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Research Article

The Relationship Between Agricultural Technology and Entrepreneurial Society in Thung Kula Rong Hai, Northeastern Thailand, From the 1970s to 2000s

ความสัมพันธ์ระหว่างเทคโนโลยีการเกษตรกับสังคมผู้ประกอบการในพื้นที่ทุ่งกุลาร้องไห้ ภาคตะวันออกเฉียงเหนือของประเทศไทย ทศวรรษ 2520-2550

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Keywords: agricultural technology, entrepreneurial society, Thung Kula Rong Hai, technology as an integral part of life

คำสำคัญ: เทคโนโลยีการเกษตร, สังคมผู้ประกอบการ, ทุ่งกุลาร้องไห้, เทคโนโลยีกับการเป็นส่วนหนึ่งของชีวิต

Abstract

Background and Objectives: The previous studies on rural entrepreneurship issues have focused on two key aspects. First, the transformation from peasants to entrepreneurs underlined by peasants' economic mobility and the formation of their collective political consciousness. Second, the use of agricultural technology to enhance production efficiency and its primary use in business. However, these studies tend to overlook the socio-cultural dimensions of entrepreneurial groups that have emerged as a result of economic transformation. By explaining through the roles of other elements in order to deepen the understanding of the phenomenon of rural entrepreneurship. The objectives of the study are 1) to examine the emergence and the characteristics of the entrepreneurs in Thung Kula Rong Hai, Northeastern Thailand, from the 1970s to 2000s; and 2) to examine the relationship between agricultural technology and entrepreneurial society in Thung Kula Rong Hai, Northeastern Thailand, from the 1970s to 2000s.

Methods: This study employed a historical approach and presents the findings in an analytical description format. Data were collected between April 2023 and May 2024 through in-depth interviews and focus groups with agricultural technology entrepreneurs. These entrepreneurs operate businesses providing plowing and rice-harvesting services using tractors, large tractors, and rice combine harvesters, which are the most commonly used machines. There were 22 interviewees in total, divided into 3 groups according to age as follows: 1) entrepreneurs aged 35–45 years, 5 interviewees; 2) entrepreneurs aged 45–55 years, 8 interviewees; and 3) entrepreneurs aged 55–65 years, 9 interviewees. The interviews in each group provided different information, such as the origins of entrepreneurs, group formation and networking, finding employment, competition in the rice farming employment business, engine maintenance, and beliefs. The reason for choosing Community A, Kaset Wisai District, Roi Et province since entrepreneurs were able to form groups in the first place in the Northeast and then expand their rice farming businesses to other regions of Thailand, in terms of the study time frame between the 1970s and 2000s, which was the starting point of the emergence of entrepreneurs, group formation and networking, and the emergence of relationships between technology and entrepreneurs in many dimensions.

Results: The study results found that in the 1970s, the government began to encourage villagers to grow Thung Kula Rong Hai jasmine rice instead of local rice varieties. As a result, in the 1990s, agricultural technology spread to Community A. The villagers preferred using tractors and harvesters in large numbers, leading to a change in production methods from human labor to machines, which increased efficiency, reduced costs, and shortened production times. These villagers saw that these technologies were effective for rice farming, so they started offering rice farming services using machinery, which led to the formation of entrepreneurs. Later, in the 1990s–2000s, the economic networks of these entrepreneurs expanded to the Thung Kula Rong Hai area and other regions. These economic networks were linked to other related economic networks, such as repair shops that repaired, modified, and created innovations. In addition, tractors and harvesters became the symbols of modernity, representing entrepreneurs in various aspects, and were integrated into their lives and beliefs.

Application of this study: The use of agricultural technology in the Thung Kula Rong Hai area plays an important role in the economic development of the region because it demonstrates the ability to expand a variety of related business networks. Therefore, the development of the government's rural agricultural policy should aim to develop agricultural technology entrepreneurs in a comprehensive manner, starting from entrepreneurship creation, support in terms of knowledge, technology, capital, and marketing, along with creating a business ecosystem that is interconnected as a guideline for effectively developing entrepreneur groups in the rural sector.

Conclusions: Agricultural technology plays a crucial role in driving the economy and fostering the emergence of tractor and rice harvester entrepreneurs in Community A. This business reflects that they have skills, experiences, abilities to identify opportunities, bear risks, and build networks, etc. Furthermore, the role of agricultural technology is not limited to functioning as mere production machinery; it also contributes to the creation of diverse networks, including rice farming services and vehicle repair businesses. Additionally, it is evident that entrepreneurs have integrated tractors and harvesters into their family relationship systems, while also performing rituals based on local beliefs. These rituals include worshiping the guardian spirits of the sky and the earth, as well as the spirits residing in the tractors and the harvesters, before embarking on their work.

