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The Conventional and Modern Uses of Water Buffalo Milk in the Philippines

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Abstract

In Southeast Asia, milking of livestock is not common. In the Philippines, water buffalo (carabao) milk has been used since the Spanish colonial period of the 16th century. Milk is processed into cheese (kesong puti) or candy (pastillas). These customs are found in a few areas on the Islands of Luzon and Visayas. However, in 1996, following the launch of the Philippine Carabao Center (PCC), the uses of modern milk have been practiced nationwide using Murrah (buffalo), which produces more milk than a carabao. This paper analyzes the dairy transition currently occurring in the Philippines from the conventional uses of carabao milk to the modern uses of Murrah milk. Intensive fieldwork was broadly conducted in conventional and modern milk use areas of the country, with water buffalo management and milk use systems researched using participatory observation and interview methods. This study delves into how the conventional uses of water buffalo milk have helped support the livelihood of special farmers and whether recent government-backed projects, such as enhancing the ability of water buffaloes to produce milk, have made carabaos dispensable. The shift to modern milk uses, which relies on buffalo milk, has become a national project, in order to improve the subsistence of peasant farmers. This paper concludes that the modern dairy farming of Murrah is becoming popular in farming societies close to the PCC and that the dairy culture has changed from being a minor conventional regional system to a major industrial farming and business system to sustain the lives of local small-scale farmers.

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Countries in Southeast Asia, including the Philippines, are regarded as being part of a “non-milk use cultural sphere,” where, historically, the milking of animals and milk use have not been conducted (Simoons, 1973, p. 606).

Although there is no concrete reason why the use of milk was not developed, several possible theories have been conceived. First, more than 90% of the people in Southeast Asia are lactose intolerant, with their ingestion of milk resulting in symptoms, such as diarrhea (Adachi, 1998, p. 150; Pievani & Zeitoun, 2021, pp. 140–141; Tsuji, in press). Second, it has been confirmed that the people of Southeast Asia experience repulsive feelings triggered by the taste and smell of milk (Tsuji, 2016, p. 134; Tsuji et al., 2021, p. 346). Considering the climate of Southeast Asia as an influential factor, it is thought that the amount of rainfall and the richness of fruit in the region has supplied locals with liquid as an abundant resource; this is not an environment, in which milk is required for additional moisture. In addition, when animals in the region are sacrificed, they are used for meat rather than milk (Junker, 2000, p. 329). Furthermore, attitudes toward milk processing, as conducted by colonists in Southeast Asia, must have contributed to the lack of milking in the region. It has also been reported that the number of water buffaloes has decreased because of an increase in imported cattle (Doeppers, 2016, p. 276). Although additional theories exist, we can conclude that multiple factors are attributable to this issue.

Despite these claims about the lack of milk uses in Southeast Asia, in this paper, we examine the case of the Philippines to show that milk is in fact used in the region. In the Philippines, water buffaloes, cattle, and goats are all used for milk production, but this study focuses on the uses of water buffalo milk.

In Southeast Asia, water buffalo milk is consumed in both the Philippines and Indonesia (Tsuji, 2019a, p. 15, 2021d, p. 1; Tsuji et al., 2021, p. 339, in press). In the Philippines, cheese (*kesong puti*) [Figure 1] and milk candy (*pastillas*) [Figure 2] are created using water buffalo milk, while in Indonesia, cheese (*danke* and *litsusu*), and yogurt (*dadih*),¹ are also processed (Kozaki et al., 2001, p. 212). Both countries have experienced colonial rule from Spain and the Netherlands, respectively, with these dairy products being introduced in the Philippines and Indonesia during the period of colonialism.

1 The word *dadih* is of Sanskrit origin. It was probably brought to Indonesia with Hinduism before the arrival of the colonialists.



Figure 1. Production of kesong puti in Laguna province (Photo taken by the author on February 12, 2018).



Figure 2. Pastillas sold in Bulacan province (Photo taken by the author on March 22, 2018).

Spanish colonial rule in the Philippines began in the 16th century. According to historical records, Spaniards and Chinese in the Visayas area milked water buffaloes and processed cheese at that time (Alcina, 2004, pp. 35–37).

