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New value chain management for sticky rice farmers to support the Nang Rong pounded unripe rice business in Buriram province

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Abstract: The objectives of this research were 1) to analyze the supply chain of value chain management for sticky rice farmers to support the Nang Rong pounded unripe rice business in Buriram Province; and 2) to develop a new value chain management system for sticky rice farmers by utilizing local resources to support the Nang Rong pounded unripe rice business in Buriram Province. The results revealed that when analyzing the new supply chain of paddy production, the research team collaboratively designed a new supply chain process for rice production, encouraging farmers to voluntarily convert their land to grow sticky rice to meet the demand of Nang Rong pounded unripe rice producers. A total of five groups, comprising 33 farmers, voluntarily participated in the conversion to paddy planting, with a total planting area of 193 rai spread across four sub-districts in Khu Mueang District, Buriram Province. Regarding the development of a new value chain management system for sticky rice farmers for a fair benefit-sharing mechanism, a network of cooperation involving both government agencies, the private sector, and the three groups of stakeholders was established. This network transferred and extended the management results to create a new value chain for Nang Rong pounded unripe rice products in other areas. The project evaluation revealed that the capabilities of entrepreneurs in the five areas were enhanced, resulting in an increase in product value per group per month by 13.12%, and increasing the community's income by 5.61%.

Keywords: *Nang Rong pounded unripe rice, New value chain, Sticky rice farmer.*

1. Introduction

There are three pounded unripe rice villages in Nang Rong District, Buriram Province, namely Butawet Village in Nong Kong Sub-district; and Khok Wan Village and Bukhram Village in Nong Sano Sub-district. The tradition of making pounded unripe rice in these communities began at Butawet Village, which was established more than 100 years ago. All three communities engage in the production of pounded unripe rice during the post-harvest period, producing clean and delicious pounded unripe rice that is sold to many provinces across the country. Additionally, there are buyers who purchase and sell pounded unripe rice abroad. The current situation in the pounded unripe rice communities, Nang Rong District, Buriram Province, involves three villages and two sub-districts: Butawet Village in Nong Kong Sub-district; and Khok Wan Village and Bukhram Village in Nong Sano Sub-district. There are a total of 33 entrepreneurs producing pounded unripe rice, organized into a single enterprise group. Also, there is one pounded unripe rice processing enterprise group with 10 members. Regarding the current situation of the pounded unripe rice product supply chain and financial status of the communities, there are the primary problem of raw material shortages, insufficient paddy

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for production, and high costs of transportation. The pounded unripe rice producer group requires approximately 930 tons of paddy annually, divided as follows: approximately 450 tons of the Hom Thung variety, approximately 300 tons of the Lao Taek variety, approximately 100 tons of the KorKhor6 variety, and approximately 80 tons of other varieties, including San Pa Tong, E Tia Daeng, Pong Aew, Mae Jo 2, Hom Sa-ngiam, KorKhor. 5, and Jasmine. The communities can grow about 400 tons of rice annually, necessitating the purchase of an additional 530 tons from other sources, costing approximately 8.3 million baht per year. The price of each variety of rice varies, ranging from 11 to 18 baht per kilogram (including shipping costs). Hom Thung rice is the most popular variety used to produce pounded unripe rice because it has an aromatic scent and large, spherical grains that, when pounded, become flat and visually appealing. The communities purchase Hom Thung rice from Ubon Ratchathani Province at a price of 18 baht per kilogram (including shipping costs of 7 baht per kilogram). The challenges faced include Hom Thung rice being an annual crop harvested in August, which makes it difficult for the pounded unripe rice producer group to maintain a year-round stock of paddy. Moreover, the group lacks the financial capacity to purchase the entire required amount in a single lot during August and faces high transportation costs. Meanwhile, off-season rice is rarely used to produce pounded unripe rice because it is hard and not preferred by customers. The second problem is the quality of the paddy. The Nang Rong pounded unripe rice producer group requires rice that is either free from chemicals or uses minimal chemicals in the production process because chemicals affect the aroma of the pounded unripe rice. During production, in the soaking process, producers must use their arms to stir and rinse the rice in a bowl or basin. If the rice has been treated with chemicals, most producers develop a red, itchy rash on the arms that come into contact with the rice. The rice producer group needs rice that is mature and completely dry, with a moisture content not exceeding 3%. Farmers must carefully harvest the rice to prevent it from getting wet and ensure it is sun-dried for 3-5 days to achieve complete dryness. If the rice has a high moisture content, it will negatively affect its smell. When used to produce pounded unripe rice, it will develop an unpleasant odor, resulting in poor-quality rice that customers do not want to buy. This causes financial losses for rice producers, who then have to use the rice as animal feed instead. Due to the COVID-19 situation, rice production entrepreneurs have had to use less paddy in their production. The total use of paddy by entrepreneurs in all three communities has decreased by 399,340 kilograms per year, or 399.34 tons per year, a reduction of 43.15%. In 2018, the producer groups used a total of 925.5 tons of paddy per year. Currently, rice usage has decreased to 526.16 tons per year. When analyzing the total value of the paddy purchased, it was found that it had decreased to 3,009,600 baht per year, a reduction from 2018 by 5,221,000 baht, representing a decrease of 63.43%. Additionally, when analyzing the supply chain of Nang Rong pounded unripe rice, a significant pain point was identified: the rice-producing communities face a shortage of paddy for the production cycle and high transportation costs. The rice is purchased from different provinces because the amount grown locally is insufficient for the production of pounded unripe rice. The Hom Thung rice variety, in-season rice harvested in August, cannot be stored in sufficient quantities to sustain year-round production, and the producer group lacks the financial capacity to make bulk purchases in August, further compounded by high transportation costs. Off-season rice is rarely used to produce pounded unripe rice because it is hard and not preferred by customers. The communities also lack a new value chain management system for farmers growing sticky rice to ensure fair benefit sharing. From visiting the area to meet with leaders of the pounded unripe rice producers in three villages, it was found that there are a total of 36 entrepreneurs in the three villages: 1) Bukram Village has five entrepreneurs. These entrepreneurs have the capacity to produce pounded unripe rice using approximately 13 tons of paddy per month. The entrepreneurs prioritize sticky rice paddy of the Kor.Khor. Six variety because it is easy to pound. Other varieties depend on what the entrepreneurs can purchase within the province; 2) Butawet Village has 13 entrepreneurs. The mostly preferred sticky rice paddy is the Kor.Khor. Six variety, followed by the Hom Thung variety. These entrepreneurs grow sticky rice to make pounded unripe rice, and, when their own

