

## Socioeconomic Adaptation of Goat-Related Value Chain Amid the COVID-19 Crisis: A Case Study of Phra Nakhon Si Ayutthaya, Thailand

Kanokporn Pakeechai<sup>1\*</sup>

Kanokkarn Klomklaw<sup>2</sup>

Chutinun Wilamas<sup>3</sup>

Jarunee Thongaram<sup>4</sup>

Prach Poungngeng<sup>5</sup>

Nopmallee Taechawatchananont<sup>6</sup>

Choklap Mankong<sup>7</sup>

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### Abstract

During the fourth wave of COVID-19, Phra Nakhon Si Ayutthaya province enforced strict controls that disrupted the entire goat supply chain. Upstream, farmers experienced increased production costs; midstream, gatherers, wholesalers, and restaurant operators struggled with restricted operations; and downstream, reduced religious ceremonies and lower incomes led to a sharp decline in goat demand. This study aims to 1) analyse the current goat supply chain and 2) develop adaptive strategies for goat-related businesses under a VUCA (volatility, uncertainty, complexity, and ambiguity) environment. Data were collected via structured, in-depth interviews with 155 goat supply chain entrepreneurs in Phra Nakhon Si Ayutthaya Province, selected through snowball sampling, and 259 consumers identified by purposive sampling. The reliability and content validity of the research instruments were confirmed using the Index of Item-Objective Congruence (IOC). Results reveal that the goat meat value chain comprises three main segments: live goat collectors or butchers (11.9% income ratio), processors (5%), and integrated entrepreneurs (74.3%). Analysis using the VUCA framework shows that the demand for goat meat declined by 95% while production costs increased by 20%, reflecting significant market volatility and changing consumer behaviour. These findings underscore the critical need for strategic planning, risk management, and operational agility. The study recommends that entrepreneurs adopt adaptive tools, such as Game Theory, to better navigate uncertainties and enhance business resilience.

**Keywords:** Adaptation, Goat Value Chain, COVID-19

<sup>1-7</sup> Faculty of Business Administration and Information Technology, Rajamangala University of Technology  
Suvarnabhumi, Thailand.

\*Corresponding Author, Email: kanokporn.p@rmutsb.ac.th

## Introduction

Goats are considered economic animals because they are small animals, easy to raise, tricky, resistant to all weather conditions, strong, not prone to disease, and are cost-effective in production. (Pakeechai, Wilamas, Phaungngern, Thongaram, & Klomlkaw, 2024) Moreover, goat meat and goat's milk are good sources of protein and quality due to their low fat, high iron, and lower calories of saturated fat than other meats. Goat's milk is easier to digest than cow's milk, which is suitable for today's consumer market with health-conscious. (Cherdchom, Phakechai, Intosorn, & Petchsri, 2015) Goat farming has been supported by the government to be raised in many areas especially in the southern and central regions. (Department of Livestock Development, 2020) Phra Nakhon Si Ayutthaya Provincial Livestock Office promotes goat farming as a strategy for provincial development because goats are animals that have marketing opportunities because they have high market demand both at home and abroad and the area is suitable for goat farming. People working as farmers have a lot of agricultural products that can be used as food for goats as well. For this reason, Ayutthaya province has been encouraged and encouraged to raise goats and breed them for income and sustainability. By 2020, Phra Nakhon Si Ayutthaya Province had a total of 269 goat farmers, with a total of 4,769 goats (4,273 beef goats and 496 milk goats). (Department of Livestock Development, 2020) The group of goat farmers with the largest number of breeder goats was in 4 main districts, namely 1) Goat Farmers Group, Chai Na Sub-District, Sena District 2) Pak Kran Goat Farming Group, Phra Nakhon Si Ayutthaya District 3) Lat Bua Luang Goat Farmers Group Lad Bua Luang District and 4) Farmers raising beef goats, milk goats, Chamab, Wang Noi district, respectively, possessing a total of 1,985 goats. (Phra Nakhon Si Ayutthaya Provincial Livestock Office, 2023) However, The COVID-19 pandemic, Ayutthaya Province is the most controlled area has severely affected the goat market due to the difficulty of domestic and international transportation. Operations throughout the goat supply chain are affected upstream where production costs are higher, midstream, especially restaurant operators who are unable to open storefronts normally, and downstream that refrain from performing religious ceremonies. And the lower income has resulted in lower purchasing power and lower demand for goats. Consistent with FAO (2020) and Vidaurreta, Gómez, and Alonso (2020), it was found that during nationwide lockdowns, goat farms in Thailand's Central Region, which is a major supplier of goats to Bangkok and nearby urban areas, were hit hard as restaurants, markets, and distribution centers shut down. This can be attributed to the fact that the Central Region, which relies heavily on urban markets, experienced more severe impacts compared to the Northeastern and Southern Regions, where goats are mainly sold locally and are often used in cultural or religious events. These areas experienced less disruption in demand, although they still faced challenges due to transport restrictions and limited sales channels (Department of Livestock Development, 2021).