บทคัดย่อ

ที่มาและวัตถุประสงค์: การศึกษาประเด็นสังคมผู้ประกอบการในชนบทที่ผ่านมา มุ่งเน้นการอธิบายในสองประเด็นสำคัญ คือการเปลี่ยนแปลงจากชาวนาไปสู่การเป็นผู้ประกอบการโดยอธิบายถึงการเปลี่ยนแปลงเศรษฐกิจของชาวนาที่นำไปสู่การยกระดับสถานะทางเศรษฐกิจจนมีสำนึกทางการเมืองร่วมกัน อีกประเด็นคือการศึกษาการใช้เทคโนโลยีการเกษตรในการเพิ่มประสิทธิภาพการผลิตและการใช้ในเชิงธุรกิจเป็นหลัก แต่การศึกษาเหล่านี้ยังมิได้อธิบายครอบคลุมไปถึงมิติสังคมและวัฒนธรรมของกลุ่มผู้ประกอบการที่ได้ก่อตัวขึ้นมาจากจากความเปลี่ยนแปลงทางเศรษฐกิจ ด้วยการอธิบายโดยใช้บทบาทของสิ่งอื่น เพื่อนำไปสู่การทำความเข้าใจต่อปรากฏการณ์ของสังคมผู้ประกอบการในชนบท งานศึกษานี้จึงมีวัตถุประสงค์คือ 1) เพื่อศึกษากำเนิดและคุณลักษณะของผู้ประกอบการในพื้นที่ทุ่งกุลาร้องไห้ ภาคตะวันออกเฉียงเหนือของประเทศไทย ทศวรรษ 2520-2550 และ 2) เพื่อศึกษาความสัมพันธ์ระหว่างเทคโนโลยีการเกษตรกับสังคมผู้ประกอบการในพื้นที่ทุ่งกุลาร้องไห้ ภาคตะวันออกเฉียงเหนือของประเทศไทย ทศวรรษ 2520-2550
วิธีการศึกษา: การศึกษานี้ใช้แนวพินิจทางประวัติศาสตร์และเสนอในรูปแบบพรรณนาวิเคราะห์ด้วยการศึกษาและเก็บข้อมูลในพื้นที่ระหว่างเดือนเมษายน พ.ศ. 2566 ถึงเดือนพฤษภาคม พ.ศ. 2567 ผ่านการสัมภาษณ์เชิงลึกและการสนทนากลุ่มผู้ประกอบการเทคโนโลยีการเกษตรที่ทำธุรกิจรับจ้างไถนาและรับจ้างเกี่ยวข้าวโดยการใช้รถแทรกเตอร์ (หรือรถไถนาใหญ่) กับรถเกี่ยวข้าวซึ่งเป็นเครื่องจักรฯ ที่นิยมใช้กันมากที่สุดโดย จำนวนผู้สัมภาษณ์มีทั้งหมด 22 ท่าน แบ่งการสัมภาษณ์ออกเป็น 3 กลุ่มกำหนดตามอายุได้ ดังนี้ 1) กลุ่มผู้ประกอบการอายุระหว่าง 35-45 ปี สัมภาษณ์จำนวน 5 ท่าน 2) กลุ่มผู้ประกอบการอายุระหว่าง 45-55 ปี สัมภาษณ์จำนวน 8 ท่าน และ 3) กลุ่มผู้ประกอบการอายุระหว่าง 55-65 ปี สัมภาษณ์ 9 ท่าน การสัมภาษณ์ในแต่ละกลุ่มทำให้ได้ข้อมูลที่แตกต่างออกไป ตั้งแต่เรื่องของการเกิดผู้ประกอบการ การรวมกลุ่มและการสร้างเครือข่าย การหางานรับจ้าง การแข่งขันทางธุรกิจรับจ้างทำนา การดูแลรักษาเครื่องยนต์ ความเชื่อ เป็นต้น เหตุผลในการเลือกพื้นที่ชุมชน A อำเภอเกษตรวิสัย จังหวัดร้อยเอ็ด เนื่องจากผู้ประกอบการสามารถรวมกลุ่มกันเป็นกลุ่มแรก ๆ ของภาคตะวันออกเฉียงเหนือแล้วขยายธุรกิจรับจ้างทำนาออกไปภูมิภาคอื่น ๆ ของประเทศไทย ในด้านขอบเขตเวลาศึกษาระหว่างทศวรรษ 2520-2550 อันเป็นจุดเริ่มต้นการกำเนิดผู้ประกอบการ การรวมกลุ่มและการสร้างเครือข่าย และเกิดความสัมพันธ์ระหว่างเทคโนโลยีกับผู้ประกอบการในหลายมิติขึ้นมา
ผลการศึกษา: ผลการศึกษาพบว่าทศวรรษ 2520 รัฐบาลเริ่มส่งเสริมให้ชาวบ้านหันมาปลูกข้าวหอมมะลิทุ่งกุลาร้องไห้แทนพันธุ์ข้าวพื้นเมือง ส่งผลให้ช่วงทศวรรษ 2530 เกิดการแพร่กระจายของเทคโนโลยีการเกษตรเข้าไปยังชุมชน A โดยชาวบ้านนิยมใช้รถแทรกเตอร์ (ชาวบ้านเรียกว่ารถไถใหญ่) และรถเกี่ยวข้าวจำนวนมาก ทำให้เกิดการเปลี่ยนแปลงวิถีผลิตจากแรงงานคนไปสู่การใช้เครื่องจักรฯ ที่เพิ่มประสิทธิภาพ ลดต้นทุน และย่นระยะเวลาในการผลิตแทน ชาวบ้านเห็นว่าเทคโนโลยีเหล่านี้มีประสิทธิภาพต่อการทำนาจึงนำไปรับจ้างไถนาและเกี่ยวข้าว และนำไปสู่การก่อตัวของผู้ประกอบการขึ้นมา ต่อมาช่วงทศวรรษ 2540-2550 มีการขยายเครือข่ายเศรษฐกิจของผู้ประกอบการเหล่านี้ออกไปในเขตทุ่งกุลาร้องไห้และภูมิภาคอื่น ๆ ในวงกว้าง เครือข่ายเศรษฐกิจเหล่านี้ได้เชื่อมโยงไปสู่เครือข่ายเศรษฐกิจอื่นที่เกี่ยวข้อง คือ อู่ซ่อมที่มีการซ่อมแซม ดัดแปลงและทำให้เกิดนวัตกรรมใหม่ นอกจากนี้รถแทรกเตอร์และรถเกี่ยวข้าวยังกลายมาเป็นสัญลักษณ์ของความทันสมัยซึ่งเป็นตัวแทนของผู้ประกอบการในแง่มุมต่าง ๆ พร้อมกับการถูกผนวกเป็นส่วนหนึ่งของชีวิตและความเชื่ออีกด้วย
การประยุกต์ใช้: การใช้เทคโนโลยีทางการเกษตรในพื้นที่ทุ่งกุลาร้องไห้มีบทบาทสำคัญในการพัฒนาเศรษฐกิจของภูมิภาค เพราะแสดงให้เห็นถึงความสามารถในการขยายเครือข่ายธุรกิจที่เกี่ยวข้องอย่างหลากหลาย ดังนั้นการพัฒนาภาคเกษตรในชนบทของรัฐบาล ควรมุ่งเป้าพัฒนาผู้ประกอบการเทคโนโลยีการเกษตรอย่างครบวงจรตั้งแต่การสร้างผู้ประกอบการ สนับสนุนด้านความรู้ เทคโนโลยี เงินทุน และการตลาด พร้อมกับการสร้างระบบนิเวศทางธุรกิจที่เชื่อมโยงกันเพื่อเป็นแนวทางในการพัฒนากลุ่มผู้ประกอบการในภาคชนบทได้อย่างมีประสิทธิภาพ
บทสรุป: เทคโนโลยีการเกษตรมีบทบาทสำคัญในการขับเคลื่อนเศรษฐกิจและทำให้เกิดการก่อตัวของผู้ประกอบการรถไถนาและรถเกี่ยวข้าวในชุมชน A การทำธุรกิจนี้สะท้อนให้เห็นว่าพวกเขาเป็นผู้มีทักษะ ประสบการณ์ เล็งเห็นโอกาส แบกรับความเสี่ยง และสร้างเครือข่าย ฯลฯ นอกจากนี้บทบาทของเทคโนโลยีการเกษตรมิได้มีสถานะเป็นเพียงเครื่องจักรที่ทำงานผลิตเพียงอย่างเดียว แต่เชื่อมโยงให้เกิดการสร้างเครือข่ายที่หลากหลาย คือ ธุรกิจรับจ้างทำนา ธุรกิจอู่ซ่อมรถ นอกจากนี้ยังปรากฏว่าผู้ประกอบการได้นำรถไถนาและรถเกี่ยวเข้ามาเป็นส่วนหนึ่งของระบบความสัมพันธ์ภายในครัวเรือน พร้อมทั้งมีการปฏิบัติพิธีกรรมตามความเชื่อท้องถิ่น โดยเฉพาะการทำพิธีไหว้ผีผู้คุ้มครองประจำท้องฟ้าและแผ่นดิน ตลอดจนวิญญาณที่สถิตอยู่ในรถไถนาและรถเกี่ยวก่อนเริ่มต้นออกไปรับจ้าง

Introduction

Since 1977, agricultural technology has played a significant role in Thai farming, from land preparation and cultivation to harvesting. This transformation stems from the ability of agricultural technology in substituting human labor, which has diminished due to rural out-migration into urban areas. Moreover, agricultural technology shortens production time, increases yields and maximizes profits ensuring cost-effectiveness. The development of agricultural technology has undergone continuous transformation and has long been intertwined with agricultural practices. While agricultural technology had begun to be introduced in the 1950s, its system remained predominantly dependent on human and animal labor. During the government of Field Marshal Plaek Phibunsongkhram, national development policies encouraged peasants to shift from subsistence agriculture to commercial production. The 1960s marked the beginning of agricultural modernization driven by national economic development plans and international cooperation in agricultural development. This era saw the introduction of modern agricultural technologies, such as tractors and combine harvesters, which initiated a shift in farming practices. By the 1980s, the Thai government had begun encouraging rural communities to grow cash crops for export. This policy shift led to the importation of agricultural machinery and equipment. Simultaneously, local innovations in agricultural machinery emerged, including the modification of drive systems, the development of implement attachments, and the enhancement of engine power. In the 1990s, agricultural production became increasingly intensified. Rural farmers switched from diversified cropping systems to monoculture cash crop farming. The production system became exclusively market-oriented, which in turn generated a growing demand for intensive use of agricultural machinery. By the 2000s, the efficiency of agricultural technology had become evident in its ability to reduce production costs and shorten cultivation time. The intensification of agricultural production also led to the emergence of farm-related businesses, giving rise to what became known as farm entrepreneurs. As a result, the role of agricultural technology intensified even further, leading to the emergence of agricultural technology entrepreneurs—particularly plowing and harvesting service providers—who have since developed increasingly complex and expansive networks since 2010.

1. Rethinking the Relationship Between Agricultural Technology and Rural Change

The studies that explain the relationship between agricultural technology and changes in Thai rural populations, such as villagers, farmers, and entrepreneurs, can be categorized into three groups. The first group examines economic changes, highlighting the role of agricultural technology as part of commercial production. The second group studies and experiments to create agricultural innovations and use agricultural technology that is appropriate for specific areas. The third group focuses on agricultural technology entrepreneurs, considering them primarily through the lenses of economics, business management, and marketing principles.