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rice supply is exhausted, they purchase additional rice from other places to continue production. Currently, the rice bought within the communities is often misrepresented on the scale, leading to unjust transactions. However, the entrepreneurs have no choice but to accept these purchases due to the lack of sufficient rice to produce pounded unripe rice. The entrepreneurs in these communities are divided into two types: (1) owners who pound the rice and wholesale it themselves; and (2) owners of pounding machines who are hired to pound unripe rice, receiving rice from Khok Wan Village and selling it both wholesale and online, with prices ranging from 55-60 baht per kilogram; and 3) Khok Wan Village has 18 entrepreneurs who prioritize the Hom Thung rice variety, followed by sticky rice of the Kor.Khor. 6 variety. Other varieties are purchased based on availability within the province.

In managing raw materials from the network of farmer groups, consisting of farmers who grow sticky rice under the operations of Khu Mueang Agricultural Cooperative Limited in Khu Mueang District, Buriram Province, there are five member groups: 1) Rice Seed Group, Village No. 16, Phon Samran Sub-district, Khu Mueang District, with 38 members and a rice farming area of 380 rai; 2) New Theory Integrated Crop Growing Group, Village No. 5, Hin Lek Fai Sub-district, Khu Mueang District, with 39 members and a rice farming area of 200 rai; 3) New Theory Integrated Crop Growing Group, Village No. 10, Khu Mueang Sub-district, Khu Mueang District, with 18 members and a rice farming area of 270 rai; 4) Khu Mueang Agricultural Cooperative Limited Community Enterprise called High-Value Quality Cattle Group, Village No. 2, Hin Khu Mueang Sub-district, Khu Mueang District, with 62 members and a rice farming area of 300 rai; and 5) Bamboo Shoot Processing Group, Pakham Samrong Village, Tum Yai Sub-district, Khu Mueang District, with 35 members and a rice farming area of 350 rai. In total, there are 192 sticky rice farmers with a combined rice farming area of 1,500 rai (in-season rice). Processes that need to be added to the new rice production value chain must start with sorting seeds, controlling chemical-free rice cultivation, and ensuring quality during rice harvest. Furthermore, the process should include reducing paddy humidity, storing paddy stocks, and managing the fair purchase of paddy from farmers. It is also essential to coordinate orders with pounded unripe rice production and transportation groups. The price mechanism must be acceptable and fair to all three parties (rice farmers, Khu Mueang Agricultural Cooperative Limited, and the rice producer group). This research will help develop a new value chain management system for sticky rice farmers, resulting in an upgrade to the grassroots economy of the community and Buriram Province. Local enterprises can increase the competitiveness of their products. The new value chain management system for sticky rice farmers will ensure fair benefit sharing, leading to a fair benefit-sharing model. Nang Rong pounded unripe rice products will promote fairness and harmonious living, creating sustainability for the members of the rice growing group. This will help members of the rice growing group of Khu Mueang Agricultural Cooperative Limited increase their income.