Consequently, there was a sharp drop in orders from buyers. Similarly, in Spain, goat milk and meat prices fell significantly in April 2020 due to reduced consumer demand (Vidaurreta et al, 2020). In response to the crisis, farmers in the Central Region formed cooperatives to pool their products and sell them collectively. They also shared essential resources, such as feed and transportation, which strengthened their ability to respond to supply chain disruptions. This approach is consistent with the "cooperative resilience" model observed in Nepal, where collaboration played a crucial role in stabilizing supply chains during the pandemic (Rahman, Joshi, & Thapa, 2022). This study aims to analyze the problems of goat business throughout the supply chain. Then propose guidelines for the adjustment of goat business in the situation of the COVID-19 in Phra Nakhon Si Ayutthaya Province to enable entrepreneurs to survive under uncertain circumstances (VUCA World). Therefore, this research will provide valuable insights to support the recovery and growth of goat farming businesses in Phra Nakhon Si Ayutthaya, ultimately enhancing their capacity to thrive in a rapidly changing world.

## Literature Review

VUCA (volatility, uncertainty, complexity, and ambiguity) describes the rapidly changing and uncertain business environment. Originally coined by the U.S. Army to describe warfare conditions, it now applies to business, emphasizing the need for adaptability, quick decision-making, and innovation to navigate dynamic political, economic, social, and environmental challenges (Suksawang, 2021).

Resilience and Adaptation Framework (Rahman et al, 2022). Resilience theory has become increasingly influential in agriculture and livelihood economics, especially in response to sudden disruptions such as disease outbreaks, natural disasters, and economic crises. It emphasizes enabling systems, including individuals, households, and organizations, to build absorptive, adaptive, and transformative capacities to survive and recover under uncertain conditions (Folke, Carpenter, Walker, Scheffer, Chapin, & Rockstrom, 2010). Rahman et al. (2022) applied this framework to assess the adaptive capacity of small-scale livestock farmers in Bangladesh, Nepal, and India during the COVID-19 pandemic. They found that more resilient farmers were better able to mitigate impacts and, in some cases, transform production, marketing, and organizational structures in response to the crisis. Adaptation occurs at three levels: 1) Absorptive: short-term coping strategies such as selling livestock, relying on family labor, shortening cycles, or stockpiling feed. 2) Adaptive: flexible adjustments including switching to local feed, adopting online sales (e.g., Facebook, LINE), expanding to local markets, and using market data. 3) Transformative: structural changes such as forming cooperatives, investing in digital tools (e.g., health tracking, logistics), and building infrastructure to reduce market dependence and enhance autonomy.

Game Theory and Strategic Adaptation in Crisis Contexts: Game theory offers a useful framework for strategic planning under uncertainty, allowing businesses to anticipate stakeholder behavior, manage risk, and improve flexibility. Marcus, Luisa, Marina, and Antonio (2021) used game theory to explore the balance between public health and economic activity during a pandemic. Applying concepts like Pareto Equilibrium and the Coase Theorem, they showed how coordinated strategies can resolve market and policy failures to achieve socially optimal outcomes. In agriculture, FAO (2021) highlight that effective COVID-19 adaptation requires integrated responses. These include aligned public policies, community cooperation, and flexible management to address shifting economic conditions and consumer behavior.

Therefore, analyzing the goat business supply chain using both the VUCA framework and the Resilience and Adaptation Theory offers a comprehensive foundation for understanding systemic challenges and formulating effective strategies to support business adaptation during times of crisis.

