

Designing a Community-Based Business Model for Pelleted Horse Feed Using Local Raw Materials in Lamphun Province, Thailand

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Abstract. This study designs a community-based business model for pelleted horse feed produced from locally available raw materials in the horse-breeding community of Ban Thi District, Lamphun Province. A qualitative approach was employed through experimental feed formulation using ground maize, rice bran, and soy sauce by-product meal, followed by pelleting and evaluation of cost efficiency and feed quality. Analytical results indicate value creation across products, service, human resources, and brand image, with the model structured according to the nine components of the Business Model Canvas. The pelleted feed is nutritionally balanced and safe, and a direct farm delivery service is feasible within existing breeder networks. Packaging that preserves quality and palatability supports a consistent customer proposition. Cost–benefit comparison shows a reduction in horse-raising costs of approximately 10–20% relative to commercial feed, suggesting economic viability at community scale. The proposed value chain enhances local agribusiness capacity and farmer income while supporting the long-term sustainability of the horse-breeding sector. The study bridges animal nutrition and agribusiness by demonstrating how localized feed formulation and organized distribution are integrated into a coherent business model, providing a practical prototype for livestock-based rural development.

Keywords: agribusiness, equine nutrition, pelleted horse feed, Thailand, value chain

1 Introduction

Horse farming in Thailand is most prevalent in the northern region, particularly in Chiang Rai, Lampang, Lamphun, and Chiang Mai, in that order. The northern region has the highest horse population, totaling approximately 1,391 horses, or 11.68% of the national horse population, and the largest number of horse-keeping households, around 484 households, representing 18.05% of all horse-keeping households in the country [1].

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Currently, horse farming faces challenges due to the high cost of animal feed or feed ingredients, as farmers often need to purchase commercially prepared concentrates. Additionally, the value of livestock products does not always balance with the increasing feed costs, which represent the major expense in horse farming. To reduce feed costs, farmers can lower the price of feed formulations while maintaining their nutritional value. This can be achieved by substituting expensive main ingredients with high-quality, low-cost local feed materials that are rich in protein and fat. The production of animal feed requires careful control to ensure high-quality feed that supports the physiological functions of livestock. Consequently, the feed industry continuously seeks new strategies to improve processing methods for producing economically viable and high-quality feed.

One critical feed processing method that requires ongoing development is pelleting. Pelleting is a heat-based process used to produce animal feed, with the aim of maintaining feed uniformity through mechanical and thermal compaction of feed particles [2]. Particle compaction occurs due to mechanical forces and inter-particle adhesion. Initially, particles rearrange under low pressure, and as pressure increases, particles undergo elastic and plastic deformation, which locks them together, increasing the density of the biomass, forming what is known as “pelleted feed”. Pelleting reduces costs and common issues associated with powdered feed, particularly in handling, transportation, and storage [3].

Osterwalder and Pigneur (2009) noted that developing or planning a business model serves as a tool for organizations seeking to start or improve business growth. It provides a comprehensive overview of the business and allows for risk assessment in investment. However, to ensure sustainable market competitiveness, business model development must consider organizational resources and internal capabilities, as each organization or business type operates under unique conditions [4].

The researcher recognized the challenges and importance for farmers to produce pelleted horse feed using local raw materials. This motivated the study on developing a business for pelleted horse feed from community-based local ingredients, aiming to provide more options for farmers, increase the value of local raw materials, and develop a strategic business model for this product. Therefore, the objective of the present study was to develop a business model for horse feed pellet products made from locally sourced ingredients of the horse-raising community in Ban Thi District, Lamphun Province.

2 Materials and methods

This research focuses on the development of a business model for pelleted horse feed products using community-based local raw materials from horse-rearing communities in Ban Thi District, Lamphun Province. The study examines the market for pelleted horse feed products, explores stakeholders’ perceptions and acceptance of the product, and analyzes strategic business models encompassing activities involving both entrepreneurs and horse farmers.

2.1 Feed Ingredients

Each feed ingredient possesses specific characteristics that influence the feed manufacturing process. These characteristics affect factors such as moisture content, pressure, and temperature required during production. Fiber is rigid and elastic in nature, which makes particle bonding difficult [5]. The addition of fats or oils to animal feed has a negative effect on pellet durability [6], as fats act as lubricants between feed particles and the die wall, thereby reducing friction and pressure within the die. This reduction in friction and pressure leads to decreased pellet durability [5].

According to Briggs *et al.* (1999), adding more than 5.6% fat prior to pelleting may not significantly affect pellet quality, depending on the protein content and the conditioning time in the steam conditioner. It was also found that increasing protein content improves pellet durability, whereas adding fat above 5.6% decreases pellet quality. This finding is consistent with, who reported the negative impact of fat on pellet durability due to reduced compression forces and increased material flow through the die holes. Additionally, the influence of protein on pellet quality depends on the source of protein as well as its intrinsic properties and the extent of heat denaturation during processing.

