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Impact of Cattle Supply Chain Risk Management (CSCRM) on Food Security: The Study Focuses on Cattle Performance in the Northern Region of Malaysia

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Abstract

Malaysians' primary challenge today is their reliance on imported livestock products. The livestock sector is complex and diverse, with both positive and negative implications for developing sustainable cattle in the future. Food security, especially in developing countries, is threatened by protein deficiency, particularly animal protein. Reducing reliance on imported food is crucial to improving food security and stabilizing supply. Addressing the cattle supply chain risks is one of the key challenges to maintaining sustainable food security. Immediate attention should be given to addressing the risks in the cattle supply chain. The livestock industry requires strategies and interventions to support sustainable and profitable livestock production, including research and development, infrastructure and technological improvements, and policy reforms. With intervention, the livestock industry may be able to manage risks along the supply chain. Research indicates that risks in the cattle supply chain can impact business performance. The results show that logistic risks are less significant dangers to improving the performance of the livestock industry. Therefore, this study examines the role of Cattle Supply Chain Risk Management (CSCRM) in ensuring the successful performance of the cattle industry in Malaysia.

Keywords: CSCRM, cattle performance, successful performance, livestock production, technological improvements

Introduction

Food security encompasses climate, disaster, civil unrest, social norms, production, access, and absorption. Food security varies at different levels of focus, whether it be global, regional, national, community, or household. According to the Food and Agriculture Organization (FAO) (1996), food security means that food is consistently available, accessible to all, nutritionally adequate in quantity, quality, and variety, and culturally acceptable. The International Conference on Nutrition (ICN) defines food security as "access by all people at all times to the food needed for an active and healthy life." Achieving

this level of food security necessitates the availability of food supplies, adequate access to food supplies, and appropriate utilization/absorption of the food. Therefore, food security can be broadly categorized into three components: food availability, food accessibility, and absorption of food (Arif, 2005).

As per the United Nations Universal Declaration of Human Rights 1948, "everyone has the right to a standard of living adequate for the health and well-being of himself and his family, including food, clothing, housing, and medical care." The right to an adequate standard of living regarding food encompasses the right to sufficient food, freedom from hunger, and the ability to access food and improve conditions that contribute to food security [Article 25(1)] (UNDPI, 1998). However, according to Sundström et al. (2014), since these factors are not equally distributed among the world's major food producers, it is essential to implement diversified risk monitoring and conduct international assessments of agricultural production to ensure global food security by 2050.

Livestock play a central role in achieving many Sustainable Development Goals (SDGs) and are directly relevant to most of them. Livestock is influenced by SDGs 1 (no poverty), 2 (zero hunger), 3 (good health and wellbeing), 5 (gender equality), 8 (decent work and economic growth), 10 (reduced inequalities), 13 (climate action), and 15 (life on land), with intricate interconnections among these goals. However, current knowledge in this area still needs to be improved, with most literature on supply chain risks being either simulation or case study-based. Shahbaz, Rasi, Zulfakar, Ahmad, and Asad (2019) also argue that while there are numerous theories and frameworks for solutions, there needs to be more theoretical development of a framework for supply chain risk management. More research is needed on supply chain risk management (SCRM). Implementing SCRM as a management tool is crucial in addressing the challenges of the dynamic and uncertain business environment and is widely adopted by firms to mitigate increasing risks (Manuj et al., 2014).

The demand for livestock products is projected to increase by over 70% between 2005 and 2030 (Tilman & Clark, 2014). This growth trend is expected to persist in the coming decades, prompting cattle systems to ramp up production to meet the escalating demand and adapt to the evolving preferences of an increasingly affluent and urbanized population within a globalized economy. So, it is essential to talk about the impact of Cattle Supply Chain Risk Management (CSCRM) on the business performance of the cattle industry in Malaysia.

Research Objectives

This paper discusses how providers and producers should focus on identifying and categorizing their risks in the supply chain to improve their operation performance.