The first group focuses on the economic history of rural areas, highlighting how the state encouraged farmers to engage in commercial agriculture in response to market mechanisms. Farmers adapted by shifting to cash crop cultivation, which in turn led to deforestation as they expanded farmland into forested areas. Various forms of agricultural technology were utilized, including tractors—be it large four-wheel tractors or two-wheel walking tractors—weed killers, chemical fertilizers, water pumps, and combine harvesters. One of the key studies that explains the causes and factors underlying the significant role of agricultural technology between the 1930s and 1990s is that of Theerasasawat (2003), who conducted research in the Songkhram, Chi, and Mun River basins in Northeastern Thailand. In addition to Theerasasawat's work, other important contributions include studies by Theerasasawat & Srisantisuk (1986), Mungmeesuk

(1990), Deesuankok & Theerasasawat (1990), and Kaewsong & Theerasasawat (1995). According to these studies, it was found that technology exerted considerable influence on local farming practices. However, reliance on these technologies placed villagers in debt and weakened their bargaining power in relation to capitalists. Although the studies in this group demonstrate that agricultural technology plays an important role in commercial agriculture, they have yet to explore how the use of agricultural technology impacts the social and cultural dimensions of the agricultural production practices in rural areas.

The second group, primarily conducted by agricultural engineers and researchers in science and technology fields, tends to emphasize the practical application of agricultural technologies for large-scale farming. This focus has led to the adaptation and innovation of agricultural machinery and techniques. Examples include studies such as the report on the study of the agricultural machinery system to increase production efficiency and increase the quality of jasmine rice in Thung Kula Rong Hai (Chinsuwan, 2001), the adoption on jasmine rice production technology with good agricultural practices of farmers in Thung Kula Rong Hai, Roi-Et province (Paowsrakoo & Wongsamun, 2018), and the study of influence of position of heater installation on temperature distribution inside dryer chamber of Thai made rice combine harvester using computational fluid dynamics (Bunyawanichkul & Naphon, 2012). There are also studies on the use of appropriate technology, including those examining the market mechanisms of agricultural machinery and their impact on farmers in rural areas, such as the study on appropriate technology for rural development (Prempree & Limpiyakorn, 1982), or research on the role of the private sector in developing agricultural technology and rural communities (Wongkiattirat, 1991). However, while this explanation highlights innovations and the appropriate use of technology, it lacks an analysis of the complex network of economic and social relationships between agricultural technology, farmers, and rural communities. These relationships go beyond the use of technology alone, reflecting multiple dimensions that need further exploration.

The third group of studies explores the relationship between agricultural technology and rice harvesting service enterprises. One such study is Muangngam (2012), which proposes that rice harvesting service businesses can be divided into two main types: local services, which rely on informal networks and familiarity to secure work, and external services, which typically depend on brokers to arrange jobs. This aligns with the study by Nuntajit (2016), which suggests that rice harvesting services in the Central Region rely primarily on direct personal networks, while operations in the Northeastern Region depend on brokers to secure work. However, the study also highlights that a major risk associated with investing in this business is drought. In addition, some studies have examined rice combine harvester entrepreneurship through the lens of business administration and economics, particularly focusing on market-related principles such as supply and demand, market competition, and consumer behavior. A study by Angsumalin & Kornyuenyong (2017) highlights that entrepreneurs in this sector are largely sales-driven, emphasizing competitive strategies based on service management and punctuality in meeting customer expectations—characteristics associated with generic products. Thus, the analysis of rice harvesting entrepreneurs using business management principles related to marketing, job acquisition, network building, and wage determination tends to focus merely on the business dimension at the expense of social dimension. Hence, a well-rounded exploration seeing the connection between business and social aspects is needed.

From the study of the role of agricultural technology in the mentioned three groups, the following conclusions can be drawn. The first group highlights the potential of agricultural technology, such as tractors and rice harvesters, in reducing production costs compared to animal labor, increasing yields, and shortening production time. The second group, the agricultural engineering and technology group, studies the improvement of machinery and production techniques to

develop large-scale agricultural innovations, along with analyzing factors of access to technology and market mechanisms that affect agriculturalists. The third group focuses on the emergence of entrepreneurs in the rice harvesting and plowing services, using business management principles. However, the role of agricultural technology is not limited to the frameworks presented by these three groups. The use of technologies such as tractors and rice harvesters has expanded into rural agricultural areas, leading to the formation of tractor and rice harvester operator groups. Recognizing these opportunities has led to the creation of new ideas and approaches to production for income through plowing and harvesting services, resulting in the establishment of a wide network of businesses. Additionally, there has been innovation in adapting agricultural technologies to better suit local needs, ultimately transforming these individuals into entrepreneurs. Hence, it is necessary to explore the relationship between technology and the transformation of peasants into agricultural technology entrepreneurs.

2. Paradigms in Studying Agricultural Technology Entrepreneurs

This study will explain the phenomenon of agricultural technology entrepreneurs in rice harvesting and plowing as an alternative perspective to the previously discussed rural entrepreneurs, such as farmers, small-scale farmers, and those with moderate incomes. For the study and definition of the term entrepreneur, the following key understandings can be summarized.

Firstly, in the dimension of innovation and change, Schumpeter (1983) proposed a fundamental concept that an entrepreneur is an agent of economic change, acting as a disruptor of the existing equilibrium (creative destruction) by introducing new products, production processes, markets, raw materials, and organizational systems. This interpretation highlights the proactive role of entrepreneurs as creators of change, rather than merely responding to market conditions. Secondly, in the dimension of risk management, Casson and Casson (2013) emphasized the practical traits of entrepreneurs, highlighting three essential skills: (1) the ability to create and maintain social networks for business benefits, (2) an integrated risk management system covering both financial and operational aspects, and (3) the ability to control emotions in crisis situations. This reflects that true entrepreneurs are not just risk-takers, but individuals who can assess and manage risks systematically. At the same time, Westhead and Wright (2013) proposed an important perspective that entrepreneurship does not necessarily begin with invention, but can arise from applying existing ideas in new ways or improving existing processes to increase efficiency, which is referred to as innovation. Thirdly, the meaning of entrepreneurship is also defined through “space,” reflecting that entrepreneurs in urban areas often rely on creativity and the initiation of businesses, supported by social networks to get their ventures started. However, the benefits are limited because urban economies tend to prioritize efficiency over personal relationships. In contrast, rural entrepreneurs rely on social networks, particularly using community relationships and kinship systems to build their networks. They are characterized by their ability to recognize opportunities based on the local resources in rural areas, which they then utilize to create and implement new innovations (Freire-Gibb & Nielsen, 2014). Referring to these definitions, rural entrepreneurs are defined as innovative-minded and business-oriented persons in this work. Furthermore, the emergence of entrepreneurs in rural areas are specifically examined by focusing on the role of agricultural technology in relation to the entrepreneurial community in Village A, located in the Thung Kula Rong Hai region. The area spans the provinces of Roi Et, Yasothon, Surin, Mahasarakham, and Sisaket, and is known for its reputation as one of the dry and barren areas in Thailand. As a result, the government has implemented intensive development policies since the 1950s. This has led to changes in production methods in Community A, in Ku Ka Sing subdistrict, Kaset Wisai district, Roi Et province, where

there has been a shift from using human and animal labor to adopting agricultural technologies, resulting in the emergence of agricultural technology entrepreneurs.

Meanwhile, studies on economic transformation in rural areas have described the shifting dynamics of peasant groups who operate within the informal economy. These groups have increasingly been referred to by new labels such as farmers, smallholders, middle-income peasants, and entrepreneurs. These new statuses have enabled them to negotiate political power in new ways. Jonathan Rigg's *More than Rural: Textures of Thailand's Agrarian Transformation* (2019), Andrew Walker's *Political Peasants: Power in the Modern Rural Economy* (2016), and Attachak Sattayanuruk's (2016) study on rural entrepreneurship argues that economic changes have transformed traditional peasants into rural entrepreneurs. In summary, studies on rural economic transformation tend to conclude that peasants have experienced upward economic mobility, which in turn has fostered a sense of political consciousness. Although the explanations in these works highlight the social and cultural dimensions, they tend to provide an overview that does not distinguish between villagers and entrepreneurs. Therefore, this article aims to present the unique social and cultural characteristics of agricultural technology entrepreneurs.