### Methodology

This study aimed to analyze the problems occurring throughout the goat business supply chain and to propose adaptation strategies in response to the COVID-19 pandemic in Phra Nakhon Si Ayutthaya Province. The objective was to enhance the resilience of entrepreneurs operating in a volatile, uncertain, complex, and ambiguous (VUCA) environment. A mixed methods approach was employed, using in-depth interviews supported by structured questionnaires. The content validity of the questionnaire was assessed using the Item-Objective Congruence (IOC) method, with each item receiving an IOC score of 0.67 or higher, indicating satisfactory alignment with the research objectives. The questionnaire also underwent a pilot test with 30 participants to evaluate its reliability. The Cronbach's alpha coefficient was calculated at 0.84, demonstrating an acceptable level of internal consistency. Data were collected during the fourth wave of COVID-19 (April to June 2021) from two sample groups. The first group represented the demand side and consisted of 259 consumers selected through purposive sampling. The second group represented the supply side and included 155 goat business operators from across the supply chain in Phra Nakhon Si Ayutthaya Province. These participants were selected using snowball sampling, a technique commonly used in qualitative research and case studies involving hard-to-reach populations, such as those in specialized supply chains. The sample comprised 13 restaurants, 7 goat collectors, and 135 goat farmers, representing approximately 50% of the total goat-farming population in the province. The research instrument consisted of both open-ended and closed-ended questions focused on identifying problems, challenges, adaptation strategies, and recovery efforts during the COVID-19 situation. These questions were categorized according to the different stages of the supply chain to ensure comprehensive coverage of all relevant business contexts. Data were analyzed using descriptive analysis techniques, guided by the VUCA framework and

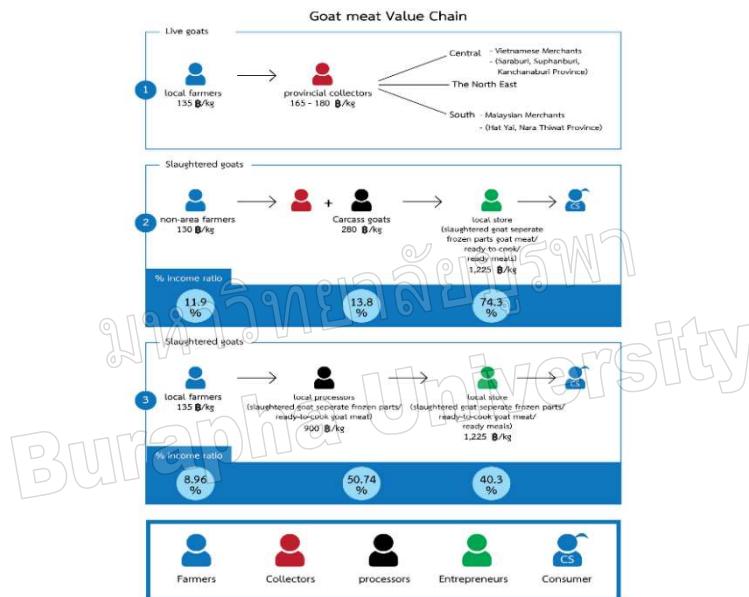
Resilience Theory, to identify key pain points and adaptation strategies at each level of the goat supply chain.

## Findings

### 1. Business Situation Throughout the Goat Supply Chain

Figure 1

Goat meat Value chain of Phra Nakhon Si Ayutthaya.



Annotation. By Kanokporn Pakkeechai, designed on February 25, 2022.

#### 1.1 Business Situation before COVID-19

Prior to the COVID-19 pandemic, the goat meat supply chain in Phra Nakhon Si Ayutthaya, which comprised farmers, collectors, processors, retailers, and consumers, experienced strong and stable demand, with an average of approximately 1,060 goats per month. This volume included: 1) live goats (around 400 per month), primarily exported to southern Thailand and Malaysia; 2) slaughtered goats (approximately 500 per month); and 3) portioned meat (about 160 per month), driven by local consumption, Muslim religious practices, and tourism associated with the “Ayutthaya Halal City” initiative.

Due to limited local supply, restaurants sourced slaughtered goats from other provinces, such as Suphan Buri and Tak, typically receiving three to four carcasses per week per restaurant. Prices ranged from 130 to 135 THB per kilogram for live goats, and from 240 to 280 THB per kilogram for slaughtered goats. Retailers enhanced product value through further processing. Whole carcasses were priced at approximately 400 THB per kilogram, representing a 1.4X increase in value. Marinated or ready-to-cook products were priced at around 900 THB per kilogram, representing a 3.2X increase, while ready-to-eat meals, such as goat curry, biryani, and stew, reached up to 4.4 times the base value. These products catered to a diverse

customer base, including Thai-Muslim, Chinese, and international consumers from countries such as Singapore, India, and Brunei.