Literature Review

Livestock in Islamic Perfective

Muslims are vested in ensuring that their consumption of halal food aligns with their ethical and religious beliefs. This encompasses the sourcing and slaughtering of animals and the conditions in which the animals are raised and fed. The issue of livestock practices has given rise to legal and ethical concerns within the Muslim community. From an Islamic standpoint, food safety involves assessing the "goodness" of food products, known as *tayyib*. Unfortunately, some individuals have exploited livestock practices for financial gain, feeding animals unsavoury items such as excrement, internal organs, and slaughterhouse leftovers. Furthermore, there are reports of livestock being fed inappropriate substances such as dirt. For instance, in Perak, farmers have been known to feed catfish, tilapia, and African catfish with pork stew, waste, and chicken dung. Consequently, the challenges and risks within the livestock industry extend from the farm to the consumer. This encompasses various stakeholders such as farmers, input suppliers, co-operatives, pack-houses, transporters, exporters, importers, wholesalers, retailers, and, ultimately, the end consumers. It is imperative to manage the risks within the supply chain efficiently.

Livestock Industry and Food Security in Malaysia

The Global Agenda for Sustainable Livestock (GASL) defines sustainable livestock as addressing critical environmental, social, and economic challenges in the livestock sector. These challenges include natural resource scarcity, climate change, widespread poverty, food insecurity, and global threats to animal and human health and animal welfare. The livestock sector is a crucial component of the global food system, contributing to poverty reduction, food security, and agricultural development. According to the Food and Agriculture Organization, livestock contributes 40% of the global value of

agricultural output and supports the livelihoods and food and nutrition security of almost 1.3 billion people. Livestock refers to domesticated animals raised in agri-business to provide labor and produce diversified products for consumption, such as meat, eggs, milk, fur, leather, and wool. The term is sometimes used to refer solely to animals raised for consumption and sometimes to exclusively farmed ruminants, such as cattle, sheep, goats, and pigs (Uzonwanne et al., 2023). 'Livestock' refers to animals that manage the household economy and risk. Livestock is divided into two categories: ruminant and non-ruminant. Ruminants include cattle, sheep, buffalo, goats, and deer, while non-ruminants include poultry, ducks, pigs, and eggs. The development of this industry can ensure food safety in the country and reduce our dependence on imported products.

The livestock sector has experienced rapid growth in middle- and low-income countries due to increasing incomes, evolving diets, and population expansion. This growth has increased demand for meat, milk, and eggs, presenting a significant opportunity for livestock producers. However, without proper management, this growth could exacerbate sustainability issues related to equity, environmental impact, and public health. In Malaysia, the livestock industry is crucial in providing meat for consumption and generating income and employment. In 2021, the livestock industry contributed approximately 16.52 billion Malaysian ringgit to the country's GDP, representing an increase of over 500 million from the previous year (Statista Research Department, Oct 26, 2022).

The livestock industry plays a critical role in ensuring food safety and security. The Malaysian government has implemented various initiatives and policies to support its development. Through the National Livestock Transformation Program (NLTP), the government provides cattle producers with financial support and technical assistance, encouraging the adoption of modern agricultural practices and technologies. Additionally, the government has established trade agreements with other countries and implemented food safety and quality standards to facilitate the export of livestock products. Livestock products contribute significantly to global protein intake, addressing malnutrition and hunger issues. Furthermore, the industry plays a role in generating energy and plant nutrients. Its development is essential for ensuring food safety and reducing dependence on imported products.

According to the Malaysia Livestock Statistics 2022-2023 report, the total population of cattle in 2022 by state is as follows: Kedah (50,576), Pulau Pinang (11,948), and Perlis (5,973). The total number of cattle in Peninsular Malaysia was 667,804 in 2022, which increased to 670,909 in 2023. It is projected that the demand for beef consumption will continue to rise annually, and the beef consumption per capita for Malaysian citizens has increased from 5.5 kg/year to 6.9 kg/year, with an average consumption of 5.7 kg/year (World Population Review, 2020).