2. Objectives

1. To analyze the supply chain and value chain management for farmers growing sticky rice in the Nang Rong pounded unripe rice business, Buriram Province
2. To develop a new value chain management system for farmers growing sticky rice within the Nang Rong pounded unripe rice business, Buriram Province

3. Literature Review

Value chain management involves the interconnectedness of organizations, resources, and activities that collectively create value through finished goods or services for customers. It aims to achieve optimal results by reducing non-value-adding activities and enhancing value-creating activities throughout the entire process. Porter (1985) introduced a value chain model that emphasizes activities within each business unit's value chain, encompassing sourcing raw materials, processing, and delivering products and services to customers. This model aims to enhance business competitiveness by analyzing the added value generated at each step or activity. The value chain thus represents a series of

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value-creation activities, including relationships with trading partners in the supply chain, influencing competitive position. This concept aligns with Chaiwat Chutrakun's (2014) theoretical framework, where physical distribution pertains to activities involved in moving goods from producers to consumers or industrial users. From this definition, it is evident that managing product distribution and physical distribution involves developing and operating an efficient system for moving products. Product movement encompasses: 1) transporting finished goods from the production site to the final customer; 2) transporting raw materials and production inputs from suppliers to the production site. This also aligns with the theoretical framework of Buranasak Madmai (2014), which states that loading and unloading are activities directly and indirectly related to the production process, along with time, speed, safety, and costs. They are also associated with other activities involved in transporting raw materials to the factory, the production process, and finally delivery of products to the customer's hands. Research in logistics management and supply chain management covers various topics. For instance, Chaowalit Simsuay et.al. (2022) investigated cooperative integration to address poverty issues using the Phumpuang Model. They implemented three key activities: 1) establishing a community distribution center to supply specific products to Phumpuang trucks (trucks selling items); 2) developing the Phumpuang Application for product ordering and management; and 3) establishing a welfare system for Phumpuang trucks to foster collaboration between the distribution center and Phumpuang trucks. In another study, Chaowalit Simsuay et al. (2023) explored community management focusing on food safety to support sports tourism cities in alleviating poverty in Buriram Province. Their approach included: 1) surveying foundational information on safe food production and processing systems and tourism potential at the sub-district level; 2) creating a network of producers, processors, product collectors, and consumers of safe food at the sub-district level; 3) establishing a system for developing a sub-district-level center for safe food and tourism management; and 4) linking the system of safe product management centers and sub-district tourism with the mechanism of local government which operates in three districts in Buriram Province. Sanphet Phianjad et. al. (2024) explored the distribution of goods via Phumpuang trucks to enhance the income of impoverished households in Sakae Phrong Sub-district, Mueang District, Buriram Province. They integrated cooperation to address poverty issues through the concept of Phumpuang trucks. This distribution pattern naturally emerged in Sakae Phrong Sub-district, Mueang District, Buriram Province, serving as a mechanism to mitigate inequality in community resource access. It facilitates intra-community goods exchange, financial circulation, and the utilization of local resources. Importantly, it generates added value for local products. Through this mechanism, there has been an improvement in the quality of life for impoverished households in Mueang District, Buriram Province, with the value chain and operational efficiency of Phumpuang truck operators as a critical driving factor. Additionally, a study of Udompong Ketsripongsa et.al. (2022) focused on the logistics management model for upstream farmers to reduce supply chain costs among volcano rice producer communities in Buriram Province. They utilized the SCOR Model technique, which involves planning, raw material management, production, delivery, and returns. Logistics costs were analyzed using the Activity Based Costing (ABC) method to develop a model aimed at enhancing the efficiency of rice supply chain management.

4. Research Methodology

1. Conduct a workshop to develop the potential of farmer members growing rice for the Nang Rong pounded unripe rice business (focusing on rice quality, rice seed sorting, and organic rice cultivation).

2. Conduct a workshop on creating a pricing mechanism for rice that is acceptable and fair to all three parties (farmers, Khu Mueang Agricultural Cooperative Limited, and the pounded unripe rice producer group) in developing a new value chain management system for farmers growing sticky rice for the Nang Rong pounded unripe rice business to ensure equitable benefit sharing.

3. Analyze the pricing mechanism for rice that is acceptable and fair to all three parties (farmers, Khu Mueang Agricultural Cooperative Limited, and the pounded unripe rice producer group) in

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developing a new value chain management system for farmers growing sticky rice for the Nang Rong pounded unripe rice business to ensure fair benefit sharing.

4. Conduct a workshop on developing a new value chain management system for farmers growing sticky rice for the Nang Rong pounded unripe rice business to ensure fair benefit sharing (including planning plantation areas, rice cultivation costs, transportation methods, and pricing mechanisms).

5. Develop a new value chain management system for farmers growing sticky rice for the Nang Rong pounded unripe rice business to ensure fair benefit sharing.

6.Conduct a follow-up and evaluation of the new value chain management system for farmers growing sticky rice for the Nang Rong pounded unripe rice business to ensure fair benefit sharing by summarizing lessons learned through After Action Review (AAR).