A halal food producer network based in Wang Noi expanded value-added offerings by utilizing goat parts such as the head, legs, liver, and stomach, and by producing processed items like sausages, which were priced between 200 and 220 THB per kilogram. Retired goats were also utilized, with marinated cuts priced as high as 800 THB per kilogram, reflecting a 6.7X increase in value. Plans were in place to export frozen packaged goat meat to areas including Bangkok, Pathum Thani, Hat Yai, and eventually Malaysia.

Some businesses pursued international expansion. For instance, Restaurant A planned to produce canned goat products for export to Pakistan. Another example is Restaurant B, which attempted to expand into food courts located at gas stations but faced setbacks due to the resurgence of COVID-19, high fixed costs, and regulatory compliance requirements, including Halal certification, FDA approval, and GMP standards. Despite these challenges, business operators emphasized that trust and loyalty among regular customers remained a key strategic advantage.

### **1.2 Business Situation During the Fourth Wave of COVID-19**

During the fourth wave of COVID-19, goat business operators across the supply chain faced severe disruptions. Many restaurants were forced to temporarily suspend operations due to income instability and uncertain profitability. Those that continued operating offered only limited takeaway goat dishes or reduced the number of goat-based menu items, reflecting a decline in consumer purchasing power.

International markets, particularly Malaysia, suspended live goat imports, resulting in a dramatic 95% decrease in local demand, from an average of 1,060 goats per month to only 53. This decline significantly affected the financial liquidity of farmers and live goat traders, who continued to incur increasing production costs. For example, the price of animal feed rose by 20%, increasing from 360 to 390 THB per sack.

If the situation were to persist through late 2021 and into early 2022, some entrepreneurs indicated their intention to exit the goat business entirely. In response to declining demand and rising costs, several restaurant owners adapted by removing goat dishes from their menus and shifting toward more affordable and higher-demand options, such as chicken-based meals.

### **2. Marketing Information Related to the Goat Business in a VUCA Context**

Within the VUCA framework, the goat business in Phra Nakhon Si Ayutthaya reflects the following market dynamics:

**2.1 Volatility (V):** The COVID-19 pandemic led to a dramatic 95% decline in demand for goat meat, from approximately 40 to 2 goats per week, and caused a complete halt in goat milk sales, which are now informally distributed to neighbors. Feed costs increased by 20%, intensifying production expenses for upstream producers. Goat meat, often considered

a niche or luxury product, remained in limited local supply, with only 5% sourced locally and 95% transported from other provinces. The disruption of tourism and widespread restaurant closures significantly affected sales. In response, business operators adjusted their production and distribution models to manage fluctuating demand and rising input costs. Delays in slaughtering also posed risks by increasing production costs and reducing meat quality, potentially driving some trade into informal or unregulated markets. Despite these challenges, this volatility has prompted strategic adaptations, such as the introduction of value-added processing strategies aligned with evolving consumer behavior.

2.2 Uncertainty (U): Business planning became increasingly difficult due to unpredictable demand and fluctuating prices. Many local operators chose to temporarily suspend their goat-related businesses, particularly as goat products cater to niche markets with specific purchasing power. Price and market instability have heightened the perceived importance of strategic risk management in daily operations.

2.3 Complexity (C): Unstable input costs and inconsistent market demand created substantial challenges for decision-making. Entrepreneurs were encouraged to clarify their operational strategies by aligning their business models with the local context and available resources. This includes choosing appropriate farming systems, such as containment versus semi-free-range methods, and diversifying product offerings across categories such as live goats, carcasses, and processed foods.

2.4 Ambiguity (A): It remains unclear whether tourist demand will return to pre-pandemic levels. This ambiguity has pushed entrepreneurs to adopt more flexible production and distribution models. Strategic tools such as game theory and problem-based learning (PBL) have been explored as mechanisms for scenario planning and adaptive decision-making.