2.2 Pelleting Process

The pelleting process in animal feed production consists of several stages, beginning with the reception of raw materials, followed by grinding or particle size reduction, weighing and formulation, ingredient mixing, heat treatment or conditioning (pellet formation), and finally packaging [2].

2.2.1 Grinding

After the raw materials are received, they are ground into smaller particle sizes using either a hammer mill or a roller mill before mixing. Grinding is mainly applied to cereal grains. The purpose of grinding is to increase the surface area for nutrient digestion, improve the uniformity of the mixture, and facilitate subsequent manufacturing processes [7]. After grinding, the materials are weighed and mixed with other ingredients to ensure uniform nutrient distribution, and then subjected to heat treatment by steam conditioning in a conditioner.

2.2.2 Steam Conditioning

Steam conditioning is the most critical factor in the pelleting process of animal feed. It is a thermo-mechanical process that involves the addition of heat and steam to the feed mixture under continuous shear or pressure [8]. The primary objective of conditioning is to ensure that the feed leaving the pellet mill is warm and has a suitable moisture level for the subsequent production stages. The addition of steam increases the moisture content of the feed mixture to an optimal level for pelleting [9]. Steam provides both heat and moisture in a balanced and efficient manner, thereby improving the conditioning process of pelleted feed [8]. The quality of the conditioning process depends on several factors, including the particle size of the feed ingredients, the quality and quantity of steam, the initial moisture and temperature of the mixture, and the retention time in the conditioner that allows proper interaction between the feed components [8, 10].

2.2.3 Pelleting

After steam conditioning, the process proceeds to pelleting. Pelleting is the most widely used feed processing method for forming cylindrical pellets of varying lengths and diameters. This is achieved by forcing the conditioned feed mixture through a thick metal plate with holes, known as a “die.” The conditioned feed flows into the pelleting chamber, where it is compressed through the die openings. The pressure generated by the rollers inside the pelleting chamber, combined with elevated temperature, induces chemical and physical transformations that cause feed particles to bind together and form solid pellets [8].

2.2.4 Cooling and Drying

Pellets exiting the die from the pellet mill have temperatures ranging from 80 to 90 °C and moisture content of 15–17%, which are unsuitable for storage. Therefore, it is necessary to cool or dry the pellets to approximately 8 °C and 10–12% moisture content [2]. Cooling is achieved by passing air through the hot pellets in either a vertical or horizontal cooler. The cooling process occurs through the evaporation of excess moisture and contact with air. Higher temperatures promote greater moisture evaporation from the pellets.

During storage under controlled conditions, such as in a cooler, careful attention must be paid to both temperature and moisture to prevent pellet deterioration, which could negatively affect product quality and shelf life. Excessive cooling time may result in overly hard pellets and loss of nutritional value. The duration of cooling depends on the temperature of the air passing through the pellets. Finally, the pellets are packaged and stored for subsequent use.

2.3 New Product Concept Analysis

According to Schiffman and Kanuk (2007), the analysis of a new product concept consists of two main steps:

2.3.1 Idea Generation for New Products

This step involves gathering ideas for product development, which may originate from various sources such as sales reports, competing products, market gaps, direct surveys, feedback from farmers, managerial needs, or research data. All collected ideas are then evaluated and refined to identify the best concepts that are most suitable for the market conditions, capable of enhancing farmer satisfaction, and providing a competitive advantage in the market.

2.3.2 Testing Product Concepts with Target Farmers

This step aims to understand the attitudes and opinions of target farmers, which can then be used to improve and refine the concept before actual implementation, or to support decisions regarding investment or abandonment of the concept. The components of attitude assessed in this step include: **Cognitive Component**: Reflects the thoughts, beliefs, and opinions of farmers toward the product. **Affective Component**: Represents the feelings or emotions that farmers use in evaluating the product. **Behavioral Component**: Refers to the actions or expressions resulting from farmers' decisions, which may vary among individuals.

2.4 Types of Business Models

Business operations can be classified into three main types:

2.4.1 B2C (Business-to-Customer)

B2C refers to selling products directly from business owners to customers, such as farmers. This typically occurs through online stores where products from producers are offered for customers to select and purchase at their convenience. Examples include convenience stores, retail shops, and online store platforms.

2.4.2 B2C (*Business-to-Business*)

B2B refers to transactions or business operations between one business and another. This involves producing goods or services specifically for other businesses to use. Examples include factories supplying products to wholesale stores, internet services for office use, and online store management platforms that help businesses manage their operations more efficiently.