Additionally, the explanation regarding the role of agricultural technology in rural areas lacks an analysis of how this role leads to the emergence of entrepreneurial groups and new beliefs that establish connections between human society and non-human entities. Such a study falls within the field of Science and Technology Studies (STS), which examines the relationships between science, technology, and society, particularly the impacts that science and technology have on social development and change. This perspective views science and technology not merely as scientific discoveries or technical tools but as important elements in shaping and defining societal values and beliefs. This concept is known as vibrant matter, where matter is not only considered as inanimate substance but also possesses agency and potential for action, playing a significant role in shaping human life. Moreover, the relationship between objects, nature, culture, politics, and ethics is complex and intricately interconnected, making it impossible to separate them definitively (Bennett, 2010). This perspective on objects helps recognize the role of non-human entities in shaping human actions and societal changes as a whole.[1]

Conceptual Framework

This study uses an economic history approach and an entrepreneurial framework to explain the economic changes experienced by agricultural technology entrepreneurs in the Community A. These people identified new economic opportunities and used them as a means to seek work, eventually establishing themselves as entrepreneurs. They became a group capable of systematically managing and bearing risks, creating economic networks by utilizing informal relationships. Their networks expanded beyond the community, forming a broad and extensive network. Additionally, the concept of the interconnectedness between objects, nature, culture, politics, and ethics is used to explain the role of agricultural technology, which serves as a determinant for entrepreneurs to form relationships within the community of tractor repair shops. This network is focused on creating or adapting the equipment for tractors and rice harvesters to suit their work needs. The study also connects beliefs and the sacred, incorporating them into agricultural technology, highlighting the complex and intertwined relationships between these elements.

[1] For a pioneering application of this view to the Thai case, see Sangkhamanee (2024), where science and technology studies are discussed in the book Anthropology in Perspectives: 40 Contemporary Concepts.

Research Results

1. Agricultural Transformation in Thung Kula Rong Hai and the Emergence of Agricultural Technology Entrepreneurs

1.1 Thai Government and Thung Kula Rong Hai Development Project

The development of Thung Kula Rong Hai became more evident during the 1960s, when the Ministry of Agriculture and Cooperatives (1979). conducted a land survey and found that the soil was infertile (classified as Low Humic Grey) and poorly drained, with a sandy loam texture. These soil conditions were identified as key factors preventing the cultivation of high-quality crops. In the 1980s, the Thai government sought assistance from the Australian government through the Thai–Australia Tung Kula Rong Hai Project. The project involved multiple agencies, including the Department of Agriculture, the Land Development Department, and the Rice Research Institute (Chulalongkorn University & National Economic and Social Development Board, 1981 : 11-12). Subsequently, the name “Thung Kula Rong Hai” appeared in Thailand’s Fourth and Fifth National Economic and Social Development Plans, which designated the area as one requiring urgent development due to its status as a backward agricultural zone and its degraded natural resources, with the goal of increasing production efficiency (Office of the National Economic and Social Development Board, 1982 : 149). Subsequent efforts focused on addressing soil salinity and developing salt-tolerant rice varieties, particularly “Khao Hom Mali 105” and “Khao Kor Khor 15,” collectively known as Thung Kula Rong Hai Thai Hom Mali Rice (TKR). These varieties were selected as new strains to replace traditional local rice cultivars. This development occurred alongside road construction projects to improve access to rice fields and facilitate transportation. The project was divided into three major components. The first involved expanding and elevating main roads to block the inflow of floodwaters, with key areas of implementation including Kaset Wisai district, Suwannaphum district, and Phon Sai subdistrict in Roi Et. The estimated cost of machinery, operations, and construction totaled 102 million baht (Ministry of Agriculture and Cooperatives, 1979 : 56). The second component entailed the construction of smaller roads connecting rice fields to main roads to allow for crop transport. The third involved land improvement efforts, including the construction of dikes and drainage crossings to control water within paddy fields. This project was a collaboration between the Ministry of Agriculture and Cooperatives and the Land Development Department, with clearly stated objectives: “to improve the land and design infrastructure with consideration for the future transformation of agriculture through water regulation and improvement” (Kanchanakul & Sutathorn, 1984 : 20-21).

Community A, located in Ku Ka Sing, Kaset Wisai, Roi Et, forms part of the Thung Kula Rong Hai region. The settlement of this community can be traced back to before World War II and may be divided into three historical phases. The first phase involved migration under the leadership of local rulers in search of new areas for subsistence. The second phase—referred to by villagers as the *“sao ha na”* era, or the era of searching for farmland (primarily paddy fields)—was marked by a widespread movement to convert forested areas into rice-growing land. The third phase began when the Agricultural Land Reform Office (ALRO) officially designated land reform zones, allowing landless villagers to claim agricultural plots. This prompted another wave of in-migration and a significant increase in population. In terms of rice production, labor was primarily organized through kinship networks. Family members and relatives regularly assisted one another throughout the rice cultivation cycle—from sowing and transplanting to harvesting and storing rice in communal granaries. This kin-based labor system was closely tied to the selection of traditional rice varieties, chosen according to their maturity periods. Medium-duration varieties, typically harvested between October and November, included Nang Nuan, Kab Yang, and Setthi. Short-duration varieties, harvested between September and October, included Dor, Plong-

Aew, Bak Muae, and Pla Kheng. These staggered harvest periods enabled the rotation of labor between households, fostering mutual support through the customary practice of *long-kaek* (reciprocal labor-sharing).

1.2 The Advent of Agricultural Technology

In the 1980s, villagers began to show increasing interest in cultivating a new rice variety—Thung Kula Rong Hai Thai Hom Mali Rice. This led to the expansion of agricultural technology into the community. During this period, agricultural technological tools were gradually integrated alongside animal and human labor. Most of the tools were used primarily for land preparation. According to a report by the Department of Accelerated Rural Development on the Ku Ka Sing Subdistrict Community Development Zone, Kaset Wisai, Roi Et, the inventory of labor and tools used in rice cultivation included 1,634 buffaloes, 1,134 cattle, 14 four-wheel tractors, 154 privately owned water pumps, 2 group-owned water pumps, 1,423 wooden plows, and 956 harrows (NAT. (8) M.TH. 5.4.1.45/47, 1981). During the same period, tractors from the Central Region were hired to clear forested areas, expanding land available for cultivation. In his well-known book *The People's History of Thung Kula* (Phusongchan, 2003 : 124) wrote: “Around 1963, Massey Ferguson tractors arrived in Thung Kula to provide land-clearing services. Some people broadcast rice seeds over the grasslands and applied chemical fertilizers at the same time. The area was then plowed over, and once the rains came, the rice sprouted. When crabs began eating the seedlings, they mixed cooked rice with Pholidol and scattered it. The crabs ate it and died en masse, causing the water to stink and nearly wiping them out. Thung Kula soon came alive—with lights scattered across the fields at night. Land was cleared both day and night. Before long, the entire Thung Kula Rong Hai area had been cleared.”

Between the late 1980s and early 1990s, the diffusion of agricultural technology was driven by two key conditions. First, the expansion of the industrial sector attracted labor migration to Bangkok and various industrial zones—especially among young people who aspired to modern lifestyles and the pursuit of a better life through success (Mills, 2012). Second, the cultivation of field crops and monoculture crops such as cassava, sugarcane, maize, and rice required the expansion of farmland to accommodate large-scale operations that would facilitate soil preparation, planting, and harvesting. The shift toward cultivating Thung Kula Rong Hai Hom Mali Rice[2] necessitated the adoption of tractors and combine harvesters, as these machines were more efficient in preparing large paddy fields and harvesting crops during the short ripening window known as *plubplueng* (the optimal time for harvesting). Combine harvesters, capable of harvesting 20–30 rai per day, helped address the labor shortage while ensuring timely harvesting. As a result, more than 100 combine harvesters were brought into the Thung Kula Rong Hai area from provinces such as Ayutthaya, Ang Thong, and Nakhon Pathom (Khon Kaen University & Department of Agriculture, 1995 : 15). This phenomenon led several villagers in Community A to take on new roles as brokers for plowing and harvesting services. Notable figures included P. Somsai, C. Klobrattana, S. Charoenphakdee, and M. Klobrattana. These men became widely known both within and beyond the community as “job finders” for tractor and combine harvester operators.