The cattle producers in Malaysia have had to revamp their operations and adopt a new approach in the industry to enhance efficiency along the supply chain. The increasing demand for livestock products presents an opportunity for producers to realign their focus. However, it is essential to note that the livestock industry significantly contributes to climate change and environmental issues while utilizing many natural resources, particularly land and water (Rabiatul Adawiyah, 2021). The entire supply chain poses numerous risks, prompting providers and producers to prioritize identifying and classifying these risks to enhance operational performance.

Cattle Supply Chain Risk Management (CSCRM)

Risk is a complex concept with diverse meanings and interpretations across different fields of research (Wagner & Bode, 2008). The discussion on risks in organizations is extensive, often highlighting the tension between viewing risk solely as a danger and recognizing it as a combination of both threat and opportunity. In recent years, managing risk in the supply chain has emerged as a critical focus for performance improvement and research. Numerous publications have presented an initial perspective on supply chain risk as the potential for harm, damage, loss, injury, or any unintended consequence, aligning with the realities of supply chain operations. However, it is essential to note that the understanding of supply chain risk is still in its early stages (Ju¨ttner, 2005). Therefore, it is recommended that companies address supply chain risk through a formal risk audit.

Mentzer et al. (2001) defined Supply Chain Risk Management (SCRM) as the systematic and strategic coordination of traditional business functions and tactics within a company and across businesses in the supply chain. The primary goal is to enhance the long-term performance of individual companies and the supply chain (p.18).

Supply Chain Risk Management (SCRM) is categorized into risk assessment, identification, treatment, and analysis (Neiger et al., 2009). Supply chain risk involves all risks starting from the flow of information, materials, products, or disruptions caused by external parties (Pujawan & Geraldin, 2009). Yeboah, Feng, Daniel, and Joseph (2014) explained in their study that supply chain risk can emerge from an external or internal supply chain environment. SCRM conducts routine activities such as planning, operating, and marketing, containing feed, performance evaluation and correction, customer delivery, diversifying, improving imports, coordination, quality, optimizing productivity, and improving company performance. All activities in industries are involved.

Previous study applies SCRM in industries by assessing the supply risk (Zsidisin & Ellram, 2003; Chopra & Sodhi, 2014), operational risk (Samvedi et al., 2013), demand risk (Fleischhacker & Fok, 2015; Zsidisin & Ellram, 2003), finance risk (Ganguly & Kumar, 2019), and information risk and many other focusing on internal and external factors.

The relationship between supply chain risk and livestock performance needs to be clarified. Supply chain risks can significantly impact livestock productivity, health, and welfare, ultimately affecting the quality and quantity of animal products. For instance, disease outbreaks can lead to substantial productivity and animal welfare losses. Furthermore, outbreaks can result in the death or culling of animals, reducing the available number of animals for production. This can affect the quantity and quality of animal products, ultimately impacting the profitability of livestock operations. Additionally, shortages in feed supply can also affect livestock performance. Livestock require specific diets to maintain their health and productivity, and shortages can lead to suboptimal nutrition and reduced growth rates. This can affect the quality of animal products, resulting in lower prices and reduced profitability.

In addition, risks associated with transportation and logistics can have adverse effects on livestock performance. Prolonged transportation and inadequate handling can lead to stress and injury in animals, resulting in diminished productivity and compromised animal welfare. This, in turn, can affect the quantity and quality of animal products, as stressed animals may exhibit reduced meat or milk yield. In summary, supply chain risks can substantially impact livestock performance, ultimately influencing the profitability of livestock operations. To address these challenges, livestock producers and supply chain stakeholders should devise robust risk management strategies and invest in technology and infrastructure to enhance efficiency, minimize waste, and improve animal welfare.