7. Summarize the new value chain management system for farmers growing sticky rice for the Nang Rong pounded unripe rice business to ensure fair benefit sharing.

8. Synthesize the new value chain management system for farmers growing sticky rice for the Nang Rong pounded unripe rice business to ensure fair benefit sharing.

9. Organize a practical forum to transfer the new value chain management system for farmers growing sticky rice for the Nang Rong pounded unripe rice business to stakeholders, including network partners from both government and private agencies, to ensure fair benefit sharing.

10. Identify the lessons learned from the new value chain management system for farmers growing sticky rice for the Nang Rong pounded unripe rice business to be transferred and expanded to other areas.

5. Results

Regarding the research findings according to Objective 1, it can be concluded that the analysis of the old value chain of rice growers within the original rice production supply chain reveals that farmers initially purchase rice seeds, primarily paddy, from Khu Mueang Agricultural Cooperative Limited, amounting to approximately 85.7 tons, and KorKhor. Six rice seeds from suppliers in Kaset Sombun District, Chaiyaphum Province, Ubon Ratchathani Province, and nearby provinces, totaling around 20 tons (in 2020). Meanwhile, fertilizers, herbicides, and pesticides are procured from Khu Mueang Agricultural Cooperative Co., Ltd. and local general stores in the district. When 192 farmers (No. 1) with a cultivating area of 1,500 rai harvest products, they will sell them to Khu Mueang Agricultural Cooperative Limited. The rice storage capacity is 300 tons, with Phet Pattana Rice Mill having a storage capacity of 200 tons, while other rice mills in the district can store up to 100 tons, as illustrated in Figure 1.

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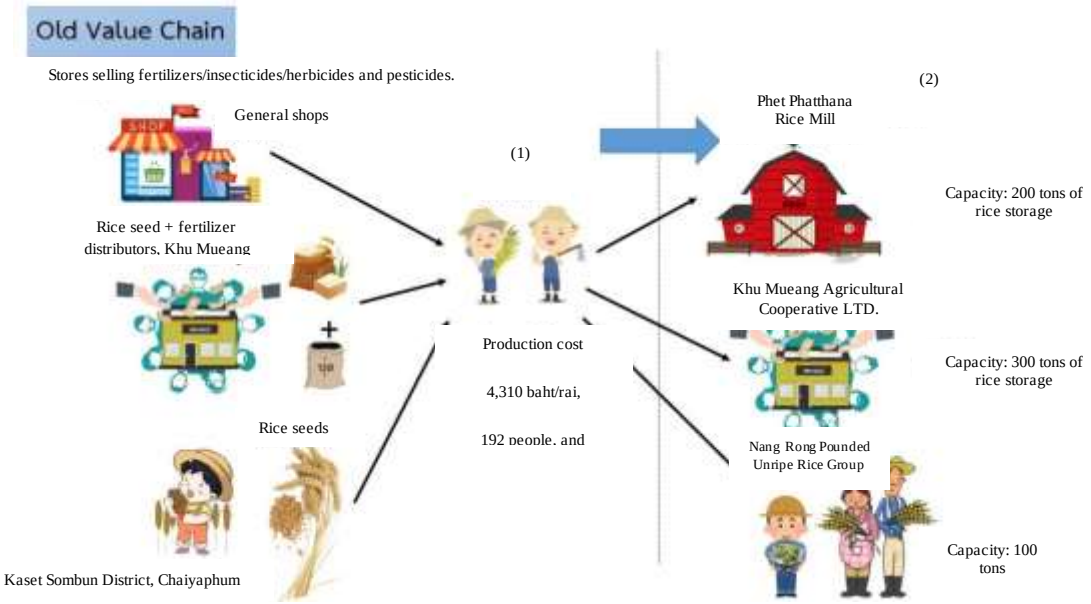

Figure 1.
The old value chain of the current rice farmer group.