[2] According to reports from the Kaset Wisai District Agricultural Office in Roi Et Province, rice cultivation data from 1995 to 1998 showed that nearly all subdistricts cultivated Hom Mali rice, covering 328,367 rai—or approximately 90 percent of total rice cultivation areas—while other rice varieties accounted for 36,816 rai. The average yield of Hom Mali rice varied by subdistrict, ranging from 345 to 382 kilograms per rai. Nong Waeng subdistrict recorded the lowest yield, while Ku Ka Sing subdistrict recorded the highest. (1992 : 55-56). In the 1996–1997 cultivation year, data on Hom Mali 105 rice cultivation in the Thung Kula Rong Hai area ranked the districts as follows in terms of cultivation area: (1) Kaset Wisai district with 239,400 rai, (2) Suwannaphum district with 174,755 rai, (3) Phon Sai district with 97,514 rai, and (4) Pathum Rat district with 87,305 rai (Roi Et Provincial Agriculture Office, 1997 : 12).

1.3 Agricultural Technology and Economic Opportunity

Between 1997 and 2000, the demand for plowing and harvesting services increased significantly, while the number of tractors and combine harvesters remained insufficient to meet demand. This led to a rise in service fees. Local brokers—known as *"phu ha ngan thai-na lae kiao khao"* (those who find plowing and harvesting jobs)—in Community A recognized this as both a problem and an investment opportunity. For example, P. Somsai, who had previously worked as a broker for combine harvesters from Lam Narai district, Lopburi province, had been securing jobs for machines in the areas of Ku Ka Sing and Mueang Bua subdistricts, Kaset Wisai district, Roi Et province. With over three years of experience, he found that plowing and harvesting jobs were in high demand and generated considerable profit. Seeing the opportunity, he decided to purchase a combine harvester and became a direct service provider rather than a broker. Another case is that of M. Klobrattana, who had worked as a broker for tractor services from Phra Nakhon Si Ayutthaya province. After observing the profitability of plowing services, he encouraged his son-in-law to purchase a tractor (a Ford-brand model) to begin contracting services. He later expanded his operations into other districts such as Suwannaphum, Selaphum, and Thawat Buri in Roi Et. S. Jankaewsai noted that combine harvesters were particularly suited to harvesting Thung Kula Rong Hai Hom Mali rice, given the morphological characteristics of the variety—such as its height, tiller number, and grain count—which matched the design of the machines. This compatibility ensured rapid harvesting, reduced loss, and maintained grain quality. He stated, "The combine's mouth is very wide—it pulls in the rice stalks smoothly. Harvesting takes very little time to finish" (personal communication, August 16, 2023). Other tractor and combine harvester groups included those led by K. Trikhramdee, S. Wiangkhamkaew, and O. Chaengsanamchai. These groups provided services within the Thung Kula Rong Hai area and later expanded their operations into parts of the central and southern parts of the Northeastern region. They were among the early pioneers of contract plowing and harvesting services in the region and were instrumental in expanding service networks throughout Northeastern Thailand.

The novelty of agricultural technology generated a sense of excitement among entrepreneurs. The large size and imposing structure of tractors and combine harvesters, powered by high-torque engines and capable of moving at considerable speed, gave rise to a variety of locally coined nicknames such as *"Jao Chang Wai Fai"* (Speedy Elephant), *"Wai Fai Chom Phalang"* (Mighty Speed), *"Chang Noi Chao Phalang"* (Little Mighty Elephant), and *"Chang Noi Turbo"* (Turbo Little Elephant). These names symbolized modern technology, which made farming faster, more efficient, and less costly—ultimately increasing income and offering worthwhile returns. The perceived novelty of these machines also created new representations of tractor and harvester owners as agents of modernity who brought technological advancement into the community, transforming rice farming into a more streamlined process. Between 2003 and 2005, many villagers expressed interest in and decided to invest in tractors. A local survey of agricultural machinery usage in Community A revealed a noticeable decline in the use of two-wheeled walking tractors. By 2006–2007, there were no new purchases of walking tractors reported. Some villagers shifted their investment toward large combine harvesters for contract harvesting. In 2003, there were two large harvesters in the village; by 2004, the number had increased to five. The rising number of tractors and combine harvesters also led some villagers to invest in trailers and ten-wheel trucks to support transportation and contract farming services.

Table 1 Adapted from the Table of Changes in Agricultural Machinery Use in Community A, 1997–2007

Type of Machinery	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Two-wheeled walking tractors	36	43	35	17	15	12	7	5	2	-	-
Large tractors	17	20	10	25	22	15	30	32	20	11	-
Small tractors	8	5	7	5	2	-	2	5	3	2	8
Large combine harvesters	-	1	3	2	2	-	2	5	3	2	1
Small combine harvesters	-	-	-	-	-	-	-	-	1	-	-
Ten-wheel trucks	-	-	4	2	-	1	4	2	1	-	-
Total	61	69	59	51	41	28	45	49	30	14	9

Note**:** Data derived from a survey on the use of modern agricultural technology, based on 43 technology entrepreneurs. Some respondents owned more than one type of machinery. (**Source:** Lao-an, 2010 : 117-118)[3]

Risk assessment is an important economic activity for the owners of tractors and rice harvesters. During 1997–2002, rice prices offered by regional rice mills in Northeastern Thailand initially rose, reaching an average of approximately 8,100–8,200 baht per ton in 1997–1998. However, prices later reduced to an average of 5,400–5,600 baht per ton in 2001–2002 (Department of Internal Trade, Ministry of Commerce, 2002 : 19). Despite this drop, data from the 2001 agricultural technology usage survey shows that tractors and combine harvesters were still being purchased; six cases involved buyers who already owned tractors and decided to purchase additional ones, while five cases involved villagers who had never owned a tractor before but decided to invest. In both scenarios, the tractor owners had already assessed the risks and determined that they would be able to secure plowing jobs by expanding their service routes into off-season rice farming areas in Kalasin, Mahasarakham, and Khon Kaen provinces. They also considered the multifunctionality of tractors, including plowing, seeding, harvesting, hauling materials, forest clearing, land preparation, and tree felling. This led to the expansion of contract plowing and land-clearing services into districts such as Chiang Yuen, Wapi Pathum, and Phayakkhaphum Phisai in Maha Sarakham province. These services were available year-round depending on client demand. (S. Khamsingha, personal communication, August 16, 2023). In addition to job planning and evaluating the functions of tractors, risk assessment also involved using a booking system to identify when plowing jobs would be available and when there would be periods of inactivity. K. Kaewsingha, a tractor owner with two large units, explained:

> Before purchasing a new tractor, I planned everything in advance. The plan showed which months would be busy with plowing jobs and which months the tractors would have to rest. In my case, there was a high demand for plowing, so I decided to buy an additional tractor. But I paid off the first one before buying the second—because there was no way I could afford the installment payments on both at the same time.
>
> (K. Kaewsingha, personal communication, August 16, 2023)

[3] The average prices of agricultural machinery during 1992–1997 were as follows: 1. Two-wheeled walking tractors (manual steering system, two forward gears, one reverse gear): 16,000–17,500 baht 2. Small and large tractors: 200,000–450,000 baht 3. Small and large combine harvesters: 650,000–1,500,000 baht Adapted from “The Current Situation and Trends in the Agricultural Machinery Industry” (Nakwattananukul et al., 2011 : 3)

In summary, agricultural technology played a significant role in the expansion of tractors and combine harvesters in Community A. The first group of owners were those who had gained experience as brokers and later identified the potential for income generation, prompting them to invest in owning the machinery themselves. Subsequently, other villagers decided to follow their path by purchasing tractors and combine harvesters for two main reasons. First, they recognized the specific attributes of agricultural machinery that ensured cost-effectiveness, operational flexibility, and efficiency—particularly the speed and power of tractors and harvesters. The entrepreneur often emphasized performance qualities of the technology such as “deep tilling, powerful,” “strong torque, highly maneuverable, low maintenance,” “powerful and fast plowing,” “Massey Ferguson: a strong breed,” “durable, modern, and low maintenance,” and “efficient, fast harvesting with clean rice output.” These features enabled them to plan contract work in a systematic way, allowing them to schedule jobs and manage clients more effectively. Second, the appeal lay in the prospect of a “quick return on investment.” Given the high cost of tractors and related equipment, prospective owners needed to evaluate the investment carefully from multiple angles. They also needed to devise repayment plans that would allow them to complete installment payments within a fixed time frame—so that the profits from contracting services could be realized as quickly as possible. Such planning and decision-making reflect entrepreneurial skills—particularly the ability to assess the broader picture, anticipate risks, develop plans, and formulate problem-solving strategies. Moreover, fluctuations in rice purchase prices prompted farmers to assess risk through multiple dimensions: planning for job acquisition, evaluating machinery capabilities, and implementing systematic work management. It can be argued that the cultivation of Thung Kula Rong Hai Hom Mali rice directly contributed to the introduction of agricultural technologies—namely tractors and combine harvesters—into Community A. By the 1990s, this had clearly led to the emergence of tractor and combine harvester entrepreneurs.