In the Philippines today, buffalo milk is conventionally used in Bulacan, Laguna, Cavite, Cebu, Samar, and Leyte provinces (Aquino et al., 2011, p. 195; Tsuji, 2020, p. 171). It is unclear why only six out of the 81 provinces in the Philippines use milk significantly, with one hypothesis being that Spanish governance, including the uses of milk, did not reach every corner of the country.

Conventional uses of water buffalo milk have been facilitated by a network of buffalo milk producers, household processing companies, and peddlers (Tsuji, 2021a, p. 53, 2021c, p. 21). Additionally, at the national level, the Philippine Carabao Center (PCC) under the Department of Agriculture (DA) was opened in 14 provinces, excluding the liaison office in Manila in 1996, to popularize buffalo milk uses in the country (Figure 3). The uses of buffalo milk in the Philippines are currently a mix of both conventional and modern milk uses (Tsuji, 2019b, p. 130) [Figure 4].

This paper provides an outline of the common uses of water buffalo milk in the Philippines, including conventional and modern milk uses and clarifies the current situation of water buffalo milk uses in the country from an anthropological perspective (Table 1).



Figure 3. The Philippine Carabao Center in Nueva Ecija province (Photo taken by the author on April 11, 2016).

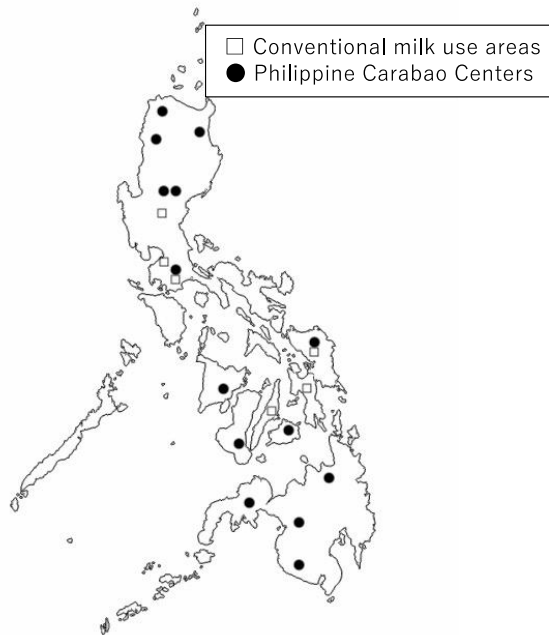


Figure 4. Location of conventional milk use areas and the Philippine Carabao Center (Created by the author).

Table 1. Conventional and modern milk uses in the Philippines (prepared from the author’s fieldwork)

	Conventional milk uses	Modern milk uses
History	16 century-	1996-
Area	Bulacan, Cavite, Laguna, Cebu, Samar, Leyte province	14 areas under the control of the Philippine Carabao Center
Type of water buffalo	carabao	Murrah
Milk uses	kesong puti, pastillas	kesong puti, pastillas, fresh milk, yogurt, etc.
Sales channel	local	capital (Manila)

Materials and Methods

Fieldwork in the Philippines was conducted in the provinces of Bulacan, Laguna, Cavite, Cebu, and Samar. In Leyte province, water buffalo milk is actively used (Aquino et al., 2011, p. 195), with fresh cheese and a candy being mainly processed in this area. Research was also conducted in Nueva Ecija and Bohol provinces, where the PCC is located, and in Palawan province, a non-milk use area, for comparative study. The research was conducted from April 5, 2016, to August 20, 2019 (16 times).

The research methods used are mainly composed of observations and interviews about water buffalo milk use and milk products found in each research area. More than 30 adults who are mostly farmers and milk processors were interviewed. Tagalog was used as the research language. The research was conducted after obtaining informed consent.

This paper remains accurate as of September 9, 2019.

Results and Discussion

General uses of water buffalo

Water buffaloes are primarily used in the Philippines for towing and transporting livestock. In fields and paddy fields, water buffaloes are used for tillage and serve as an important source of labor for farmers (Figure 5). They are also often used to transport people and loads, especially in areas where tractors and automobiles are not widespread. However, because of the “Green Revolution,” which began in 1976, many water buffaloes have been replaced by tractors and a large number of buffaloes have been slaughtered as a result.² In addition, in some areas, water buffaloes are used for entertainment purposes, such as racing and bullfighting (Food and Agricultural Organization of the United Nations, 1977, p. 210). Several unique festivals involving water buffaloes exist in various parts of the Philippines, with races and bullfighting also conducted during such festivals (Philippine Carabao Center, 2012, pp. 24–33) [Table 2]. These activities were introduced with the arrival of the Malay people to the Philippines, although the Philippine water buffalo was shown to have been introduced from southern China through DNA research (The Society for Research on Native Livestock, 2009, p. 167, 178).