From Figure 1, it is evident that the current value chain of paddy farmers comprises two critical links: (1) the rice grower or farmer link and (2) the purchasing source link. From the analysis of these links, it was found that: No. (1) or the rice grower or farmer link produces 9,500 tons of paddy annually (8,700 tons of Jasmine 105 rice variety and 800 tons of KorKhor. 6 sticky rice variety), generating income of approximately 107.25 million baht for rice farmer members (sticky rice growers). Regarding this link, upon further analysis, it was found that the source for purchasing paddy is Khu Mueang Agricultural Cooperative Limited, with the total amount of approximately 85.7 tons, while KorKhor. Six rice seeds are purchased from suppliers in Kaset Sombun District in Chaiyaphum Province; Ubon Ratchathani Province; and neighboring provinces, totaling about 20 tons. Additionally, fertilizers, herbicides, and pesticides are sourced from Khu Mueang Agricultural Cooperative Limited and general stores within the district. The rice produce that farmers send to the purchasing source faces several issues leading to price deductions. These include excessive humidity beyond the purchasing source's criteria, rice seeds mixed with weeds like grass seeds and dry grass leaves, etc., and use of chemicals in rice cultivation. Implementing a controlled process from rice seed selection to high-quality rice harvesting would enable sticky rice farmers to enhance their potential across various areas, thereby increasing their income. Regarding (2) the purchasing source link, it is essential to increase production capacity to meet customer demands. Analysis of rice production entrepreneurs revealed that the COVID-19 situation significantly affected the use of paddy in production. Entrepreneurs across all three communities collectively used 399,340 kilograms of paddy annually, equating to 399.34 tons per year—a decrease of 43.15%. In 2018, the producer group utilized up to 925.5 tons of paddy annually. However, currently, this has declined to 526.16 tons per year. When evaluating the value of purchased paddy rice within the community, it decreased to 3,009,600 baht annually, representing a reduction of 5,221,000 baht compared to 2018, or a decline of 63.43%. Based on the above information, a new value chain analysis is conducted to strategize rice production in areas transitioning to growing sticky rice by around 2021 to meet increasing customer demand. In summary, within the current value chain of the rice producer group, there are three key links: 1) the rice grower or farmer link; 2) the pounded unripe rice producer group link; and 3) the customer group link. Upon analyzing these links, it is found that rice farmers contribute 526.16 tons of sticky rice annually to the chain, generating income of 5.79

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million baht for sticky rice farmers. Further analysis reveals that 19.79% of the paddy, amounting to 103.97 tons annually, is sourced from other provinces. This incurs transportation costs of 7 baht per kilogram to middlemen transporting rice to the community, totaling 727,790 baht in transportation expenses. This increased costs of producing pounded unripe rice results in financial losses, impacting the economy of Buriram Province.

When analyzing the new value chain for paddy production, the research team collaboratively designed a new process for rice production involving farmers. Initially, rice farmers who are members of Khu Mueang Agricultural Cooperative Ltd. will enter into contracts to receive rice seeds and fertilizers directly from the cooperative. Meanwhile, herbicides and pesticides will be purchased from general stores in the district. In the envisioned new supply chain for rice production, the research team has introduced new links to serve as collectors of paddy for sale to the pounded unripe rice production group, specifically Khu Mueang Agricultural Cooperative Limited. This involves 33 rice farmers cultivating an area of 193 rai. The rice depot has a storage capacity of 300 tons. The research team collaborated with marketing executives and the president of the rice farmer group of Khu Mueang Agricultural Cooperative Limited to plan rice production in areas transitioning to growing sticky rice. The cooperative conducted a willingness survey among its rice grower group members and decided to switch from growing Jasmine rice 105 to growing sticky rice to meet the demand of 530 tons annually from the Nang Rong pounded unripe rice producer group. Currently (2021), there are a total of 36 entrepreneurs. The successful outcomes of having the pounded unripe rice producer group is that it has helped reduce the transportation costs of paddy, the purchase of high-priced rice, which sometimes requires direct retrieval from sellers, and uncertain pricing. Khu Mueang Agricultural Cooperative Limited has acted as an intermediary in purchasing paddy for the Nang Rong pounded unripe rice producer group, presenting an opportunity for members of the rice growing group to increase their income. Some rice growing areas in Khu Mueang District, adjacent to the Mun River, support twice-yearly rice cultivation, making them ideal for supplying raw materials to the Nang Rong pounded unripe rice producer group. The plan includes transitioning these areas to growing sticky rice. Based on this information, some farmers have voluntarily dedicated their land to growing sticky rice to meet the demand for paddy from the Nang Rong pounded unripe rice producers. In 2021, the cost of rice cultivation per rai for all five entrepreneur groups, prior to switching to organic growing methods, averaged 3,430 baht per ton. The selling price of sticky rice in 2021 is 11,000 baht per ton, as depicted in Figure 2.

