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Mini Review

Buffaloes Production and Reproduction Efficiencies as Reviewed for Parity in Nepal

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Abstract

Buffalo rearing is major part of Nepalese agriculture and they are reared for milk, meat, draft power and manure. Buffaloes are the main source of milk production in Nepal producing about 65.3% of the total annual milk in the country. Different indigenous breeds such as Lime, Parkote and Gaddi as well as Indian Murrah and Nili Ravi are recorded in Nepal and they are raised in different management and production system. Different genetic and non-genetic factors cause variation in production and reproduction performance between these breeds and within these breeds also. Non genetic factors affecting the performance of these buffaloes are season of calving, parity, management practices, nutrition etc. In this paper, effect of parity on production traits such as colostrum period, lactation length, lactation yield and days to reach peak milk yield as well as reproduction traits such as calving interval, dry period and service period are reviewed. Thus, this paper after reviewing related articles from various journals, proceedings and magazines is aimed to evaluate the effect of parity on reproductive and production efficiency of buffaloes of Nepal. Though the performance of indigenous breed is generally considered low, there is high potential of these breeds under proper breeding and management programs.

Keywords: buffaloes; lactation; parity; production; reproduction

Introduction

Livestock is the major part of Nepalese farming system and plays significant role in Nepalese economy. It contributes around 11% to the national Gross Domestic Product and more than one-third of the total agriculture gross domestic production. Buffaloes are one of the major livestock raised in Nepal. Buffaloes are raised for milk, meat, draft power and manure. The world population of buffalo is estimated as 199 million (FAO, 2012) with more than 96% of the population located in Asia. Buffaloes are the main source of milk production in Nepal producing about 65.3% of the total annual milk in the country, which is equivalent to 1210 thousand MT of milk (MOLD, 2017) (Fig. 1). According to Ministry of Agriculture Development's Livestock Population Report 2015/16, there are around 5 million buffaloes scattered across the nation.

In Nepal, buffaloes are reared in mixed farming systems and their production systems vary greatly across the agro-eco zones. In Southern Terai, inner Terai and mid-hill, buffaloes are mainly kept under complete stall-feeding during seasons of crop cultivation and are occasionally allowed to graze freely in the crop fields whenever there are no standing crops. In the Himalayan foot hill region, grazing of buffalo in pasture, forests and recently harvested crop fields is more frequently seen, although people keep the milking buffalo within the fence of the homesteads. In the high hills and mountains, they are even reared under migratory herds and they are taken up to the high altitude of alpine pasture, sometimes beyond 3500m. Buffaloes in Nepal are well known for their ability to feed on low quality forage, as they utilize crop residues such as straws of rice, millet, wheat and legumes across all agro-eco zones, but are also fed on green forage. Usually milking buffalo are offered with high quality green fodder and some supplemental grains on regular basis (Rasali, 2000). Buffalo population in Nepal can be broadly classified into three groups based on their breed characteristics- Hill buffalo, Terai buffalo and Indian breeds. Lime, Parkote and Gaddi are the three breeds of Hill buffalo. Lime are found in greater number in the northern areas of high hills and mountains, Parkote are found more towards the southern mid hills. Gaddi buffaloes are found in the Far-western Development Region (Rasali, 1998). Due to lack of systematic study on the population and breed characterization, Terai buffalo are largely considered as the non-descript type. Apart from these indigenous buffalo, about 10 % in the hills and little over 10% in Terai, of the total buffalo population, are said to be of Indian Murrah breed or their crosses which have come into existent in the various pocket areas of the country as a result of crossbreeding programme and occasional imports of buffaloes from India. There has been also introduction of Nili Ravi breed into Nepal (Rasali, 2000). Year wise milk production trend of buffaloes is shown in Fig. 2.

