Buffalo in Borneo, Sarawak: A Review of the Current Status of the Indigenous Buffalo Industry

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Abstract: The Malaysian water buffalo, Bubalus bubalis, has traditionally been an important livestock for the local people of Sarawak. Buffalo, other ruminants, and non-ruminants are essential for the livestock industry as they supply the largest source of protein for the entire nation. Cattle provide the largest production in the livestock industry at 0.2%, followed by other ruminants, including goats (0.1%), sheep (0.04%), and buffalo (0.03%). Water buffalo, or ‘kerbau sawah’ as it is locally known, is an overlooked animal compared to other livestock. Amidst the growing demand for beef within the domestic consumer market, the buffalo population in Sarawak has risen over the past five years from 5,396 to 6,205 heads in 2019. However, the self-sufficiency level (SSL) of cattle and buffalo beef has dropped from 26% in 2013 to 21.6% in 2019 despite the rising demand for local produce. Malaysia continues to import frozen buffalo beef from India and live bovine from other countries to meet domestic demands and support the growth of the local buffalo industry. Due to this, the Department of Veterinary Services (DVS) Sarawak introduced a buffalo yard program (‘Natad Kerbau’) to assist the state smallholder farmers in managing their buffaloes better. This paper focuses on describing the current status of buffalo production in Sarawak, its important functions (including provision for food security), and future prospects of B. bubalis in the livestock industry of Malaysia and Sarawak in particular.

Keywords: East Malaysia, buffalo, population, domestic demands, traditional practices.

INTRODUCTION

The livestock industry is the most crucial aspect of agricultural production in Asia, which in recent decades has been rising at an unparalleled pace [1]. The exponential growth in demand for food of animal origin is rapidly spreading in developing countries, fuelled by growing incomes, expanding urbanization, and population growth. Livestock products for different countries depend on socio-economic factors such as human health concerns, changing of socio-cultural values, and religious beliefs [2]. In Malaysia, religion plays one of the most influential roles in animal protein food choice. Muslims make up 60% of the population, and the remaining 40% comprise those practising Christianity, Hinduism, and Buddhism. This multi-faith society has contributed to the availability of a wide range of livestock meat as animal protein sources in the country. The major components of Malaysia’s livestock industry comprise of the non-ruminants: chickens (95.8%), ducks (3.2%), and swine (0.6%). According to the annual statistics report from the Department of Veterinary Services [3], the current state of the ruminant sector is far less significant in comparison to poultry, as meat production from cattle (0.2%), goats (0.1%), sheep (0.04%) and buffalo (0.03%) contribute only a small percentage to the industry total.

Among commercially farmed ruminants, buffalo is the least popular and is considerably neglected compared to cattle. The passive buffalo production in Malaysia and Sarawak, especially in recent years, has impacted the overall population size. In 2019, it was estimated that the number of buffaloes in Malaysia was approximately 101,695 heads distributed throughout both the western and eastern regions of Sarawak and Sabah, in Malaysian Borneo [3]. Overall, of Malaysia’s total buffalo population, the population in Sabah accounted for 46.7% of the total population, whereas Sarawak comprised only 6.4% of the population. The high concentration of buffaloes in these east Malaysian states is mainly due to the long-standing traditional local practice of breeding buffaloes as an additional...
small-scale economic activity. Buffaloes were used to plough rice fields in West Malaysia and still play a major role in traditional culture, especially in Sarawak. This paper focuses on describing the current status of water buffalo production in Sarawak and its prospect in the livestock industry in Sarawak.

DOMESTICATION OF THE WATER BUFFALO

The domestic Asian water buffalo, *Bubalus bubalis*, is a very calm and articulate beast, tame yet bucolic, obedient and friendly, rich in history. The positive attributes of this animal have contributed to its spread across many countries. The domestic water buffalo can be classified into two different breeds: swamp ("kerbau sawah") and river buffalo. Both swamp and river buffalo (of the Murrah strain) can be found in Sarawak; they differ genetically and morphologically as well as in usage [4]. Swamp buffaloes are mainly used as beasts of burden, including draught power in paddy fields, transportation, and meat production. Murrah buffaloes are known for their high-quality milk production, yielding 8 to 10l of milk per day and 2500l per lactation on average [5]. Comparisons from a cytogenetic perspective of the swamp and Murrah buffalo showed that they have 48 and 50 chromosomes, respectively, whereas their crossbreed has 49 chromosomes [6].