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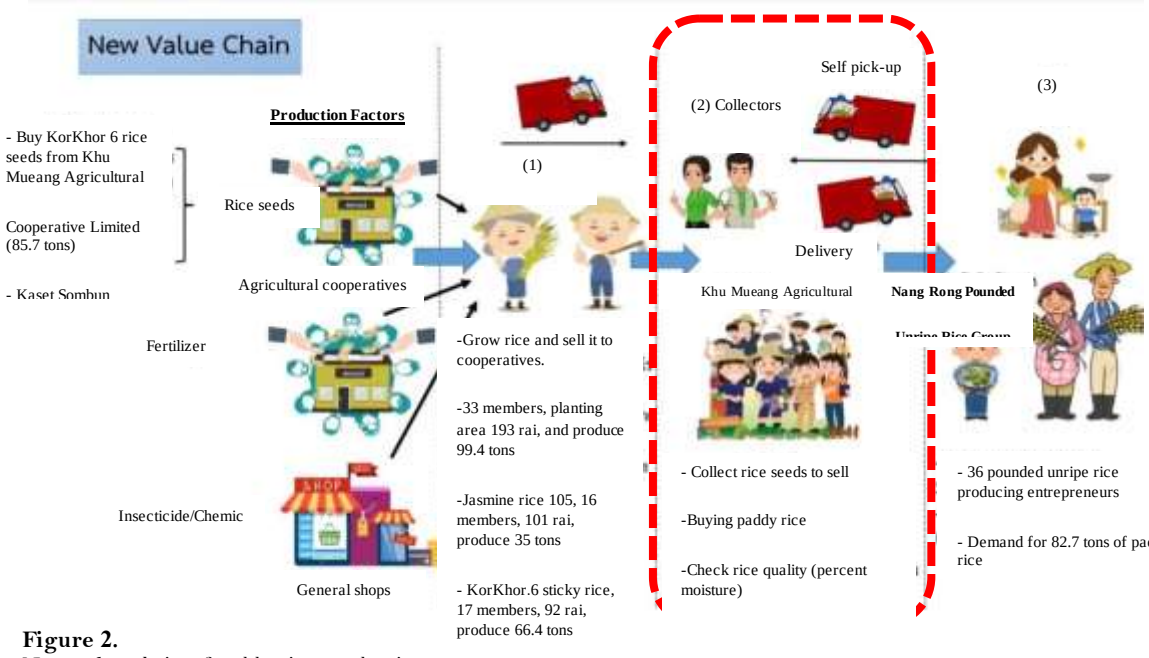

Figure 2.
New value chain of paddy rice production.

Based on Figure 2, the research team collaborated to design a new supply chain process for rice production. Initially, rice farmers who are members of Khu Mueang Agricultural Cooperative Ltd. will enter into contracts to receive rice seeds and fertilizers directly from the cooperative. Meanwhile, herbicides and pesticides will be purchased from general stores in the district. In the envisioned new supply chain for rice production, the research team has introduced new links to serve as collectors of paddy for sale to the pounded unripe rice production group, specifically Khu Mueang Agricultural Cooperative Limited (Nor. 2). This involves 33 rice farmers cultivating an area of 193 rai. The rice depot has a storage capacity of 300 tons. The research team collaborated with marketing executives and the president of the rice farmer group of Khu Mueang Agricultural Cooperative Limited to plan rice production in areas transitioning to growing sticky rice. The cooperative conducted a willingness survey among its rice grower group members and decided to switch from growing Jasmine rice 105 to growing sticky rice in 2021 to meet the demand of 530 tons annually from the Nang Rong pounded unripe rice producer group (No. 3). Currently (2021), there are a total of 36 entrepreneurs, which consist of 30 news entrepreneurs and 6 existing entrepreneurs. The successful outcomes of having the pounded unripe rice producer group is that it has helped reduce the transportation costs of paddy rice, the purchase of high-priced rice, which sometimes requires direct retrieval from sellers, and uncertain pricing. Khu Mueang Agricultural Cooperative Limited has acted as an intermediary in purchasing paddy for the Nang Rong pounded unripe rice producer group, presenting an opportunity for members of the rice growing group to increase their income. Some rice growing areas in Khu Mueang District, adjacent to the Mun River, support twice-yearly rice cultivation, making them ideal for supplying raw materials to the Nang Rong pounded unripe rice producer group. The plan for rice production in areas transitioning to growing sticky rice in 2021 is progressing well. Based on this information, some farmers have voluntarily dedicated their land to growing sticky rice to meet the demand for paddy from the Nang Rong pounded unripe rice producers, as depicted in Table 1.

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Table 1.
Rice production plan in areas transitioning to growing sticky rice in 2021.

Area transitioning to growing sticky rice in 2021	Amount of area cultivated by each farmer (rai)
1. Chot Nong Hang Village, Pakhiap Sub-district	16 cases, area 101 rai (Kor Khor.22 rice variety, planted 2 times)
2. Kok Khok Village, Khu Mueang Sub-district	2 cases, area 12 rai (KorKhor.6 rice variety)
3. Sa Bua Village, Phon Samran Sub-district	4 cases, area 22 rai (KorKhor.6 rice variety)
4. Khok Phet Village, Phon Samran Sub-district	1 case, area 3 rai (KorKhor. 6 rice variety)

From a survey of the needs of rice farmers in Khu Mueang District, it was found that some farmers voluntarily used their land to grow sticky rice to meet the demand for paddy from Nang Rong pounded unripe rice producers. A total of 33 farmers from all five groups have volunteered to shift to growing sticky rice to support orders from the pounded unripe rice production group, with the total cultivation area of 193 rai. The expected total yield is 99.4 tons per rai, with cultivation areas spread across four sub-districts in Khu Mueang District, Buriram Province. Upon analyzing the data on costs for rice farmers, it was determined that the average total rice production cost is 4,310 baht per rai. This includes variable costs such as rice seed costs averaging 375 baht per rai, direct labor costs averaging 870 baht per rai, and fixed costs including machinery depreciation, maintenance costs, and local taxes averaging 2,725 baht per rai. The cost structure analysis reveals that variable costs account for 36.77% of the total, while fixed costs make up 63.23%.