2.4.3 B2C (*Business-to-Business-to-Customer*)

B2B2C refers to a business model where a company sells to other businesses and facilitates those businesses in selling products to customers. This model integrates buyers and sellers on a single platform, where the platform owner acts as an intermediary connecting business owners with consumers. Examples include marketplace platforms such as Lazada, Shopee, and Amazon, which allow well-known brands to open storefronts on the platform, providing consumers (e.g., farmers) with the opportunity to access genuine products, services, and promotions from multiple brands in one place.

2.5 Strategic Business Model

A strategic business model is a mechanism that drives the process of managing a business to achieve maximum profitability and enhance the value of products and services, ultimately leading the organization to success. The Business Model Canvas, developed by Alexander Osterwalder, is a widely used business model framework because it is simple to understand, neutral, and comprehensive. It is suitable for new businesses or those seeking innovation in products or services and can be applied across all industries. The framework divides strategic planning into nine key components as follows:

2.5.1 *Customer Segments*

This involves identifying the target groups the business aims to reach. Correctly defining the target segments is crucial for a business model, as a clear target allows the business to offer products and services that meet customer needs effectively.

2.5.2 *Value Proposition*

This component specifies how the business's products create value for customers and why customers choose them [11]. Value propositions may include innovation, introducing new features, or enhancing product characteristics to increase perceived value.

2.5.3 *Channels*

Channels refer to the communication, distribution, sales, and marketing avenues the company uses to reach and interact with customers. Selecting the right mix of channels that effectively reach the target audience is essential and highly beneficial for business success.

2.5.4 *Customer Relationships*

This defines the type of relationship the business wants to establish with customers, ranging from automated responses to highly personalized services. It also includes strategies for

marketing communication to target audiences, building brand recognition, or conducting targeted promotional activities such as special marketing events, sales promotions, and roadshows.

2.5.5 Revenue Streams

Revenue streams refer to the cash inflows the business receives after deducting costs. These can arise from one-time purchases, repeat purchases, subscription services, or post-sale services.

2.5.6 Key Activities

This involves identifying the critical activities the business must perform to achieve its objectives, such as production, service delivery, providing products/services that solve customer problems, and networking.

2.5.7 Key Resources

Key resources are the essential assets required to make the business model successful. These include physical resources (e.g., machinery and equipment), financial resources, intellectual property, and human resources.

2.5.8 Key Partners

Forming business partnerships is essential to maximize benefits, reduce risks, and acquire necessary resources. Key partners may include strategic business partners, joint ventures for new business development, suppliers of raw materials or equipment, and service providers.

2.5.9 Cost Structure

The cost structure encompasses all costs incurred in operating the business according to the chosen model, such as costs of creating product/service value, maintaining customer relationships, resource utilization, and service delivery. Cost calculation is derived from the activities, resources, and key partnerships identified in the business mode

3 Results and discussion

3.1 Study on Value Creation

The results of the study on value creation and new product concepts indicate that pelleted horse feed produced from local raw materials represents a viable and acceptable product concept for horse farmers. Overall, the attitudes of horse farmers toward pelleted horse feed were at a very good level. When analyzed by specific dimensions, farmers' understanding of the product was rated as very good, while their feelings and behavioral intentions were rated as good. This reflects a high level of acceptance of pelleted horse feed made from local raw materials. In terms of the product aspect, horse farmers perceived that pelleted horse feed formulated from local ingredients is nutritious and energy-rich, containing relatively high levels of protein and plant fiber. These characteristics correspond with the

nutritional role of pelleted feed as a concentrated energy source for horses. The utilization of local raw materials, including agricultural by-products and agro-industrial residues, further contributes to cost reduction and increases the economic value of locally available resources. However, appropriate adjustment of feed formulations remains necessary to ensure that fiber and protein levels meet the physiological requirements of horses, thereby preventing digestive disorders and promoting efficient nutrient utilization [12]. Regarding the service aspect, the results showed that entrepreneur horse farmers not only produce pelleted horse feed for on-farm use but also provide free delivery services to members within their network. This practice strengthens relationships among horse farmers and enhances accessibility to the product within the community. For the personnel aspect, the study found that farmers supplying local raw materials are able to generate additional income, support other farmers in the area, and contribute to local economic development. This demonstrates the role of community-based feed production in creating shared economic benefits across different stakeholder groups. In terms of image and branding, horse farmer entrepreneurs were able to develop branded packaging for pelleted horse feed that maintains product quality, aroma, and palatability, is free from contamination, and allows for extended shelf life. These factors contribute positively to product credibility and consumer confidence.