**Figure 2**

*VUCA Countermeasures Analysis for Goat Entrepreneurs in Phra Nakhon Si Ayutthaya Province  
Unfold the Supply Demand Chain Image to Illustrate All Relevant Parties.*



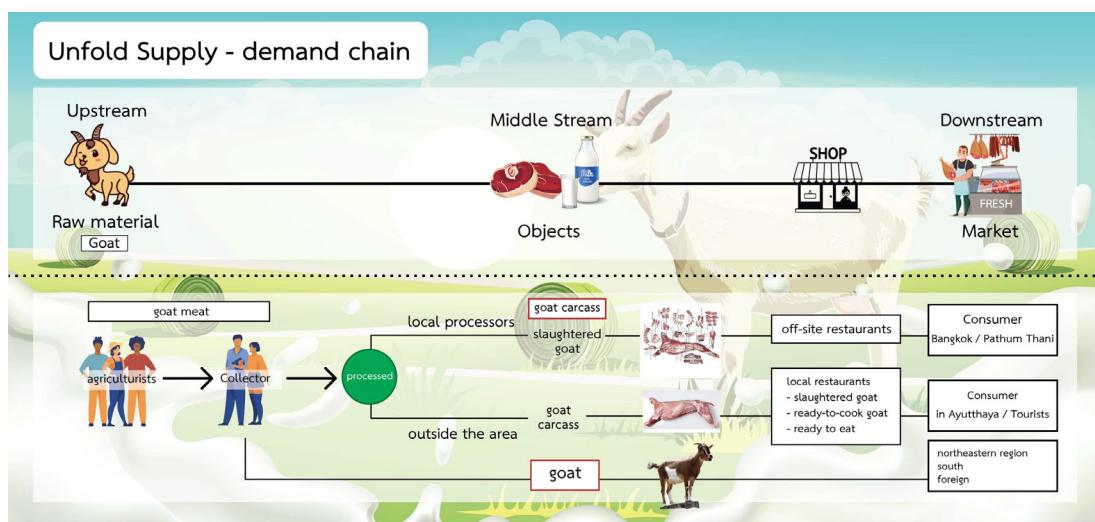
Annotation. By Kanokporn Pakeechai, designed on May 30, 2022.

### 3. Key Stakeholders in the Goat Business in Phra Nakhon Si Ayutthaya

As illustrated in Figure 3, the goat business in Phra Nakhon Si Ayutthaya involves three primary stakeholder groups: **1) Live goat collectors and carcass distributors:** This group is responsible for importing slaughtered goat carcasses from outside the province to supply local restaurants that specialize in goat dishes. They dominate approximately 60% of the local goat carcass market. **2) Processing groups (halal food producers):** These stakeholders procure live goats from both local sources, which account for only 5% of demand due to limited supply, and from nearby provinces such as Kanchanaburi, Saraburi, and Suphan Buri. The goats are slaughtered and processed into various halal food products, which are primarily distributed to destinations outside the province, including restaurants in Pathum Thani and a halal distribution hub located in Bangkok. This segment presents a potential opportunity for the expansion of local goat farming to meet growing market demand. **3) Integrated entrepreneurs:** These businesses operate across the entire value chain, encompassing goat farming, slaughtering, restaurant operations, and agrotourism. They exclusively process and sell goats raised on their own farms, typically through natural and free-grazing methods. This model appeals particularly to health-conscious consumers who prioritize food origin and sustainable practices. While the three business models serve different market segments, they tend to operate independently, with minimal overlap. Stakeholders generally maintain their established procurement channels due to several factors, including the specific characteristics of goat products, slaughtering requirements, storage limitations, and the importance of trust-based trading relationships. This stable and trusted network continues to support effective raw material management and remains the preferred system among local operators.

**Figure 3**

*Connecting Stakeholders Throughout the Demand and Supply Chain of Goat Meat in the Case of Phra Nakhon Si Ayutthaya Province*



Annotation. By Kanokporn Pakeechai, designed on May 30, 2022.