Regarding the research results according to Objective 2 on development of a new value chain management system for farmers growing sticky rice in the Nang Rong pounded unripe rice business, the research team has developed a pathway from sticky rice growers to the downstream of the Nang Rong pounded unripe rice production chain as follows:

Aspect 1: Regarding the development of a new value chain management system for rice farmers through integration of rice growers as members of Khu Mueang Agricultural Cooperative Limited, both the cooperative and the Nang Rong pounded unripe rice producer group have undergone development and training. This includes surveying rice plots with farmer members of the rice growing group to plan paddy planting and create a local resource database. There was also a meeting on rice price determination mechanisms involving farmers from the rice growing group, Khu Mueang Agricultural Cooperative Limited, and representatives of the rice producer group. Additionally, forums were organized to analyze rice pricing with farmers and to develop a new value chain management system for rice farmers in Khu Mueang District. Farmers received training on recording cultivation data, organic rice cultivation, and understanding the costs of rice cultivation. The team also conducted surveys in the area to assess rice planting plots of the Lao Taek variety and identify any issues.

Figure 3.
A meeting to jointly determine rice prices and a forum for analyzing the jointly determined rice prices by three parties.

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Aspect 2: Regarding calculation of rice cultivation costs, it was found that the average total production cost is 4,310 baht per rai. This includes variable costs such as raw material costs (rice seed costs) averaging 375 baht per rai, direct labor costs averaging 870 baht per rai, and fixed costs including machinery depreciation, maintenance costs, and local maintenance taxes averaging 2,725 baht per rai. Analysis of the average cost of rice cultivation per rai for farmers reveals that the costs consist of two main parts: variable costs accounting for 36.77% and fixed costs accounting for 63.23%.

Aspect 3: Regarding the inspection of rice seed quality (sticky rice) including varieties such as Lao Taek, Hom Thung, KorKhor6, or other varieties demanded by the Nang Rong pounded unripe rice producer group, Khu Mueang Agricultural Cooperative Limited will assign personnel to coordinate the planning of paddy cultivation according to the regular production cycle (May to September). This includes transferring paddy production techniques, managing rice produce, and transferring rice cultivation technology to farmers in the Khu Mueang District area. Activities are also aimed at fostering collaboration with network agencies. The conditions for controlling the quality of paddy seeds include: 1) The rice should not be excessively yellow, and there should be no black or red seeds. 2) It should not be rice that has been soaked in water. 3) The moisture content should not exceed 14%. 4) The mixture should contain no more than 1% rice, and no white rice grains should be included. And 5) the rice should not have a stale smell and should not float above water after soaking. Additionally, there is an analysis of the mechanism for establishing rice prices that are acceptable and fair to all three parties (the rice grower group, Khu Mueang Agricultural Cooperative Ltd., and the pounded unripe rice producer group).

Figure 4.
A practical forum for developing a new value chain management system for sticky rice farmers.

Aspect 4: Regarding price mechanism for purchasing and selling rice, Khu Mueang Agricultural Cooperative Limited, the Nang Rong pounded unripe rice producer group, and rice farmer members will agree on conditions to ensure fairness: 1) The Nang Rong pounded unripe rice producer group will purchase rice through Khu Mueang Agricultural Cooperative Limited based on the average market price plus an additional 2 baht. The rice purchased must meet the quality criteria specified by the Nang Rong pounded unripe rice producer group. 2) Rice farmer members are required to produce both in-season and off-season rice for sale to the Nang Rong pounded unripe rice producer group. And 3) in case of any issues or discrepancies in buying and selling rice, all three parties agree to negotiate together to find solutions. In monitoring the project outcomes, the research team convened a consultation meeting with relevant network partners in the area to finalize a memorandum of cooperation on spatial project development. The project "Management of a New Value Chain for Sticky Rice Farmers in the Nang Rong Pounded Unripe Rice Business" forms part of the activities, engaging seven agencies and three communities to support and drive integration and development of the new value chain for sticky rice farmers to support the Nang Rong pounded unripe rice business in Buriram Province. The research project's outcomes, as summarized in the 12-month evaluation table (sub-project 1), have successfully

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met the objectives of enhancing the capabilities and capacities of local sticky rice enterprises across all five groups. Moreover, there has been a 13.12% increase in product value per group per month, surpassing the targeted goal of 10%, leading to a 5.61% income increase in the target communities.