Minimal research has been dedicated to studying supply chain risks in the livestock industry, despite the potential for every livestock company to encounter such risks, such as dealing with sick animals and failing to meet weight targets. Identifying these supply chain risks is crucial for companies to enhance performance and address issues effectively. All participants can effectively manage risks to minimize losses and damages (Yeboah et al., 2014). Therefore, companies should proactively manage risks to mitigate potential damages (Geraldin et al., 2007). So, further research is needed to help us understand this relationship. This study categorizes supply chain risk management (SCRM) into four groups: supply risk, operational risk, demand risk, and logistical risk.

Supply risk results from disruptions emerging from "upstream" activities (Zsidisin & Ellram, 2003). Here, firms face risks related to suppliers, such as price fluctuations, supplier bankruptcy, and unstable quality and quantity of inputs (Chopra & Sodhi, 2014). These risks can trigger failures in delivering inbound goods/ services to the purchasing firm and subsequently throughout the downstream supply chain (Wu et al., 2006). Operational risk refers to disruption caused by internal problems of the firm due to its ability to produce and supply goods (Samvedi et al., 2013). Among them, changes in design and technology can lead to increased project costs and disrupt operational activities, thus decreasing investment returns (Kim & Chavas, 2003).

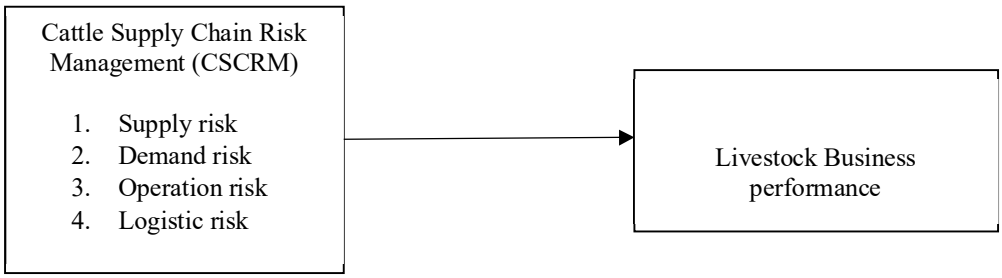

Figure 1: Research Framework for CSCRM and Performance.

The concept of demand risk is associated with downstream activities in the supply chain (Fleischhacker & Fok, 2015). This risk encompasses customer bankruptcy, demand fluctuations, intense market competition, and fragmentation (Tuncel & Alpan, 2010). According to Zsidisin and Ellram (2003), rapid shifts in customer expectations can lead to increased product costs, making it difficult for supply chain firms to forecast actual market demand. Moreover, demand variability negatively impacts inventory systems, leading to stock shortages or surpluses (Jemaıë & Karaesmen, 2005). Logistics risks are integral to the agri-food supply chain, where efficient logistics entails delivering the right product in quantity, condition, place, time, and cost. Logistics risks include escalating energy expenses, labor shortages, port congestion and closures, and unreliable service (LaLonde, 2004). Figure 1 depicts the research framework outlining the relationship between Cattle Supply Chain Risk Management (CSCRM) and livestock business performance in Malaysia.

Research Methodology and Data Analysis

In qualitative research, the in-depth interview method is utilized to gather insights on concepts, programs, or situations from a few informants (Boyce & Neale, 2006). This interview style involves direct communication between the researcher and the informant to obtain the necessary information. In our study, we employed in-depth interviews to comprehend the viewpoints of stakeholders in the livestock industry regarding the influence of supply chain risk on their performance.

Fourteen respondents are involved in this study. They are engaged in the cattle business. This approach was also used to understand the factors impacting their business performance. Each participant interview typically lasted between 30 to 45 minutes. Before the interviews, participants were given an overview of the two-part structure, which covered demographics and the correlation between supply chain risk and livestock industry performance.

Respondent Profile

The table presents the profile of respondents based on various criteria, including education level, types of business, business location, number of employees, years of experience, and available facilities. The researchers interviewed a total of fourteen (14) respondents. These respondents were involved in livestock businesses in the northern region of Malaysia, working as Food and Agriculture Organization importers, breeders, butchers, and quarantine providers.