² The actual number of buffaloes slaughtered during the green revolution has not been made clear.



Figure 5. Carabao plowing a rice paddy field in Palawan province (Photo taken by the author on August 15, 2017).

Table 2. Major carabao festivals in the Philippines (Prepared based on information from the Philippine Carabao Center [2012]).

	Name of Festival	Province	Season	Events
1	Kneeling Carabao Festival	Bulacan	May	parade
2	Pahiyas Festival	Quezon	May	parade
3	Katigbawan Festival	Bohol	June	parade
4	San Isidro de Labrador Festival	Rizal	May	parade
5	Carabao-Carroza Festival	Iloilo	May	parade
6	Karbo Festival	Ilocos Sur	May	parade
7	Nuang Festival	Isabela	September	parade
8	Turogpo Festival	Leyte	March	bull fight
9	Pasungay Festival	Iloilo	January	bull fight
10	Gatas ng Kalabaw Festival	Nueva Ecija	July	parade, race
11	Kesong Puti Festival	Laguna	April	parade

Water buffaloes are also part of the “livestock trust” system, alongside cattle, goats, pigs, chickens, and other livestock. Livestock trust is a practice that allows livestock owners to delegate the care of livestock to a caretaker who is an acquaintance of the owner. The caretaker then receives calves born from the livestock as interest (Tsuiji, 2011, p. 53, 2013, pp. 98–99, 2019c, p. 27).³ Water buffalo caretakers are eager to provide the buffalo with pastures with the expectation of calves being born. Meanwhile, this allows the owner of the buffalo to avoid the trouble of taking care of the livestock alone. Water buffaloes used in the livestock trust system are preferably female, but males are also taken care of as stud bulls.

Water buffaloes are slaughtered at ceremonial occasions, such as weddings, especially in Islamic and indigenous communities, the bride’s family may provide the groom’s family with a water buffalo as dowry (Tsuiji, 2011, p. 53).

Locals of some areas in the country, such as the Mountain Provinces in northern Luzon, also use the skulls of water buffaloes that have been slaughtered in rituals to decorate their residences as a symbol of their prosperity.

Water buffalo meat (carabeef) is preferred over beef or pork as it is a low-cost, low-cholesterol food.

As mentioned above, water buffaloes have been used in the Philippines for economic purposes, rituals, food, and many other purposes, but not historically for their milk.

Conventional milk uses

People in the Philippines have, however, milked water buffaloes in recent history, making a living by processing the milk into cheese or pastillas. The history of such practices dates to Spanish rule. It is not clear why Filipinos have continued to produce water buffalo milk until today. This may be because they realized that water buffaloes can be used not only for agricultural purposes but also to produce milk. After all, they form a part of the country’s livelihood. Today, water buffalo milk is consumed by a very small number of people within a limited area. Water buffalo milk is an unusual industrial culture.

Conventional buffalo milk uses involve milking domestic water buffaloes and processing their milk into cheese or pastillas. Water buffaloes are not raised in densely populated areas. Instead, they are raised in areas with low populations, such as mountainous regions with meadows on which buffaloes can graze. Livelihoods cannot be established solely through buffalo breeding; therefore, people combine agriculture and livestock breeding. Moreover, only about one liter of milk can be produced per day from the water buffaloes; hence,

3 In fact, there are various arrangements between livestock owners and livestock caretakers.

it is necessary to possess multiple milkable female water buffaloes to ensure sufficient milk sales to survive. Milking is performed early in the morning, between 4 a.m. and 8 a.m. Water buffaloes are tied to trees and milked. Women assist with milking, but men are the primary practitioners (Figure 6).



Figure 6. Milking carabao in Samar province (Photo taken by the author on August 14, 2019).

