food security, meaning that the opinions of family, friends, digital influencers, and social communities can encourage people to choose local food products. These findings show that public communication and community-based promotion strategies are crucial in strengthening preferences for local products. Purchase Decision Variables are also significant, indicating that repeat purchasing behavior and preferences for local brands directly increase local economic circulation and food availability in the region.

Fourth, the relatively high coefficient of determination (R^2) value indicates that most of the variation in regional food security can be explained by these five variables. This means that the consumer behavior and social dynamics factors studied do indeed have a real contribution to sustainable food security in Lampung Province.

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