#### 4. Baseline Analysis of the Goat Business Using the Business Model Canvas (BMC)

1) Value Propositions: The business offers high-quality, fresh, and Halal-certified goat products, emphasizing premium ingredients such as homemade roti flour, imported butter, and authentic masala spices. Goats are naturally raised, with carcass weights under 16 kg, providing a distinct competitive edge and high customer satisfaction. 2) Customer Segment: Target groups include local Thai-Muslims, family tourists, southern Thai-Muslim communities, international visitors (e.g., Pakistan, Singapore, Brunei), and public sector clients. Additional markets include industrial buyers, hotel guests, and family groups. 3) Customer Relationships: Customer loyalty is cultivated through active social media engagement, religious and community-based events, personalized services (e.g., birthday cakes), and loyalty discounts (10%). Word-of-mouth marketing further enhances brand retention. 4) Channels: Sales and communication are conducted via online platforms (Lineman, Foodpanda), social media (Facebook, YouTube), and television features. These channels facilitate broad outreach and convenient access to products. 5) Key Activities: Core operations include goat farming, meat processing, ready-to-eat meal production, and managing an agricultural learning center. CSR activities, such as honey production under the Wanida brand, contribute to brand image and long-term sustainability. 6) Key Partners: Strategic partners include delivery platforms (Lineman), marketing channels (Dtac), financial institutions (Krung Thai, Kasikorn), local raw material suppliers, and tourism operators. These collaborations help reduce operational costs and enhance distribution. 7) Key Resources: Tangible assets include land, machinery, and labor, while intangible assets consist of brand reputation, customer goodwill, and unique family recipes. Branding efforts remain minimal, limited to a logo and shop contact information. 8) Cost Structure: The business incurs both fixed costs (wages, rent, advertising) and variable costs (raw materials, utilities). Effective cost management is vital for sustaining profitability. 9) Revenue Streams: Approximately 80% of revenue derives from processed goat product sales, with the remaining 20% from ancillary activities such as resort services and honey sales. Goat meat remains the primary income source, supplemented by live goat sales.

#### 5. Strategic Guidelines for Adjusting Goat Businesses Across the Supply Chain During the COVID-19 Crisis

To address the impacts of COVID-19, the Business Model Canvas (BMC) was employed to analyze the business context, conditions, and constraints, identifying feasible actions to support the core mission and upgrade goals under the “Ego Business to Eco System” concept.

**Mission Statement:** To enhance acceptance and demand for goat products in Phra Nakhon Si Ayutthaya Province.

**Identified Problems:** People: 1) Limited skills and knowledge within the workforce. 2) Product: Lack of product differentiation and low consumer awareness, resulting in minimal consumption. 3) Market: Goat product markets remain relatively small and underdeveloped.

Proposed Solutions: 1) People: Develop adaptive strategic plans aligned with changing conditions. Implement new value chain management models and restructure the goat supply chain to increase resilience and efficiency. 2) Product: Enhance product acceptance through target audience analysis and product upgrading, focusing on quality improvements in goat meat and milk. Conduct consumer behavior analysis and demand forecasting to better align production with market needs. 3) Market: Establish digital sales platforms to improve product accessibility. Strengthen public relations efforts to increase awareness of goat products. Pilot online marketing innovations to promote fair trade and support business growth.

## 6. Analysis of Goat Product Business Development

According to the Business Model Canvas (BMC) framework, the goat business in Phra Nakhon Si Ayutthaya can be described as follows: 1) Value Propositions: The goat business should prioritize high-quality, fresh, and halal-certified products offered at competitive prices. Products may feature premium ingredients such as homemade roti flour, imported butter, spices from Bangladesh, and goats raised through natural methods. Creating shared value through corporate social responsibility (CSR), such as returning a portion of profits to consumers, can also help build trust and loyalty. 2) Customer Segments: Target customers include local Thai-Muslim communities, domestic and international tourists, government agencies, hospital staff, and industrial clients organizing events. The market can be further expanded to include families, elderly consumers, and tourists from countries such as Pakistan, Singapore, and Brunei. 3) Customer Relationships: Customer loyalty can be fostered through personalized services, including loyalty discounts, birthday offers, and special events held at local mosques. Regular interaction through social media and participation in local activities can encourage word-of-mouth promotion and increase engagement. 4) Channels: The business should employ both online and offline channels to reach customers effectively. Online platforms include Lineman, Facebook, YouTube, and TikTok. Offline promotion can be carried out through television, Wongnai, and partnerships with community organizations. Expanding e-commerce activities can promote fair trade and attract a broader customer base. 5) Key Activities: Key activities include raising goats, preparing ready-to-eat meals such as goat curry and biryani, sourcing slaughtered goats, managing an agricultural education center, operating a resort, producing honey under the Wanida brand, and conducting CSR marketing initiatives. These activities help build customer loyalty and ensure business sustainability. 6) Key Partners: Strategic partnerships include delivery services such as Lineman, promotional channels such as Dtac, financial institutions including Krung Thai and Kasikorn banks, local suppliers from community markets and herbal shops, and tourism businesses. These collaborations help reduce operating costs and expand market reach. 7) Key Resources: Key resources include physical assets such as machinery, cooking equipment, land, and human resources, as well as intangible assets such as brand reputation, goodwill, and traditional

family recipes that have been passed down through generations. 8) Cost Structure and Revenue Streams: The business adapts to market changes by diversifying its product offerings to include ready-to-cook meals and delivery services. Effective cost and revenue management ensures both profitability and sustainability. Strategic financial planning is required to project future revenue models and manage risks associated with external uncertainty, particularly within the VUCA environment.