Asian buffalo is generally recognized to comprise of three species: *Bubalus depressicornis* or Anoa from Indonesia, *B. mindorensis* from the Philippines, and *B. bubalis*, which is a derivative from the domestication of *B. arnee*, the Indian wild buffalo [7]. The species *B. arnee* is presumed to be the closest representation of the ancestors of the domestic water buffaloes of Southeast Asia, which occurred some 5000 years ago and was distributed throughout Mesopotamia to Indo-China, covering the South and Southeast Asia. However, this species is believed to be extinct in the regions of Bangladesh, West Malaysia, the islands of Sumatera, Java, and Borneo. Archaeological, anatomical, and historical evidence ratifies the debate that both swamp and river buffalo originated from the same lineage, *B. arnee*. However, the swamp buffalo is morphologically more akin to their ancestral species, as reviewed by [7].

In Borneo, the origin and domestication of *B. bubalis* are poorly understood and are still a debated subject. Genetic data indicates that the domestication of swamp buffaloes centralized in an area to the far south of China and northern Thailand, including Indochina [4]. This domestication practice advanced south through West Malaysia to the islands of Indonesia, which includes Sumatera, Java, and Sulawesi, north, and northeast to central China, and then via the eastern island route of Taiwan, to the Philippines and Borneo. It has also been hypothesized that the water buffalo may have been brought in by traders of the Hindu empire from Sumatera during the 12th and 13th centuries; however, without any convincing evidence documenting this occurrence, it is more likely to be an indigenous species [8].

A more widely accepted theory is that water buffaloes are part of the indigenous fauna of the island [9]. A study of animal remains from the Niah cave complex in Sarawak is indicative of the Stone Age presence of buffaloes [10]. Interestingly, there are reports from an archaeological study that believes that one of the mammalian fossils unearthed from the Niah caves was a water buffalo, implying that this species has inhabited Borneo as far back as the late Pleistocene [11]. Various other studies consider it probable that *B. bubalis* was part of the original fauna of the island with north-west Borneo as its current distribution [12]. Feral and semi-feral buffaloes used to be populous throughout Borneo, but the current status of these wild populations is poorly known.

THE CURRENT STATUS OF BUFFALO POPULATIONS IN MALAYSIA AND SARAWAK

Buffalo, alongside cattle, are both used in beef production to support the local demand for red meat in the country. The population of buffaloes in Sarawak is estimated to be 6,334, and 86% (5,500) of this figure is found in the north-eastern region of the state, in the Limbang and Lawas Divisions (pers. comm.) (Figure 1). These divisions are recognized for their buffalo breeding farms, with approximately 41 farmers practising buffalo farming as their primary source of livelihood. In Sarawak, the buffalo population has shown a declining rate over the past decade, decreasing from 8,459 heads in 2010 to only 6,446 in 2020 [3]. This fall has been attributed to decreases in the buffalo population (number of stock), low reproduction rates, high mortality, the slaughter of livestock, diminishing grazing areas, and a decreasing number of farmers (pers. comm.). Although there has been some increase in the population over the past five years, the rate is still low at an approximate growth rate of 3.8% annually. As for the dairy Murrah, to date, only 22 heads are known to remain in Sarawak, and they are bred exclusively at the Batu Danau Buffalo Station in Limbang, Sarawak.
Nevertheless, the trends in population numbers of this livestock (including the cattle industry) could be related to the high domestic demand for beef (both cattle and buffalo red meat) (Figure 2). Unfortunately, Malaysia is experiencing a shortage in beef production in contrast to the soaring demand from local consumers. This will be discussed further in the following section.