2. Agricultural Technology Entrepreneurs of Thung Kula Rong Hai

The group of tractor and combine harvester entrepreneurs consisted primarily of individuals who already possessed farmland as capital and generated income through land rental and informal lending. This financial base enabled them to invest in tractors and combine harvesters, and they also had the capacity to diversify into related businesses, such as rice milling and livestock raising, thereby increasing their income opportunities. Furthermore, they were better positioned to access credit from formal financial institutions. For example, the Bank for Agriculture and Agricultural Cooperatives (BAAC), Kaset Wisai District Branch in Roi Et province, implemented an asset-to-capital conversion program. Reports show that participants in this program typically owned between 31 and 51 rai of land. The highest allocation of agricultural loans went to (1) agricultural machinery, with 73 loan contracts totaling 14,006,227 baht; (2) repair and mechanical services, with 63 contracts totaling 10,089,252 baht; and (3) machinery and electrical equipment manufacturing, with 12 contracts totaling 2,725,312 baht (Rungpanarat, 2007 : 49, 51). These financial resources enhanced their capacity to invest and expand their businesses. Many drew upon their hands-on experience in plowing and harvesting work to identify business opportunities and eventually transitioned into full-fledged entrepreneurs.

2.1 Rural Entrepreneurs and Risk Assessment

In addition to identifying opportunities and assessing the broader picture before investing in tractors and combine harvesters, agricultural technology entrepreneurs also conducted micro-level evaluations. These included estimating the total costs of purchasing the machinery, repair and maintenance expenses, hiring labor, fuel costs, meals, broker fees,

land access charges (*kha yiam na*)[4], and transportation costs. All these expenditures were weighed against anticipated income and targeted profits to determine whether the investment was worthwhile. They also evaluated the level of competition within the local labor market by surveying service prices to ensure their investment matched both the functional requirements and market context. Tractors selected by entrepreneurs typically fell into two categories. The first category emphasized the functional suitability of the machinery for local tasks. In Thung Kula Rong Hai, most tractor operators began by offering *prab na*[5] services, which refer to plowing for the purposes of surface leveling, weed control, soil refinement, and field smoothing. Given the soil characteristics—sandy loam and expansive flat terrain—plowing was relatively easy, fast, and efficient. For such conditions, entrepreneurs favored tractors with small to medium engine capacities,[6] priced between 450,000 and 750,000 baht. Another type of service area included work outside of the Thung Kula Rong Hai zone, where operators were hired to clear forested land by removing trees, shrubs, and other vegetation. They also provided plowing services in off-season rice fields (*na prang*) in provinces such as Kalasin, Maha Sarakham, Khon Kaen, and Sakon Nakhon. Due to the heavy-duty nature of these tasks, the tractors selected were typically mid-to large-horsepower models, priced between 750,000 and 1,500,000 baht. “If it’s strong torque and raw power you want, Ford tractors are the top choice,” (S. Naphiangdee, personal communication, August 16, 2023). This micro-level assessment was closely tied to the accumulation of practical experience. For example, S. Saengpha, who had been operating tractors for over five years, had developed intimate knowledge of local field conditions. He explained:

> Just one glance, and I know if the plot the landowner wants to clear is hard or easy. Then I can figure out how much to charge per rai. I have to assess how dense the bush is. If it’s thick, I have to dig up the roots too. Before I even start plowing, I need to check whether there are tree stumps or deep roots. If there are, I have to figure out how to remove or kill them. You have to look carefully. Like the *sabang na* trees—we have to dig out the roots first, then push the trunk over with the tractor. That’s a separate charge, around 450 to 550 baht per rai.
>
> (S. Saengpha, personal communication, August 16, 2023)

In the case of combine harvesters, owners typically assess three key aspects before undertaking contract work. First, they evaluate the geographic characteristics of the paddy field, including whether it is planted with main-season (*na pi*) or off-season (*na prang*) rice. *Na pi* fields are generally flat, with sandy loam soil and photoperiod-sensitive rice varieties. In contrast, *na prang* fields are located in irrigated zones, often in low-lying areas prone to flooding, and are planted with photoperiod-insensitive rice. This assessment helps determine which harvester model is best suited for the field, and whether any obstacles—such as uneven terrain, tree roots, or stumps—may be encountered. It also informs problem-solving and route planning. Second, following the geographic evaluation, owners estimate the time and speed

[4] The term *kha yiam na* refers to right-of-way fee refers to a fee paid by tractor or combine harvester operators to the landowner, or in some cases to a broker who forwards the payment to the landowner, in exchange for the right to drive tractors and combine harvesters across the land to plow and harvest another field. This fee, which ranges from 50 to 80 baht, is usually paid upon entering the field for plowing or harvesting.”

[5] In Thung Kula Rong Hai, most tractor operators began by offering prab na services—a term that refers to clearing paddy fields by removing weeds, brush, and forest overgrowth in order to prepare the land for rice cultivation.

[6] Tractors can be classified into three categories based on engine horsepower: (1) small-sized tractors with less than 40 horsepower; (2) medium-sized tractors ranging from 41 to 80 horsepower; and (3) large-sized tractors with more than 81 horsepower. (Rice Research and Development Division, Rice Department, n.d.)

required for harvesting by considering fuel prices and labor costs (if the owner does not operate the machine themselves). The goal is to ensure that operational costs align with profitability. Third, owners assess the transportation logistics—how far the combine harvester must be moved to reach the field—and the harvesting pattern to be employed. The options include (1) outer-loop harvesting, which starts at the edge of the field and spirals inward; (2) inner-loop harvesting, beginning at the center and moving outward; or (3) alternating up-and-down rows, where the machine moves in one direction and then returns in the next row. The choice of harvesting method depends on the distance from the field to accessible roads or field bunds where trucks can reach the harvester to collect rice. This cost-efficiency assessment is further linked to the evaluation of the harvester's capacity and durability. Factors such as field size, weather, rainfall, soil conditions, tree roots, and the presence of animals may increase the risk of mechanical damage. As a result, harvester owners take great care to maintain, protect, and preserve their machines to ensure long-term usability. N. Kaewsee explained while placing his hand on the front intake of the harvester during the interview:

> It's not cheap—owning one is like having a child. It's precious to me. This machine helps me earn a living. This one alone has harvested thousands of *rai* of rice. It has worked through sun and wind. I have to take good care of it so it can keep harvesting for many more years.
>
> (N. Kaewsee, personal communication, August 22, 2023)

Therefore, the willingness to bear the risks of investing in a purchase is based on market analysis and prior experience in providing plowing services. The value of the investment is guaranteed by the availability of work.

2.2 The Creation of Rural Entrepreneur Networks

It was found that entrepreneurial networks are created through kinship relationships. Group members were often selected from among relatives or friends within the same or nearby villages. These individuals were expected to possess agricultural machinery skills, a willingness to learn, a sense of responsibility, and personal trustworthiness. In plowing and harvesting groups, leadership was typically held by individuals with extensive experience, self-confidence, and a reputation for innovation, bravery, and adventurousness. One example is the group led by P. Phuseema, who was among the first to pioneer long-distance plowing services outside Northeastern Thailand, extending into other regions such as Prachinburi and Chachoengsao. P. Phuseema stated:

> Moving out of the area by transporting a large tractor is not easy. Although it is challenging and involves obstacles, it is worthwhile because the compensation from the work allows me to earn enough to save several baht in gold.
>
> (P. Phuseema, personal communication, August 16, 2023)

Entrepreneurs in Community A also established strong linkages with those in neighboring communities, such as Mueang Bua in Mueang Bua subdistrict, Kaset Wisai district, Roi Et province. They further developed a job-hunting network by building connections with brokers in other villages and forging ties with local leaders such as subdistrict heads, village chiefs, and local contractors. The network later expanded from the Thung Kula Rong Hai area to other provinces in the Northeast, and further extending to the Central region and parts of the North.