When enough milk is produced, the worker carries the milk to a milk processing factory or broker. Milk producers rarely process milk; instead, they sell milk to milk processors. This is due to the need for cash income. In addition, the processor can avoid the problem of producing milk. While the price of milk varies, it is typically about 100 pesos (about 1.87 USD) per liter or about 35 pesos per 350 milliliters.

Processors are domestic processors or general housewives; however, they are known as milk processors in their areas. Many women process milk, but men can also perform this task.

Water buffalo milk is often processed into milky fresh cheese that is not mature. This cheese can be called kesong puti, keso, kesiyo, keso, kasilyo, etc. – all of which originate from the Spanish word queso (Table 3). The manufacturing method differs somewhat between cheese types (Table 4), but all are sold for 20-30 pesos per piece. The processing methods for the selection of water buffalo cheese are discussed on the next page.

Table 3. Local names of kesong puti (Prepared from the author's fieldwork)

General Name	Local Name	Area
kesong puti	kesong puti, keso, quezo	Laguna province
	kesong puti	Bulacan province
	kasilyo	Cavite province
	kesiyo, queseo	Cebu province
	keseo	Samar province

Table 4. The manufacturing method of kesong puti (Prepared from the author's fieldwork)

	Laguna province	Bulacan province	Cavite province	Cebu province	Samar province
Heating	No	Yes	Yes	Yes	Yes
Coagulation (coconut vinegar)	Yes	Yes	Yes	Yes	Yes
Coagulation (rennet)	n.d.	No	No	n.d.	n.d.
Seasoning (salt)	Yes	Yes	Yes	Yes	Yes
Wrapping (banana leaves)	Yes	Yes	Yes	Yes	Yes

Kesiyo (from Cebu province) is created by first heating water buffalo milk to 72 °C, using coconut vinegar as a starter. The milk is coagulated in the pan and when the curds are shaped to a moderate size, the cheese is seasoned with salt and the water is dehydrated. The cheese is then wrapped in banana leaves to complete the process. Rennet is seldom used. Rennet is used in Laguna and Cebu provinces and vinegar is used in Bulacan, Cavite, and Samar provinces (Kozaki et al. 2001, p. 212). Likewise, vinegar is used in Laguna and Cebu according to the author's research, although the practices in Leyte provinces are unknown. In Laguna province, the rennet is called bahay asim. While in Cebu province, it is called kuajo, named after the Spanish word. Kasilyo (from

Cavite province) and keso (from Samar province) follow the same recipe. These cheeses are sold in local neighborhoods (Tsuji, 2017a, pp. 60–61, 2017c, p. 13, 2017d, p. 21).

Keso (from Cebu province) does not use heated milk; instead, milk is placed in a pitcher or similar container, mixed with coconut vinegar starter and salt, and stirred. When the curd develops, it is wrapped in gauze, pressure is applied with a stone, and the whey is dehydrated. The whey is then discarded and the cheese is wrapped in banana leaves to complete the process. Rennet is seldom used. The cheese is sold in local neighborhoods (Tsuji, 2017a, pp. 60–61, 2017b, p. 9, 2017d, p. 21).

Kesong puti (from Laguna province) does not involve heating the milk. Milk is placed in a container and stirred with starter, salt, and coconut vinegar. When the curd forms, it is filtered through a wire mesh and the whey is discarded. Curds are placed in the banana leaves and processed. The use of rennet is acceptable, but it is rarely used because it is not easy to obtain in local markets. Two or four curds are then wrapped with banana leaves, reinforced with betel palm (*Areca catechu*) bark, and tied with a string. Cheese in this area is peddled carefully, with such reinforcements, so that it does not suffer any damage at all (Tsuji, 2018a, p. 13, 2019d, p. 29).

In Laguna province, there is a cheese peddler who buys cheese produced at home and sells it to other customers. This peddler mainly sells cheese around the Lake Laguna area, but sometimes extends his journey to Manila. The peddler buys cheese from the producer at 10 pesos per piece and resells it at 30 pesos. Peddlers sell about 40 to 80 cheeses over 10 hours per day (Tsuji, 2018a, p. 15). Peddling is a laborious task, and when cheese cannot be obtained, it puts peddlers in an unstable position that forces them to sell another product. For example, in Laguna, peddlers sell salted eggs (itlog na pula), boiled coconut milk with lake shrimp (alamias), and confectionery made from coconut milk processed with glutinous rice or cassava (espalol and suman) as cheese substitutes (Tsuji, 2018a, p. 11).