INSIGHTS INTO BEEF PRODUCTION AND DEMAND IN SARAWAK

Red meat is a popular meat choice as it is both delicious and highly nutritious concerning protein quality, vitamins, and minerals [13]. In Malaysia, the production of fresh beef is inadequate to meet the needs of the local population. It must be noted that in this review, fresh beef is classified as both cattle and buffalo meat. The key concern is that Malaysia's beef sub-sector remains uncommercialized due to the low production capacity and the inconsequential participation of the private sector in the economic development of the beef sub-sector [14]. The trend of beef demand, the output, and per capita consumption basis from 2013 to 2019 are shown in Figure 2. There was a marked decline in the production output of the beef industry in recent years from 51,715 metric tonnes (MT) in 2013 to 45,352 MT in 2019. As Malaysia's cattle population continues to grow slowly, the national beef production cannot meet local demands. Therefore, it is unsurprising that poultry meat is the primary driver for the growth of total meat production in Malaysia. The gap between red meat and white meat consumption varies greatly from person to person depending on economic status and consumer preference which

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**Figure 1:** Distribution of buffalo in Borneo Sarawak, East Malaysia, in 2020 (Source: Department of Veterinary Services, DVS).

**Figure 2:** Estimated output, consumption, and per capita consumption of beef in kilograms (cattle/buffalo) in Malaysia, 2013-2019 (Source: Department of Veterinary Services, DVS).
explains the lower red meat consumption in this country [15]. As income increases amongst consumers, the authors mentioned that higher quality or more expensive red meat is preferred for consumption, which means a shift in demand from local to higher quality imported meats [15].

The trend in beef demand by local consumers, as shown in Figure 2, maybe due to the rising price of local beef and the decreasing cost of imported beef. In Sarawak, the market price for local buffalo meat is at USD 8.46 (RM35.00) per kilogram, whereas imported meat is priced at USD 6.04 (RM25.00) per kilogram. The lower price of imported buffalo meat can influence consumers’ decision in selecting buffalo meat over cattle. It is estimated that the demand increase for livestock products will continue in the near future, primarily due to population growth, income increase, urbanization, and changing consumption patterns [16]. The lower demand for local buffalo meat is supported by the inconsistent number of buffaloes slaughtered in Sarawak over recent years (Figure 3). The number of slaughtered buffalo previously showed an increasing trend which steadily declined to only 513 heads by 2019. On that note, the use of buffalo as a source of red meat first gained prominence due to the insufficient local production of beef cattle to meet the domestic demands. A key issue arising from this situation was the fact that not all consumers prefer buffalo meat over cattle meat.

The estimated self-sufficiency level (SSL) of livestock products in Malaysia from 2013 to 2019 is shown in Figure 4. The self-sufficiency level (%) refers to the ability of local production to fulfil the demands of domestic consumers. For the beef industry, the SSL percentage has been slowly declining from 26% in 2013 to 21.59% by 2019. Through the Agriculture Policy Plan (NAPs) launching, the Malaysian government targeted that by 2020, SSL for beef to be

Figure 3: The estimated recorded slaughter of cattle and buffalo in Malaysia and Sarawak, 2015-2019 (Source: Department of Veterinary Services, DVS).

Figure 4: Estimated self-sufficiency of livestock products in Malaysia, 2013-2019 (Source: Department of Veterinary Services, DVS).
up to 33%, achieved through increased production of domestic red meat, including buffalo meat [17]. In Sarawak, the state government has targeted to increase the SSL for buffalo meat from 1.3% in 2017 up to 6.5% by the year 2030 (pers. comm.). Malaysia imports buffalo meat from various countries, with 70% coming from India and remaining from Australia, Pakistan and Bangladesh [14]. This is supported by data provided from the International Trade Centre (ITC), which states that Malaysia mainly imports live bovines from Australia and Thailand (Figure 5A), whereas fresh and frozen beef is imported from various countries, with the majority coming from Australia (Figure 5B, C). Malaysia is massively dependent on importing live buffaloes for slaughter (Figure 6) and imported beef from other countries (Figure 7) to support local needs. For instance, in Sarawak, the number of imported live buffaloes has increased over the past three years from 150 heads in 2017 to 300 by 2019 (Table 1). This shows the high level of dependency on imported buffaloes for beef supply for Sarawak.