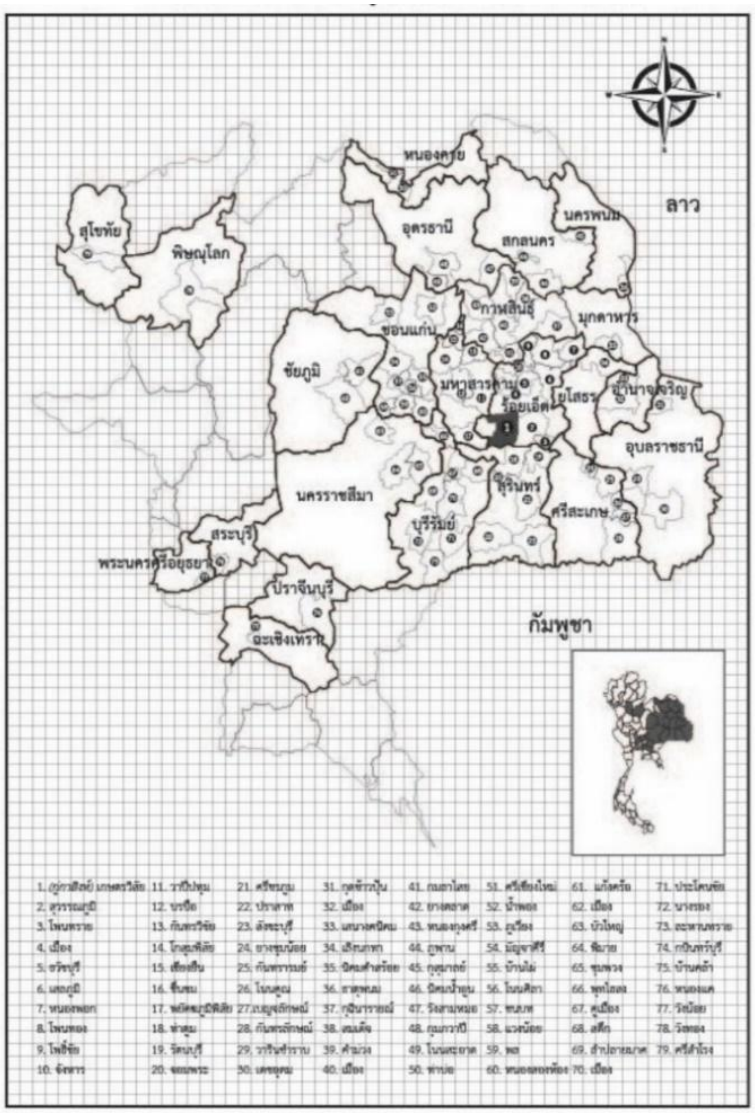

Figure 1 Modified Data From the Table of the Pathway for Creating Networks of Rice Plowing and Harvesting Contractors in Various Regions Between 1997–2007. (**Source:** Lao-an, 2010 : 136-138) and Follow-Up Survey Between 2008–2013. (**Source:** Lao-an, 2024)

3. The Society of Entrepreneurs: Innovation Networks of Rural Entrepreneurs and Technology as a Part of Life

From the points mentioned above, it is evident that the role of agricultural technology has led to the formation of a group of tractor and rice harvester operators. These individuals identified opportunities and avenues for contract work. The specific characteristic of this group is their ability to bear risks by applying relevant skills and experience to think critically and solve problems systematically. Additionally, the creation of networks through the use of kinship systems for work and the expansion of these networks to offer plowing and rice harvesting services beyond the community on a larger scale. Furthermore, the role of agricultural technology is in a position that connects entrepreneurs with the creation and modification of tractors and rice harvesters, ultimately forming an innovation network community. Within these connections, a complex relationship emerges, one that cannot be separated between the entrepreneurs and the tractors and rice harvesters. This perspective allows for a clear understanding of the role of non-human entities. Therefore, in the final section, this article will discuss the society of entrepreneurs by focusing on two points: the innovation networks of rural entrepreneurs' modifications and technology as an integral part of rural entrepreneurs' lives.

3.1 Rural Entrepreneur Innovation Networks

Tractor and combine harvester repair garages serve as key sites for repairing machinery and modifying various components to suit specific field conditions. These garages are important spaces where knowledge, understanding, and hands-on experience of mechanics are brought together and applied. For example, in Community A, the owner of a combine harvester repair garage is I. Phusaengkaew. He completed lower secondary school at the village school. After that, he went to work at a motorcycle repair shop in Suwannaphum district, Roi Et. His interest in tools, spare parts, and engines, along with his learning about motorcycle engines, enabled him to understand the causes of breakdowns and malfunctions. He gained the trust of the shop owner and became a key assistant in repairing vehicles. Through the buying and selling of spare parts, tires, and second-hand equipment, he came to know sellers, buyers, and vehicle owners who visited the shop. His passion for and immersion in the motorcycle repair business kept him working in the field until the age of 24. He was invited by his maternal relative, T. Khansai, to work as a combine harvester operator. Because of the better income, he decided to take the job. Saengkaew 's responsibilities extended beyond operating the machine—he also learned about its various components. These included starting the engine, movement, acceleration, steering, distinguishing between normal and abnormal engine sounds, cutter head, conveyor column, fuel tank, the color of exhaust smoke, and the grain collection bag. Through observation, he gradually began to understand more about the individual components of the combine harvester. He drew on his motorcycle engine repair experience to comprehend the mechanics and functioning of the combine harvester. Although the systems were different, he said, "Engines operate on similar fundamental principles." Saengkaew developed a keen understanding of the engine system, power transmission system, hydraulic system, electrical system, and the harvesting mechanism of the combine harvester. He explained the operation of the machine and gave an example of how adjustments are made depending on the type of rice field:

> For blade height, in wet-season paddy (na-pi), the blade should be set low in order to cut tall and dense rice efficiently. In contrast, for dry-season paddy (na-prang), the height may be adjusted slightly higher. For cutting speed, in na-pi fields, the speed should be reduced to prevent the engine from overworking and to minimize damage to the rice. For the feeding system, in na-pi, the feeding rate should be increased so that the rice flows into the pipe continuously, whereas in na-prang, it should be slowed down slightly.
>
> (I. Phusaengkaew, personal communication, August 15, 2023)

By the age of 37, Phusaengkaew had opened his own combine harvester repair garage in the village, along with a shop selling equipment related to tractors, harvesters, and other agricultural tools. His years of work experience led to the accumulation of deep knowledge and technical expertise. This knowledge extended beyond personal memory—it became embedded in his way of thinking. His understanding of repair and modification was actively communicated among other garage owners in the same village. Eventually, the network expanded to include garages in neighboring subdistricts, such as Thee Charoen Garage, S. Rungrueang (specializing in combine harvesters and soil pulverizers), Phadung Tractor, Adul Charoenyont Shop, Banchachok Combine, Ban Chang Tae, Therdchai Tractor (specializing in second-hand harvesters), and Uncle Korn's Garage (lathe, milling, drilling, welding). These repair spaces facilitated the exchange of knowledge, sourcing of spare parts, price comparisons, and discussions about mechanical modifications. As a result, tractors and combine harvesters became the medium that connected people, leading to the formation of an expansive network of agricultural repair garages.

Figure 2 Map of Agricultural Machinery Repair Shops in Kaset Wisai District and Hin Kong Subdistrict, Suwannaphum District, Roi Et Province.
(**Source:** Google Maps, n.d.)