### **Positive Externalities**

Economic: Income is distributed throughout the goat supply chain, including farmers, meat collectors, slaughterhouses, halal food processors, restaurant operators, and consumers in Phra Nakhon Si Ayutthaya and surrounding provinces. Profits have increased due to the implementation of efficient business models and management strategies. Social: Collaboration between producers and processors strengthens the supply chain through mutual understanding of product characteristics and shared goals. Environmental: The incorporation of by-products into new products contributes to waste reduction and supports environmental sustainability.

### **Negative Externalities**

The promotion of goat meat products may adversely impact stakeholders in competing sectors, such as those involved in pork, chicken, beef, and cow's milk production. These groups may experience income losses, particularly in Phra Nakhon Si Ayutthaya Province.

## **Discussions**

Goat business development across the supply chain involves three key areas:

**1. People and Operators:** To meet increasing local and external demand, goat business operators have diversified their product offerings. These range from live goats, priced between 130 and 135 THB per kilogram, to goat carcasses (240 to 280 THB/kg.), mutton cuts (approximately 400 THB/kg.), marinated meat (800 to 1,000 THB/kg.), and ready-to-eat dishes (150 to 300 THB/plate). The primary customer groups include Thai Muslims, urban residents in areas such as Bangkok and Pathum Thani, and tourists from countries including Singapore, India, Brunei, and Bangladesh. The “Ayutthaya Halal City” initiative has stimulated tourism and increased demand for goat products. Due to insufficient local supply, goats are often imported from nearby provinces such as Suphan Buri and Saraburi. Local farmers benefit from lower feed costs and access to larger land areas. However, the relatively small size of goats and limitations in feed quality contribute to higher production costs. Goat farming remains a niche activity, typically led by Thai-Muslim entrepreneurs who focus on raising live goats and producing basic slaughtered meat for household consumption or small-scale businesses.

**2. Products and Processing:** Goat processing requires careful slaughtering practices due to hygiene concerns, including unpleasant odor caused by self-urination. Consequently,

many businesses prefer to source goats from trusted external suppliers. Local slaughterhouses, which were originally designed for cattle, are currently being modified to meet goat-specific processing standards. These trusted suppliers deliver slaughtered goats at 240 to 280 THB per kilogram for carcasses weighing less than 16 kilograms, meeting quality expectations among customers. Goat meat is generally perceived as a premium product, particularly among higher-income consumers. Operators and halal food producers have created added value through frozen, ready-to-cook, and ready-to-eat products. However, marketing efforts remain limited, and sales are primarily driven by repeat customers, especially among Thai Muslims and urban residents. Specialty dishes, such as Goat Curry Roti, appeal to health-conscious consumers. Despite these innovations, goat meat remains a niche product and is priced significantly higher than more commonly available alternatives. Prior studies, such as those by Cherdchom et al. (2015) and Limcharoen (2019), have confirmed this pattern of market segmentation. However, aligning product offerings with the preferences of emerging consumer groups, such as Chinese consumers, may present future growth opportunities (Ngamsomchat, 2021).

**3. Market:** The goat meat and milk market remains primarily niche, serving the needs of Thai-Muslim consumers. Consumer preferences often lean toward ready-to-eat meals, including goat biryani, and pasteurized goat milk. Common purchasing locations include Khrua Muslim Ayutthaya, Yilah, Amina Must Try, Atika, and Wanida Kitchen. Nonetheless, surveys indicate a decline in goat meat consumption among younger Thai-Muslim consumers, who typically consume such products only during religious or festive occasions. Key barriers include limited product awareness, relatively high prices. For example, goat biryani is priced at 150 THB, whereas chicken biryani is priced between 50 and 60 THB. Limited product availability is also a significant constraint. Some entrepreneurs have begun exploring electronic trading platforms, though overall adoption remains low due to limited skills in marketing, public relations, and product presentation. These challenges are consistent with the findings of Sugiarto, Wakhidati, and Gandasari. (2021), who identified weaknesses in product development, competitiveness, and packaging design. Enhancing packaging, particularly with respect to halal certification, branding, and visual appeal, has been shown to positively influence consumer purchasing decisions.