Figure 5: A) Live bovine imports by country of origin, B) Fresh/chilled beef imports by country of origin, C) Frozen beef imports by country of origin, 2018 (Source: International Trade Centre, ITC).

Figure 6: Import of live buffalo for slaughter in Malaysia, 2015-2019 (Source: Department of Veterinary Services, DVS).

**PROGRESSION OF BUFFALO REARING SYSTEMS IN SARAWAK**

Farmers in Sarawak have been breeding and rearing buffalo for decades. In general, more than 90.0% of the ruminant population in Malaysia is still produced by small farm holders [14]. Most of them have been involved in this industry for over 20 years, with some being family businesses passed down from one generation to another [18]. The majority of local buffalo farmers in Sarawak practice an extensive management system (or traditional system) for their buffaloes. Small-scale farmers mainly practice an open system where their buffaloes are left to graze in unutilized open fields or pastures. Access to water bodies such as streams/rivers or watering holes for their buffaloes to wallow in is also common. The open pasture or grazing area is known as ‘halaman’ in Sarawak. The rearing area may or may not be fenced up. Open grazing systems are common among smallholders where the locals of Jawhar and Peint Tahsils also practice open grazing for their herds in the forest and agriculture fields after harvesting crops [19].
In the provinces of Rambutan and Indralaya in Indonesia, farmers let their buffaloes loose from pens to graze and wallow in the morning and lead them back in the afternoon [20].

In Sarawak, the ‘Natad kerbau’ (buffalo yard) system was introduced under the Buffalo Entrepreneurs Programme in 2016 (Figure 8). The term ‘Natad kerbau’ comes from the local language of the LunBawang ethnic group, and the term refers to a fenced area used to house a herd of buffaloes (pers. comm.). This buffalo yard is a system that aims to enhance the traditional methods of breeding buffaloes to increase the buffalo population in Sarawak. ‘Natad kerbau’ involves a semi-intensive management system across eight hectares of land. This system entails a more precise husbandry system that meets the buffaloes’ nutritional needs coupled with enhanced animal husbandry. The land is fenced with hardwood

Table 1: The Import of Buffalo Beef (kg) from 2018-2019 and Importation of Live Buffalo to Sarawak from 2017-2019
(Source: Department of Veterinary Services, Sarawak)

| Year  | Indian Beef/kg | Live buffalo import/head |
|-------|----------------|----------------------------|
|       | Male           | Female                     | Total   |
| 2017  | 3,417,038      | 15                         | 135     | 150 |
| 2018  | 4,590,688      | 20                         | 209     | 229 |
| 2019  | 8,007,726      | 2                           | 300     | 302 |
| Total | 8,007,726      | 37                         | 644     | 681 |

*n/a not available.

Figure 8: Layout of ‘Natad Kerbau’ that was introduced by the Department of Veterinary Services (DVS) Sarawak.
fencing and barbed wire; additionally, stables are constructed for the buffaloes; Napier grass sufficient for 50 buffaloes is grown in open areas under the cut-and-carry feeding system. The main goal of ‘Natad kerbau’ is to provide a systematic method for increasing the number of buffaloes in Sarawak. This undertaking is complicated and requires both strategic planning and intense rearing effort. A secondary goal of this system is to curb the occurrence of buffalo theft which is a problem endured by many buffalo breeders in Sarawak. Breeders are encouraged to register for the ‘Natad Kerbau’ system under the Department of Veterinary Services (DVS) Sarawak. The total number of buffalo breeders currently registered with the Sarawak DVS is currently 484 since the system was introduced to farmers (pers. comm.).

ISSUES AND CHALLENGES IN BUFFALO FARMING

The buffalo industry, especially in Sarawak, has stagnated over recent years, leading to a retarded growth rate in the number of buffalo farmers as well as in the total population of buffaloes. Buffalo farming has largely been neglected in preference to other livestock such as cattle and goats. A major challenge facing the local beef industry is the slow growth rate of local beef production in relation to the exponential rise in demand. Although the government has undertaken efforts to improve the industry through successive Malaysian plans, the slow growth rate of the beef production industry persists.