Table 1: Profile Respondents

Informants	Education Level	Type Business	Business Location	Number Of Employees	Year Experiences	Facilities
1	Degree	Breeders	Malau, Jitra, Kedah	2	5	Food Grinding Machine
2	Diploma	Quarantine Centre	Stesen Kuarantin Perlis	3	30	Quarantine/ Regulation/ Inspection
3	SPM	Importers/ Cattle Businesses	Pdg Besar-Batu 20, perlis	3	30	Own Barn/Truck
4	SPM	Breeders	Mata Ayer, Perlis	5	18	Livestock Facilities
5	SPM	Breeders	Kg Sena Dalam Padang Besar Perlis	5	30	High Capital
6	Degree	Butcher	Selama Kedah	11	4	Yes
7	SPM	Breeders	Panggas Besar, Chuping, perlis	2	6	Barn/ Chopper
8	Diploma	Quarantine Centre	Padang Besar, Perlis	33	29	Standard Quarantine Facilities
9	SPM	Breeders / Butcher	Selama Serdang Kedah	2	20	Truck/ Chopper/ Water Pump/ Electric
10	SPM	Breeders	Kg Kubang Leret, Pokok Sena	1	3	No
11	SPM	Breeders	Kg Tok Kun, Mukim Bukit Lada, Pokok Sena	1	5	Chopper/ Grass Machine
12	SPM	Butcher	Kg Bukit Tampoi, Mukim Gajah Mati, Kedah	1	10	Grass Machine

13	SPM	Breeders	Banggol Rasyid, Selama Kedah	2	15	Truck/ Chopper/ Water/ Electric
14	SPM	Breeders	Batu 12, Jalan Selama Serdang Kedah	3	20	Truck/ Chopper/ Water/ Electric

Supply Chain Risk Management

Supply chain risks encompass all potential disruptions related to the flow of information, materials, and products, often stemming from external sources (Pujawan & Geraldin, 2009). Supply chain risk management (SCRM) involves various routine activities, including planning, execution, marketing, performance evaluation, corrective measures, customer delivery, process enhancements, import expansion, coordination, quality optimization, and overall improvement of company performance. This study identifies four critical risks for measuring supply chain risk: supply risk, operational risk, demand risk, and logistics risk.

Supply Risk

According to the supply risk analysis, most respondents emphasized addressing supply risk issues. While they expressed satisfaction with the received supply, challenges persist due to inconsistent sizes. The study found that most respondents conduct supplier inspections to ensure valid permits and the health of animals, ensuring they are in good condition. Additionally, the study revealed that existing suppliers can generally meet their needs. However, there is a risk of critical resource shortages due to price fluctuations and non-standard animal sizes. Challenges are also experienced during festive seasons, such as Hari Raya. Furthermore, stringent border procedures lead to lengthy processes, potentially impacting the health of the animals and posing the risk of mortality. This situation presents a challenge in obtaining a healthy supply.

The study revealed that most respondents highlighted the importance of addressing supply risk. While they expressed satisfaction with the supply received from the supplier, issues related to supply risk arising from mixed sizes were identified. The study found that most participants conduct supplier inspections to verify valid permits and the health of the animals received. Additionally, the study concluded that the current suppliers could fulfil their requirements.

Table 2: Supply Risk

Informants	Is the Quality of The Supplier Satisfactory?	Does The Company Have a Supplier Inspection Procedure?	Does The Number of Suppliers Sufficient for The Business?	Are Frequent Changes Happening to Critical Resources?	Does Any Complexity to Critical Resources?
1	Yes	No	Yes	Rarely Happens	No
2	Satisfying	Yes	Enough	Depends On the Importer and Businessman	Strict And Long Conditions During the Process at The Border
3	No	Good	Enough	Prices Are Variable	No
4	Yes	There Is	Enough	Size Not According to Request	No
5	Problem Of Mixed Size Cows	Easy To Help Health	Enough	Follow Capital & Seasonal Demand	Capital/Logistics
6	Yes	Yes	Yes	Yes	Yes
7	Yes	Yes	Yes	Yes	Yes
8	90% Satisfying	Comply With Permit Conditions	Enough	Depending On Current Needs	Depends On the Entrepreneur