## Conclusions

The COVID-19 pandemic, characterized by unpredictable disruptions, necessitates adaptive strategies for goat business operators within the VUCA (volatility, uncertainty, complexity, ambiguity) framework, guided by principles of resilience and adaptation.

1. Volatility: The goat sector experienced a 95% decrease in demand alongside a 20% increase in production costs. Given its status as a niche market, accounting for only 5% of both demand and supply, producers must revise their visions and strategies accordingly. In the Central Region, farmers responded by downsizing herds, delaying breeding, and selling

goats earlier than usual to reduce costs. In contrast, farmers in the Northeastern Region adopted absorptive adaptations by switching to local feed sources, such as Napier grass, Leucaena, and rice straw, to reduce expenses (Dhakal & Karki, 2022). Additional coping strategies included using household labor, shortening production cycles, and stockpiling feed. Cooperative supply chain management further enhanced resilience. For instance, Central Region farmers formed cooperatives to share feed, pool products, and coordinate transportation, reflecting successful models from Nepal (Rahman et al, 2022). This approach aligns with Resilience Theory, which emphasizes collective action as a critical component of crisis response.

2. Uncertainty: In the face of unpredictable demand, driven by fluctuating market conditions and diminished purchasing power, many goat enterprises temporarily suspended operations. Risk mitigation strategies are essential, including diversification of distribution channels, adjustment of product sizes, and revision of marketing approaches (Cherdchom et al, 2015). When traditional markets closed, some producers transitioned to online platforms such as Facebook and LINE, and adopted home delivery services. In the Southern Region, farmer groups established local retail outlets and initiated value-added processing, including the production of sausages, milk tablets, and goat milk soap, to extend product shelf life and broaden market appeal (Department of Livestock Development, 2021; Haque, Rahman, & Sultana, 2021). Marketing innovations targeted urban consumers, particularly Chinese customers, through ready-to-eat and frozen goat products, such as herbal goat stew and fried ribs, thereby supporting niche market expansion (Limcharoen, 2019; Bunyaket, 2021).

3. Complexity: Effectively navigating the complex goat market requires clarity in decision-making. Tools such as the Business Model Canvas assist entrepreneurs in reassessing business objectives, identifying strategic partners and resources, and formulating flexible, evidence-based strategies to manage multifaceted challenges.

4. Ambiguity: The long-term impacts of COVID-19 on demand, consumer behavior, and the perceived value of goat products remain unclear. Strategic foresight is essential under such conditions. Game theory can be applied to develop adaptive response plans in the face of ambiguity. As demonstrated by Marcus et al. (2021), game-theoretic approaches can help balance public health priorities with economic objectives during pandemics by identifying optimal strategies that maximize social welfare. Concepts such as Pareto efficiency and the Coase Theorem can guide both policy and private sector decision-making under uncertainty. However, the effective application of these models requires access to comprehensive and high-quality information (Gibbons, 1997).

## Recommendation

### General Recommendation for Implementation

1. Promote Branding Through Digital Marketing and Storytelling: Entrepreneurs should prioritize increasing brand awareness and expanding their customer base through digital platforms. This includes presenting compelling narratives that resonate with consumers' lifestyles, health values, and religious beliefs in order to enhance brand credibility and foster long-term engagement.

2. Utilize Strategic Planning Tools Such as Game Theory: To prepare for unpredictable circumstances, entrepreneurs are encouraged to use game-theoretic approaches to analyze various scenarios and develop flexible strategies that can be adjusted in response to changing conditions.

3. Establish Collaborative Networks: Forming cooperative networks among goat farmers and processors can strengthen bargaining power, facilitate knowledge sharing, and reduce operational costs through economies of scale and shared resources.

### Recommendation for Future Study

1. Enhance Processing Capacity and Promote Product Innovation: Investing in the development of ready-to-cook and ready-to-eat goat products, as well as health-oriented and Halal-certified items, will help businesses meet the demands of niche markets while adding value to raw agricultural products.

2. Develop Comprehensive Risk Preparedness Plans: It is essential to establish risk mitigation strategies, particularly for disease outbreaks or unforeseen emergencies. Such plans should include contingency logistics, alternative supply chain arrangements, and communication protocols to ensure business continuity.

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