In Bulacan province, pastillas are produced using water buffalo milk in addition to cheese. Pastillas are candies derived from Spain that are typically sweetened with condensed milk, but here, the candy is processed using boiled water buffalo milk and sugar.⁴ Bulacan and Leyte provinces are famous for the water buffalo milk pastillas; the high concentration of water buffaloes here may have made it easy for Spaniards to develop a dietary culture using water buffalo milk. As this province is also a major producer of sugar, the abundance of both milk and sugar must have led to the production of candy. In this way, pastillas

4 Pastillas, also called pastillas de leche, have a milky taste (de leche), but also have ubi flavors (*Dioscorea alata*) and yema flavors (egg yolk).

would have been accepted by Filipinos seeking a sweet treat.

Pastillas are produced by adding sugar to water buffalo milk and boiling the mixture down until it becomes pasty on a classic cooking stove. Then, solidified pastillas are cut into appropriate quantities, covered with sugar, and wrapped in paper. Boxes containing 25 pieces of pastillas are sold for approximately 130 pesos. Processing is carried out in at-home manufacturing locations and the candies are sold at souvenir shops, as well as in shops dedicated to the sale of pastillas. Pastillas sell especially well during Christmas and Holy Week (Tsuji, 2018b, p. 28, 2019e, p. 8).

As mentioned above, conventional water buffalo milk has a minor but established position as a food culture for the production of cheese and pastillas in the Philippines.

Modern milk uses

In the Philippines, water buffalo milk has been consumed since the 16th century by limited individuals living in a limited number of areas. While conventional water buffalo milk use culture is difficult to spot in everyday life across the country, the use of water buffalo milk is prevalent today at the national level.

The literature from the 16th to 17th centuries contains very few descriptions of the use of water buffalo milk in the Philippines (Alcina, 2004, pp. 35–37; Morga, 1966, p. 315), but after the 20th century, interest in the subject increased.

Negative experiences exist in the Philippines concerning water buffaloes, such as the loss of buffalo to rinderpest early in the 20th century, the massacre of the animals by the Japanese military in the mid-20th century (Roque, 2011, p. 6), the mass slaughter of water buffalo during the “Green Revolution,” and dependence on foreign milk consumed in the country is overwhelmingly imported. The emergence of elevated nationalism is related to recent attempts in the country to produce milk domestically by using water buffalo, which is a national symbol (Tsuji et al., 2017, p. 106).

In general, the modern uses of water buffalo in the Philippines began in 1996 – only 25 years ago at the time of writing. In 1996, the PCC was established from a national policy in 14 areas of the Luzon, Visayas, and Mindanao Islands. The mission of the center is to improve the livelihoods of farmers rearing water buffalo, improve the health of the people, improve and preserve water buffalo genes, and pursue the utility value of these animals.

The PCC aims to improve livelihoods by loaning water buffaloes to farmers engaging in milking. Farmers are obliged to receive certain training as a condition of receiving water buffaloes. The water buffaloes loaned by

the PCC are river-type buffaloes (Murrah), rather than swamp-type buffaloes (carabao), but hybrids are also loaned. Backcrossing is performed until the fourth generation. From the fourth generation, it is considered a cow for dairy (Philippine Carabao Center, 2009, p. 7). Carabao and Murrah are both Asian water buffaloes (*Bubalus bubalis*), but differ in terms of chromosome number, in addition to their life forms. The former's chromosome is $2n=48$ and the latter's is $2n=50$ (Barker, 2014, p. 7694). Murrah is bigger than carabaos and has a milk yield of about five liters per day, equivalent to five times that of a carabao. Murrahs imported from Bulgaria, Brazil, America, Italy, and India are used for milking purposes (Figure 7). When Murrah or hybrids give birth to calves, farmers give them to the PCC to repay their loans (Tsuji, 2017a, p. 59).



Figure 7. Milking Murrah by the PCC in Nueva Ecija province (Photo taken by the author on April 11, 2016).

The PCC buys milk from the farmers, processes it, sells it in stores and cafes directly under the center, and ships it to big cities like Manila (Figure 8). The price of milk varies from center to center, but it is typically around 60 pesos per liter. The price of milk is increasing annually. Farmers also engage in processing, while agricultural cooperatives are organized and farmers are integrated.