3.2 Development of a Strategic Business Model for Pelleted Hores Feed Products

The results of horse farmers' opinions regarding the importance of marketing mix factors revealed that the development of pelleted horse feed from local raw materials such as cornmeal, rice bran, and soy sauce by-product meal can reduce feeding costs by approximately 10–20% compared with commercial ready-made feeds. This finding highlights the economic feasibility of locally produced pelleted horse feed. The developed strategic business model reflects the potential for establishing a community-based pelleted horse feed production system, with local markets and horse owner networks serving as the primary marketing channels. Such a model supports the development of community-based branding and contributes to long-term grassroots economic growth. Moreover, the model enables horse owner communities to gain practical business experience, generate supplementary income, raise awareness among horse farmers, and serve as a prototype for future business development. Horse farmers and entrepreneurs rated all components of the marketing mix as being of very high importance, with the ranking as follows: product, price, promotion, and distribution channels. Detailed analysis of each component revealed that, for the product aspect, the most important factors were the quality of raw materials, followed by the nutritional value or benefits of the feed, and the credibility and reputation of the producer. For the price aspect, horse farmers considered price appropriateness relative to quality as the most important factor, followed by price appropriateness relative to quantity and clearly displayed pricing. In terms of distribution channels, fast service during purchase was ranked highest, followed by the availability of online sales channels and off-site delivery services. Regarding promotion, the most important factors included promotional campaigns offering free or half-priced pelleted feed during periods of high commercial feed prices, followed by communication of nutritional benefits and campaigns targeting horse enthusiasts to promote improved horse health.

<p><u>Key Partners</u> ✓Local raw material producers (farmers) ✓Community enterprises or horse breeders’ cooperatives ✓Universities or research institutes ✓Government and private agencies ✓Animal feed distributors</p>	<p><u>Key Activities</u> ✓Research and development of horse feed formulas suitable for nutritional needs ✓Production and quality control of pelleted horse feed ✓Building marketing and distribution networks ✓Training and educating horse owners on the use of pelleted feed ✓Brand building and public relations</p>	<p><u>Value Propositions</u> ✓Nutritious pelleted horse feed suitable for equine dietary needs ✓Made from local raw materials, reducing import costs ✓Affordable pricing compared to imported commercial feeds ✓Supports income generation and strengthens the local community economy ✓High-quality, standardized, and safe products for animals</p>	<p><u>Customer Relationships</u> ✓ Building trust through feed quality testing ✓ Providing nutritional consultation to horse owners ✓ Membership or loyalty programs for regular customers ✓ Product quality guarantees and after-sales service</p>	<p><u>Customer Segments</u> ✓Horse farmers within the local community ✓Horse farms for sports or racing purposes ✓Horse farms for tourism and service activities (e.g., riding, shows) ✓Researchers and educational institutions (using feed for experiments)</p>
<p><u>Cost Structure</u> ✓ Costs of local raw materials ✓ Labor costs for production ✓ Machinery and maintenance costs ✓ Packaging and logistics expenses ✓ Marketing and promotional expenses ✓ Training and personnel development costs</p>		<p><u>Revenue Streams</u> ✓Sales of pelleted horse feed (by sack/kilogram) ✓Sales of customized feed formulas for racing or tourism horses ✓Revenue from nutritional and horse management consulting services ✓Sales of franchise rights or production models to other communities</p>		

Figure 1: The Business Model Canvas

These findings are consistent with the value chain concept, which emphasizes the integration of farmer and producer groups, standardized small-scale processing within communities, targeted marketing channels, and quality assurance systems to ensure continuous raw material supply and enhance consumer confidence. Furthermore, the high level of understanding and positive attitudes among horse farmers aligns with consumer behavior theories suggesting that favorable attitudes toward new products particularly perceptions of complete nutrition, health support, and reduced health risks positively influence purchasing and investment decisions. The strategic business model developed in this study provides a clear and comprehensive overview of business operations, making it suitable for evaluating investment decisions and formulating strategic plans to enhance competitiveness. This supports previous findings that understanding business strengths, weaknesses, opportunities, and constraints prior to actual investment increases the likelihood of business success [13-14]. In addition, the emphasis on a clear value proposition highlights its critical role in effectively meeting the needs of target customer groups [15]. The analysis of data obtained from interviews with the entrepreneur case study, combined with information gathered from previous research steps, can be used to develop a strategic business model for the pelleted horse feed production business, as shown in Figure 1. The details of the developed business model, structured through the Business Model Canvas, can be explained as follows.

4 Conclusion

From this study concludes that pelleted horse feed produced from local raw materials has strong potential as a community-based product, offering both nutritional and economic benefits. The feed provides a concentrated source of protein, fiber, and energy, while the use of local agricultural by-products helps reduce production costs and increase the value of local resources. Horse farmers demonstrated a high level of understanding and positive attitudes toward pelleted horse feed, indicating strong acceptance and confidence in the product's ability to support horse health and reduce health risks. The strategic business model developed in this study effectively integrates value creation, marketing mix considerations, and community participation. It provides a practical framework for investment decision-making and long-term business planning, while also supporting local economic development. Overall, the findings suggest that community-based pelleted horse feed production can serve as a sustainable and scalable business model for horse-rearing communities.

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