The niche market for buffalo meat in specific regions has not yet been fully exploited. In Sarawak, the Limbang and Lawas Division accounts for 86% of the buffalo population in the state, but the opportunity to develop buffalo as a major source of meat has not been exploited until recently. The state government has now begun to focus on developing breeding and production technologies for buffalo. Over the past five years, Malaysia imported 75-80% of her beef requirements from different parts of the world to meet the domestic demand [14]. Local beef production has been sidelined in the face of the lucrative beef import industry.

The lack of advanced breeding and rearing systems for buffalo farming is another key challenge for the buffalo industry. Technologies such as artificial insemination (AI) and embryo transfer technology (ET) have yet to be applied in the breeding and production of buffalo and the entire livestock industry in Malaysia. This, despite the shift towards modern methods in the management and production of livestock in recent years [21]. For instance, in the United States of America, it has been shown that 99% of the presently available Holstein Al sires and 95% of the currently existing Jersey Al sires, as well as their previous lineage, were developed via ET, which indicates the impact that ET has had on dairy cattle genetic development through the production of Al sires [22]. Thus, the neglect of buffalo in the livestock sector, the preference for importing cattle and buffalo beef from other countries, coupled with the lack of technology adoption in breeding and development of the buffalo industry are some of the major challenges to be met. Mitigation measures may also be necessary to curb any detrimental effects to the industry and improve buffalo farming and production in Sarawak.

FUTURE DIRECTION OF BUFFALO INDUSTRY IN SARAWAK

In recent years, the buffalo industry gained considerable interest from the government due to the potential of commercializing buffalo-based products such as meat, cheese and milk [23]. The government's primary focus is to minimize Sarawak's reliance on food imports by setting a target of 50% of SSL for Sarawak beef supply by 2030 and making Sarawak a net exporter of food within the next 12 years (pers. comm.). The ‘Natad Kerbau’ program and the system are methods to achieve this goal. Under the 11th Malaysia Plan (11MP), farmers will be assisted by training in modern farm management techniques and artificial insemination methods to increase calf production. The current focus of the buffalo industry is to increase the buffalo population numbers from 5,500 to 11,000 by 2025, with the primary focus area to achieve this target being the Limbang Buffalo Valley, with a greater focus on the reorganization and transformation of the industry.

Buffalo farming in Sarawak has the potential to become a lucrative effort that can contribute meaningfully to the economy. Thus, with more initiatives and approaches to raise the production of local goods, this industry should flourish. Both governmental agencies and private enterprises are keen to develop the buffalo industry have been recognized as an important resource for red meat with the potential to fulfill the high demand for animal-based protein. Recent initiatives to increase the population of male buffalo calves as an additional source of good quality meat are one of many potential avenues to promote the growth of this industry. Another interesting
effort by the Ministry of Modernization and Agriculture Sarawak through the State Veterinary Department is developing a pilot dairy production centre within the Maragang Buffalo Station in Limbang, designed to house between 600 and 1000 dairy buffalo for both milk and Mozzarella cheese production. The dairy centre is still in the master planning stages, and the construction of facilities is estimated to begin by 2022 (pers. comm.). Such efforts bode well for the industry’s future and could lead to a decrease of imported meats as well as dairy products into the country, and finally achieving the target for SSL of red meat production in Sarawak.

CONCLUSION

In conclusion, buffaloes are important livestock in Malaysia. Buffalo has been and continues to be an integral part of the local socio-economic structure, especially amongst smallholder farmers in Sarawak. The development of the buffalo industry in Sarawak is of economic importance and value for preserving the traditions of the local communities. Thus, the role of the buffalo in sustainable agriculture continues. Increased local buffalo meat production would decrease the state government’s reliance on imported meats and boost chances of achieving the SSL target for red meat production in Sarawak. However, there is a lack of information on breeding, knowledge on meat quality, growth performance, carcass characteristics, reproductive physiology, and disease status on domestic water buffalo in this region; thus, further studies are needed to narrow the gap.

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CONFLICT OF INTEREST

The authors declare they have no conflict of interest.

END NOTE

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