Figure 8. Carabao milk sold at a big department store in Manila (Photo taken by the author on December 28, 2016).

The dairy products processed by the center are diverse and include raw milk, yogurt, ice cream, pizza, confectionery, and soap, in addition to conventional products, such as cheese and pastillas, which strive to disseminate water buffalo dairy products. Many tourists visit shops and cafes directly under the center to buy dairy products.

The lactation period of Murrahs is 305 days per year (Barker 2005, p. 2), while the lactation period of carabaos is 150-200 days (Bhat, 2010, p. 57). Farmers milk water buffalo every morning at their homes and deliver milk to the center or cooperative (Figure 9), but they hardly ever drink the milk they produce. Rather, they prefer to sell the milk and receive a cash income, with which they can improve their socioeconomic lives by being able to pay their children's educational expenses and business funds and purchase automobiles and motorbikes. It is natural that people recognize the value of water buffalo and worship the money that is produced easily, which is why milk producers do not drink their own milk, despite being concerned with the health benefits of milk (Tsuji et al., 2018a, p. 4, 2018b, p. 41).



Figure 9. Carabao milk cooperative in Samar province (Photo taken by the author on August 12, 2019).

However, farmers who can borrow buffaloes on loans have a certain economic margin; it is difficult for poor farmers, such as tenant farmers, to borrow buffaloes to produce milk. Moreover, the PCC prioritized giving milk buffaloes to poor farmers, so that the number of farmers who make their living by milking buffaloes will increase in the future.

In addition, the PCC provides buffalo milk to badly malnourished children and promotes the health of locals (Figure 10). Water buffalo milk surpasses cow's milk in its energy, protein, fat, calcium, phosphorus, retinol, and vitamin A content (Chinte-Sanchez, 2008, pp. 237–238), making it a good source of nutrients.



Figure 10. Carabao milk intake project by the PCC for malnourished children in Nueva Ecija province (Photo taken by the author on April 11, 2016).

Regarding the improvement and conservation of water buffalo genes, the milking of water buffaloes is being promoted alongside the preservation of native genes. The laboratory is trying to steer the use of water buffaloes from conventional uses in agriculture and transportation to use in milk, indicating that the future uses of water buffaloes must change significantly.

While the improvement in the utility value of water buffaloes is a task for the future, various festivals and events related to the animals have been held in various parts of the Philippines since the establishment of the PCC. The dissemination of activities related to water buffaloes and their milk is steadily progressing.

Conclusion

This paper has shown the general situation of water buffalo uses in the Philippines, conventional milk uses, and modern milk uses.

The Philippines, along with Indonesia, demonstrate unusual use of water buffalo for the typically non-milking cultural areas of Southeast Asia. Although this is a product of colonialism, it is a serious element that greatly differs from the usage patterns of other Southeast Asian countries with water buffaloes.

However, Filipinos being lactose intolerant tend not to like milk and they feel repulsed by it. Therefore, in the Philippines, a milk-drinking culture has not been developed and milk use has survived by converting lactose into cheese or pastillas.

In recent years, opportunities to ingest raw milk, yogurt, and other products have increased as a result of heightened general health consciousness, but the use of water buffalo milk is still too costly to be popularized. Buffalo milk cheese and pastillas are considered luxury goods. Water buffaloes are still mainly used for agriculture and transportation. It will take time for many people to become familiar with the modern uses of water buffalo as these uses are part of an underlying culture.

However, conventional water buffalo milk is currently undergoing dramatic changes. Murrah will become popular in the production of milk and, in the future, Murrah must become the center of milk uses rather than carabao (Tsuji, 2021, p. 159).

Crossbreeding carabao and Murrah increases the production of milk and increases the distribution volume. If this happens, the relationship between buffalo milk and Filipinos will become much deeper.

This paper emphasizes that the use of water buffalo milk is a special culture inside the Philippines and even in Southeast Asia. Both conventional and modern milk uses is a unique phenomenon found in the Philippines. Although there are several challenges, this paper concludes that dairy farming of water buffalo is under rapid transition from conventional milk uses to modern milk uses and dairy culture has become a major industrial farming system from a minor regional system in the country.

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