6. Discussion

The research findings indicated that farmers in the area were reluctant to grow rice due to rising production costs and labor issues, which have led to a decrease in rice cultivation. The project's management strategy aims to address these challenges by implementing a mechanism to reduce production costs. This includes integrating new links into the system, where Khu Mueang Agricultural Cooperative Limited acts as an intermediary in purchasing paddy and supplying it to the Nang Rong pounded unripe rice producer group. This initiative is expected to lower production costs and alleviate transportation expenses, thereby serving as a guideline for resolving project issues. An important addition to the system is the involvement of Khu Mueang Agricultural Cooperative Limited, overseeing five farmer groups comprising a total of 192 farmers cultivating an in-season rice farming area of 1,500 rai. Some farmers have voluntarily transitioned to cultivating the KorKhor. 6 rice variety to meet the demands of the five rice production groups, totaling 193 rai. It is anticipated that during the May-November 2021 production cycle, these efforts will yield approximately 99.4 tons of rice, sufficient to fulfill the orders totaling 82.7 tons from the rice production groups. Khu Mueang Agricultural Cooperative Limited plays a crucial role as the primary link in the new value chain of the Nang Rong pounded unripe rice business by ensuring fair purchase of paddy from farmers. The cooperative operates as a central entity overseeing the equitable purchase of paddy from its member farmers through a mechanism for setting purchase and sale prices negotiated in tripartite meetings with the pounded unripe rice production group. This approach aims to establish fair pricing that satisfies both farmers and the pounded unripe rice producer group. This initiative aligns with the findings of Thitima Booranawong et.al. (2023), who identified six approaches to managing the fish value chain in Nakhon Si Thammarat Province. One of these approaches involves adding intermediaries who gather raw materials to ensure sufficient fish supply for production demands. This strategy enhances product quality and competitiveness for community enterprises engaged in net fish farming, thereby increasing their income share and product value. The approach also aligns with the research of Sriprai Sakunphun et.al. (2022, who investigated the supply chain management model for coffee crops in agroforestry systems. Their study emphasized the use of integration to collect coffee cherry beans efficiently, meeting quantity requirements and enhancing the production process of coffee beans or roasted coffee beans for direct sale to consumers or through retail and wholesale channels under the group's brand. This strategy aims to reduce production costs and increase product prices. By collaborating, producers can collectively market Thai highland coffee products, thereby improving their ability to negotiate prices and enhancing their bargaining power with suppliers of production factors. The approach is also consistent with the research of Thumnong Chidchob et.al. (2014), who developed a supply chain model for organic jasmine rice in Thailand. Their study concluded that the mill serves as a pivotal link for farmers, facilitating the flow of information from consumers to farmers and enabling production planning among sticky rice growers. It emphasizes coordination in procurement and fairness in trade practices. Regarding the cost of rice cultivation in 2021, the study found that the actual cost before transitioning to organic methods was 3,430 baht per rai for farmers across all 5 entrepreneur groups. Additionally, the selling price of sticky rice in 2021 was calculated at 11,000 baht per ton. Such production and harvest issues align with the findings of Saknarin Kaenkla (2016), who researched the value chain of organic rice products in Mae Taeng District, Chiang Mai Province. Their research underscores the importance of government support in providing knowledge and promoting adherence to organic farming standards among agricultural groups. It is also consistent with the research by Yuttakorn Ritthaisong et.al. (2018), who conducted a study on enhancing the efficiency of the Thung Samrit jasmine rice supply chain to bolster the competitiveness of the Phimai Agricultural Cooperative in Phimai District, Nakhon Ratchasima

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Province. The study identified significant factors influencing supply chain efficiency, including information management, inventory management, transportation management, and facility management. Specifically, the research highlighted that information management positively correlates with inventory management, transportation management, and facility management with statistical significance at the 0.05 level. In addition, findings from in-depth interviews highlighted guidelines for enhancing the efficiency of the Thung Samrit Jasmine rice supply chain for the cooperative, including: 1) maintaining consistent rice quality; and 2) implementing a flexible pricing strategy based on quality. These initiatives align with the operational outcomes of this project. In other words, a memorandum of cooperation has been drafted for spatial development within the project, with multiple seven agencies and three communities actively supporting and promoting the integration and development of a new value chain for farmers involved in growing sticky rice for the Nang Rong pounded unripe rice business in Buriram Province. The results of this research project, summarized in the evaluation table, successfully met its objectives by elevating the capabilities and competitiveness of local sticky rice-growing entrepreneurs across all five entrepreneur groups.

7. Recommendations

1. To develop the potential of rice farmers in the Khu Mueang District area, it is necessary to foster understanding and build confidence in the rice market. Providing additional knowledge about rice pricing conditions to farmers interested in transitioning to rice cultivation will encourage more farmers to grow rice for supplying the Nang Rong pounded unripe rice producer group.

2. Further research should prioritize groups of entrepreneurs who are prepared to work and make adjustments, potential areas, and local leaders and agencies ready to coordinate, to ensure swift action and achieve tangible results.

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