From repair garage to modifier: “Strong, Durable, Functional” – This was the phrase spoken by Sanan Jantasa, a combine harvester repair shop owner (S. Jantasa, personal communication, August 15, 2023). The main mission of the repair garage is to repair and modify tractors and combine harvesters. These modified machines are called *“rot kiao build”* (modified rice harvester), or more commonly referred to as *“rot kiao sing”* (racing-style harvester). They are modified from their original factory condition to enhance performance—particularly in harvesting speed and the ability to operate continuously for long periods. Sanan explained that the modifications stemmed from his direct experience in repairing harvesters. By listening to engine sounds, the timing of gear shifts, and how the vehicle moved, he could detect whether a machine was broken or functioning properly. Another source of insight came from conversations and knowledge-sharing with clients who came for repairs or modifications. This exchange of knowledge led to experimentation with various combine harvester parts, such as widening the harvester’s mouth from 60 cm to 95 cm, from 70 cm to 95 cm, or from 93 cm to 105 cm. The modifications extended to other related parts, including new cutter heads, blade rails, new-spring units, and left-right boosters. Prices ranged from 55,000 to 300,000 baht. The widening of the harvester’s mouth had to correspond with adjustments to the auger angle. Each garage typically developed its own specific techniques for these modifications. Thus, modifying a combine harvester was not simply a matter of replacing parts—it was about creating something new from constantly evolving knowledge and experience. Repair garages became spaces for the creation of knowledge and innovation. Mechanics functioned as inventors and thinkers, blending diverse knowledge systems to solve problems and optimize machines for practical use in the field.

3.2 Technology as Not a “Foreign object” but “Part of Life”

Agricultural technology plays a role as an active agent that connects both living and non-living entities, working together to form a complex network. In this section, the author will discuss technology as not an “alien object,” but an integral part of life. It can be said that the role of these machines enables entrepreneurs to move outward and build networks with various sectors. These machines become constant companions, requiring attention and proper care. Entrepreneurs often come to accept them as members of the family. This is evident in the practice of naming them, such as “Kaimuk” (Pearl), “Thongkham” (Gold), “Rot Kiao Pan Lan” (Billion-Baht Harvester), “Phraya Khao” (Lord of Rice),

“Suea Lek Thongkham” (Golden Steel Tiger), “Mangkorn Thong” (Golden Dragon), “Khamkhun,” “Sai Khao” (White Sand), and “Khamphaeng.” Such practices reflect how tractors and combine harvesters are regarded as essential household members. Their physical form and power symbolize the core labor force that brings income and prosperity to the family. In the case of combine harvesters, an advertisement titled “Rot Kiao Khao –Khwam Nai Jai Thueng Khon Khap Rot Kiao Khao Thuk Khon” (Combine Harvester – A Message from the Heart to All Harvester Operators) (Kasetphatana, 2017) illustrates the intimate bond between the machine and its operator, likening it to the relationship between an elephant and its mahout. A key sentence in the advertisement reads: “When you love the mighty elephant, the elephant will love you back.” Beyond being accepted as part of the family, this relationship is also expressed through rituals devoted to the tractor and combine harvester. These rituals include adorning the machines with silk and satin cloth, draped over the harvester’s mouth or on the tractor, as part of a decorative offering. Such adornment symbolizes dressing the machines in new garments of high value and significance. N. Laksaa stated:

> I bathe the combine harvester and tractor, and carefully wipe down every part to make them clean. Then I place a checkered cloth (pha khao ma) over the harvester’s mouth and hang a gold necklace on it. These decorative items represent beauty, dignity, wealth, and abundance.
>
> (N. Laksaa, personal communication, August 17, 2023)

The belief in sacred power embodied in tractors and combine harvesters is enacted through ritual practices, which express reverence for the protective spirit believed to inhabit these machines—known as “Mae Ya Nang.” [7] These rituals are divided into two stages. The first stage takes place after the purchase of the tractor or combine harvester, when the spirit of Mae Ya Nangis invited to inhabit the machine and is asked to provide protection from malfunction and damage. The second stage occurs before departing to perform plowing or harvesting services. S. Kaewwong explained:

> Marigold garlands are hung near the gear lever of the combine harvester, tractor, or transport truck. Ritual offerings are prepared, including a pig’s head, oranges, bananas, dragon fruit, coconuts, pineapples, pomegranates, apples, green soda, red soda, orange soda, water, white liquor, betel leaves, incense, and candles. These offerings are placed in front of the tractor and combine harvester.
>
> (S. Kaewwong, personal communication, August 17, 2023)

The ritual begins with a Buddhist prayer to the Triple Gem, followed by a special chant offered to the spirit along with the lighting of incense and candles. This act symbolizes the relationship between Mae Ya Nang and Phra Mae Phosop[8], the rice goddess who protects the paddy fields. The prayer includes the following passage:

[7] Mae Ya Nang is a sacred entity that forms a bond between the owner and the vehicle. It has a close relationship with both the owner, serving as a protector and spiritual anchor, and with the vehicle, as the spirit residing within and receiving worship.

[8] Phra Mae Phosop is the spirit or goddess who protects and oversees rice plants and agricultural produce. The mention of the relationship between Mae Yanang and Phra Mae Phosop highlights the connection between the sacred entities that protect agricultural vehicles and the goddess who guards agricultural produce. This reflects the hopes and beliefs of entrepreneurs in ensuring the success and safety of both people and machinery in their agricultural endeavors.

> "Blessings be upon us—Sathu, Sathu, Sathu. Today, I come to humbly offer my words to Phra Mae Phosop, the sacred protector of the vast rice fields. On this day, we begin the harvest. May the rice be reaped smoothly and brought safely to the drying grounds. May the combine harvester not sink into the mud or become stuck. May Mae Ya Nang offer her protection and support. May Phra Inn in the heavens clear the way before us. Please, let there be no rain at this moment. Grant us three days of good sunshine. In return, I will offer a boiled chicken in gratitude. May the new rice be stored safely in the granary. After that, dear rain, you may fall freely. Sathu."

As the final words of the ritual chant fade, the tractor, combine harvester, and transport truck are started—clutches engaged and horns sounded. This act marks the symbolic signal of readiness to begin the rice harvest. It is seen as Mae Yanang's way of responding to the owner of the agricultural machinery, assuring them that "wealth and prosperity are near, as the harvest season approaches." (S. Kaewwong, personal communication, August 17, 2023)

Discussion and Conclusion

Studies considering the role of agricultural technology in rural areas in terms of socio-cultural aspects are quite limited. As this research revealed, agricultural technology plays a crucial role in economic transformation by enhancing production efficiency, which results in the emergence of tractor and rice harvester entrepreneurs. These entrepreneurs possess specific characteristics, requiring skills and experience in business, including identifying opportunities, assessing risks, and building networks, among others. Furthermore, the role of agricultural technology is not merely machinery that performs tasks; it also facilitates the creation of networks through innovation and modification. This process is intertwined with beliefs, spirits, sacred entities, and the transformation of these technologies into members of the entrepreneur's family, which cannot be separated from one another.

In this study, it can be concluded that the first wave of economic transformation in rural areas became clearly visible during the 1980s to 1990s. The Thai government implemented policies promoting the cultivation of cash crops, leading many villagers to increasingly engage in such agricultural practices. Rice, in particular, emerged as a key cash crop that reshaped traditional modes of production. The reliance on manual labor gradually gave way to the adoption of agricultural technologies due to their greater efficiency in substituting human labor, reducing production time, and lowering costs. This turning point marked the emergence of a new class of agricultural technology entrepreneurs—tractor and combine harvester owners—in the Thung Kula Rong Hai region.

The momentum generated by this initial turning point led to a subsequent wave during the 1990s–2000s, characterized by the emergence of skilled and entrepreneurial actors. These individuals identified opportunities, assumed risks, and expanded their work networks across broader regions. Such characteristics stemmed from their accumulated experience in plowing and harvesting, along with systematic management, careful planning, and the ability to identify and resolve problems in a professional manner. Agricultural technology thus reveals the dynamic movements of entrepreneurial actors within Community A in a highly tangible way.

The society of agricultural machinery entrepreneurs reflects the expansion of economic networks that connect with repair garages for tractors, combine harvesters, and related equipment. Through processes of repair, modification, and customization, these machines have come to be known as "built-up tractors" or "modified harvesters" (*rot thai biw*, *rot kiao biw*). These innovations emerge from a problem-solving orientation and aim to enhance the performance and efficiency

of agricultural technologies. Importantly, the adoption of agricultural machinery has brought not only changes in tools and production practices but also deep spiritual dimensions—especially in the evolving relationship between entrepreneurs and their tractors and combine harvesters, which have become far more than mere mechanical tools. Hence, studies on economic changes in rural areas should be scrutinized beyond the formation of entrepreneurial groups focusing on economic mobility and the rise of political consciousness. Furthermore, technology in rural areas should be explored through a more critical lens that centers it as an integral part of rural change, particularly in the emergence of rural entrepreneur class.

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