9	Yes	Yes	Yes	Yes	No
10	No	No	No	No	No
11	No	No	No	No	No
12	No	No	No	No	No
13	Yes	Yes	Enough	Yes	Yes
14	Yes	Yes	Yes	Yes	No

Operation Risk

According to the table on operational risk, 50% of the respondents reported no disruptions during operations. However, others cited disruptions caused by issues with interstate permits, fluctuating market prices, and animal diseases. Most respondents also noted that the level of variability in carrying out activities was low. The main operational challenge was livestock stock, which needed to meet the prescribed standards. Furthermore, production capacity was found to be dependent on the supplier and prevailing circumstances. The study also revealed no instances of product recalls during production activities. Similarly, respondents indicated that a product recall would be implemented during a disease outbreak.

Table 3: Operation Risk

Informants	Are there any Interruptions during the Production process?	Is the level of process variation high?	Does the Product recall process occur frequently?	Does Inventory of products handled incorrectly occur?	Is production capacity inflexible?
1	No	No	No	No	No
2	No	No	No, If Not Disease	No	Depends On the Supplier
3	No	No	No	No	No
4	Interstate Permit	No	No	No	No
5	Market Price	No	No	Does Not Follow the Specifications	Not Consistent According to Situation/Demand
6	Yes	No	No	Yes	Yes
7	Yes	Yes	No	Yes	Yes
8	No	No	No	No	No
9	No	No	No	No	No
10	Animal Diseases	Yes	No	No	Yes
11	Animal Diseases	Yes	No	No	Yes
12	Animal Diseases	No	No	No	Stable
13	No	No	No	No	No
14	No	No	No	No	No

Demand Risk

According to the data in the table, seasonal demand poses the most significant risk to overall demand. The Hari Raya Qurban/Aidil Adha celebration is a particularly critical time for all entrepreneurs. The surge in demand presents an opportunity to boost profits but also poses the challenge of fulfilling every customer request. To mitigate the risk of last-minute cancellations, operators typically require a deposit from customers, reducing the likelihood of changes or cancellations.

Table 4: Demand Risk

Informants	Is there an unexpected or highly uncertain demand?	Did an error occur in giving a significant focus to the request?	Are there frequent delays in customer requests?	Has there been a change in the customer's preferences?	Does the request pose a Risk to the reputation of the company name?
1	Never Happened	No	No	Ever Happened	No
2	Seasonal Demand	No	No	Must Fulfil Quarantine Requirements	Follow The Requirements of Quarantine
3	Yes - Suddenly Ask	No	None - Depends on Permits	No	No
4	Yes - Qurban Season	No	No	Sometimes - Rarely Happens Because the Deposit Has Been Taken	No
5	No	No	No	Available-Rare	Affected
6	Yes	No	No	Yes	Yes
7	Yes	No	No	Yes	Yes
8	Yes - Raya Qurban	No	No	No	No
9	No	No	No	No	No
10	Raya Korban / Festival	No	No	No	No
11	Raya Korban	No	No	No	No
12	Normal	Yes	No	No	No
13	Yes	No	No	Yes	No
14	Yes	No	No	No	No

Logistic Risk

The study revealed that logistics reduces supply chain risk, as most companies have trucks and barns, mitigating logistic risk.

Table 5: Logistic Risk

Informants	Is the transportation operation sufficient?	Is it a bad/poor transport design on the network?	Does the transport activity have the financial strength?	Is there a delay during delivery?
1	Yes	No	Yes	No
2	No	No	No	No
3	No - Own Truck	No	Enough	No
4	Enough - Own Truck	Appropriate	Yes	No
5	Enough - No Problem	There Is, but Still OK	There Is	Rarely
6	Yes	Yes	Yes	Yes

7	No	No	Yes	Yes
8	Enough	No	Definitely	No
9	Yes	No	Yes	No
10	Yes	Yes	No	Yes
11	Yes	Yes	Own Truck	Yes
12	No	Yes	No	No
13	Enough	No	Yes	No
14	No	No	There Is	No

Livestock Performance

The evaluation of industrial livestock performance considers critical factors such as gross profit margin, net profit, profit-to-sales ratio, return on investment, and the ability to fund the business. The results of the study have been summarized in the table below. According to the table, the profit margin is calculated based on profit per head or average. The research findings indicate that the profit ranges from RM150.00 to RM600.00 per head, or an annual profit of between 70 thousand and 300 thousand. The net profit value is reported to be 30 thousand per year. Furthermore, studies suggest that businesses in this industry can allocate 10% to 50% of their profits to fund their growth. Consequently, this study has established that this industry presents substantial financial opportunities and potential for business expansion.

Table 6: Livestock Performance

Informants	What is the value of the gross profit margin of the company?	How much is the net profit from the operations carried out?	What is the ratio of profit to sales?	What is the return on investment?	How much is the ability to fund business growth from profits?
1	No Margin Calculation	Around 20k A Year	Not Used Because I Do not Know	No	10% Of Income
2	30k	30k Years	10%	No	No
3	15o.00 Per Head	100 Per Head	1 Ratio 3	2%	No
4	500-600 Heads / 300k	150k	1 Ratio 2	7%	300k Minimum
5	400-500	300 Per Head	No	8%	15-20%
6	No	3000-6000	1 Ratio 2	1000-2500	50%
7	No	3000-5000	1 Ratio 2	1000-2500	40%
8	300k	30k Years	10%	No	No
9	70k	30k Years	500	30k	30k
10	6000	4000	6 Ratio 8	No	No
11	8000	6000	6 Ratio 8	No	No
12	4000	3000	3 Ratio 4	No	10%
13	50k Years	30k A Year	500	20%	30k
14	70k	30k	500	30k	0

Findings and Interpretation

According to the study findings, supply chain risk factors such as supply, operational, demand, and logistics risks were analyzed. It was observed that logistics risk has a relatively lower impact on livestock operators, mainly because most of them own their trucks and barns. Therefore, there are more significant risks affecting the performance of the livestock industry than logistical issues. The interview results indicated that border procedures, market prices, varying sizes, seasonal demand, and health inspections influence supply risk. Operational risk is primarily attributed to animal diseases and non-compliance with specified standards and pricing. Additionally, seasonal demand poses a significant risk, particularly during festive periods, as unexpected demand necessitates preparedness to meet customer needs.

The results of this study reveal new insights in the field of livestock and offer a more detailed understanding of the interrelationships between the factors under investigation. The findings contribute to identifying the roles of various factors and provide valuable literature for future research. This study can help industry stakeholders focus on critical success factors for businesses in this field, ultimately contributing to the sustainability of Malaysia's food security. By providing guidance, actively involved individuals can enhance the development of their livestock businesses in the future.

Conclusion and Recommendation for Future Research

Future research could expand upon this study by gathering the perspectives of businesses operating across Malaysia. Additionally, future investigations could focus on Peninsular Malaysia, particularly examining the efficiency and impact of Cattle Supply Chain Risk Management (CSCRM) on the performance of the cattle industry in Malaysia. It is essential to develop an empirical framework based on CSCRM. Subsequent research should also aim to increase the sample size and geographic diversity. Furthermore, future studies should consider the role of managerial skills as a dynamic factor. According to existing literature, the success and efficiency of CSCRM are positively influenced when cattle producers possess moderate managerial skills in supply chain management. In conclusion, effective supply chain management is vital for any organization, and successfully managing supply chain risks is crucial. Cattle producers who effectively manage supply chain risks with adequate skills will likely experience increased profitability. Therefore, this research contributes to both practical and academic knowledge, aiming to augment publications and understanding of supply chain risk management, ultimately enhancing food security in Malaysia.

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