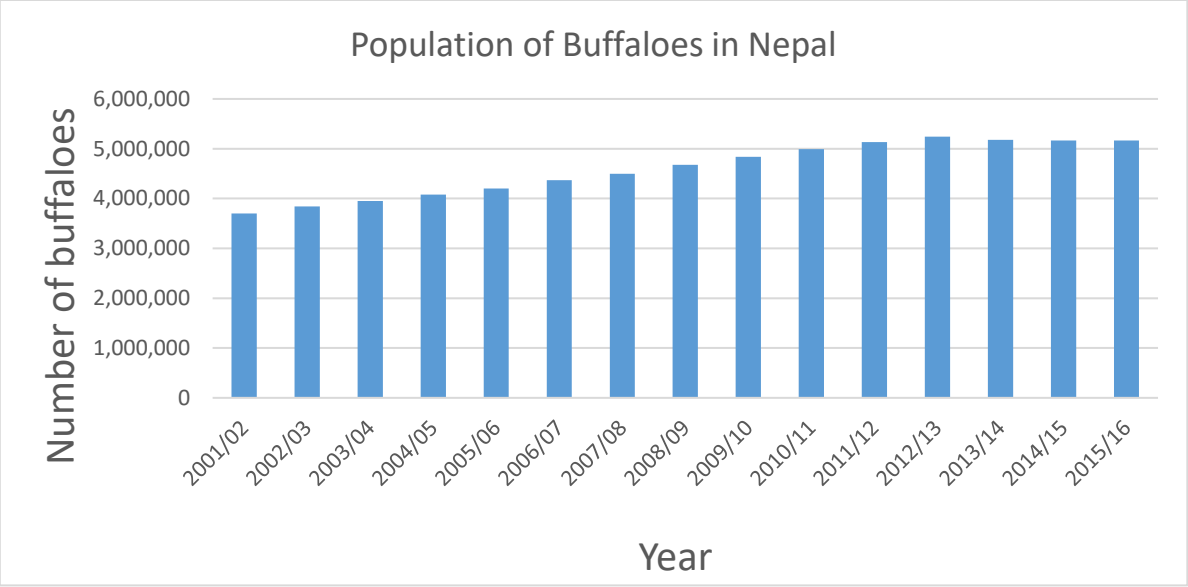

Fig 1: Buffalo population in Nepal (MOAD,2017)

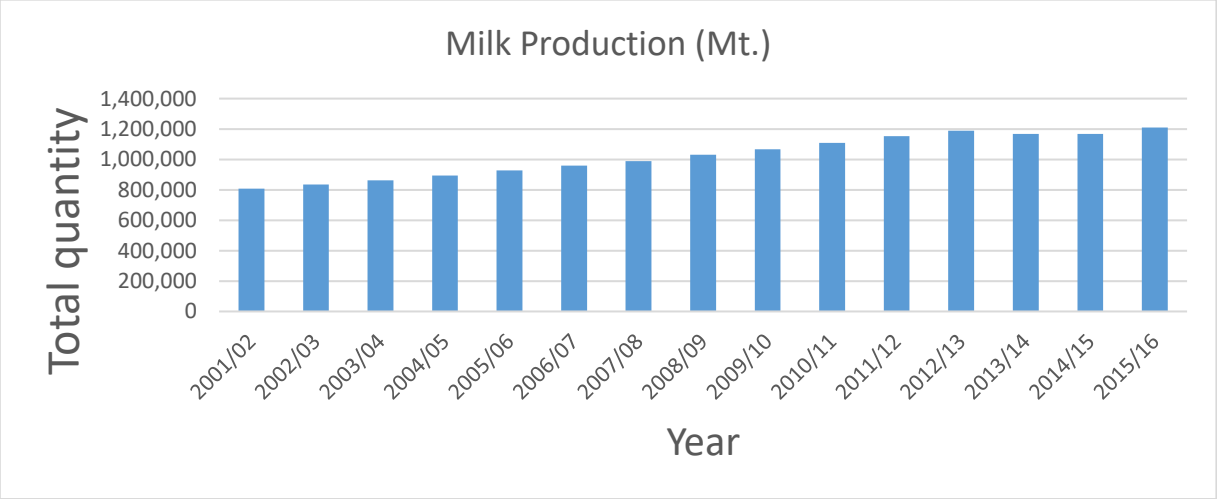

Fig 2: Year wise milk production trend of buffaloes (MOAD, 2017), Mt- Metric tone

There is great variation in production and reproduction ability between these breeds and within these breeds. These variations may arise not only due to genetic factors but also due to different non-genetic factors like management practices, environmental variations, season of calving, nutrition, parity, disease condition etc. Among these factors, parity plays an important role in some of the milk production and reproduction trait.

Production Traits

Different production traits that are considered in this study are Lactation length, Lactation yield, Colostrum period and Days to reach peak milk yield. These traits are considered as economically important and some of them are greatly affected by increasing parity.

Lactation Length (LL)

It is the time period of secretion of milk from mammary glands after parturition until another calving. Lactation length of 305 days is considered as ideal length for buffaloes. Lactation length was high (309 days) in first parity and was low (284 days) in sixth parity (Chaudhry, 1992) compared to LL of 265 days (shortest) and 278 days (longest) in fifth and first parity (Afzal *et al*., 2007) respectively which was not much different in Nili Ravi buffaloes in Pakistan. LL of Parkote, Lime and Murrah cross was 285 days, 276 days and 269 days respectively in western hill of Nepal which showed shortest LL in Murrah cross and longest LL in Parkote (Shrestha *et al*., 2005) and average LL of local buffaloes was 326 days and that of Murrah cross was 321 days in eastern hills (Shrestha *et al*., 1994). LL of 333 days was observed in first and second parity and was increasing in fourth and above i.e. 355 days in Murrah crossbred (Poudel *et al*., 2017) (Fig. 3). In research performed in western hills, LL of 364 days was observed in first-third parity, 346 days in fourth-sixth parity and 394 days in seventh and above in Lime buffalo (Sharma *et al*., 2017). LL of 356 days in first-third parity, 364 days in fourth-sixth parity and 394 days in seventh and above was reported in Parkote breed (Sharma *et al*., 2017). LL of 310, 291 and 268 in first, second and third parity were observed in Venezuela in water buffaloes (Nava-Trujillo, 2018).

Lactation yield

Total milk yield per lactation is one of the most important characteristics of dairy buffaloes. Lactation yield (LY) was high i.e. 2150 kg milk in seventh parity and was low i.e. 1818 kg milk in sixth parity (Chaudhry, 1992) whereas milk yield was least in parity 1 and high in parity 4 and yield of first parity was not much different from fifth, sixth and seventh parity (Afzal *et al*., 2007) in research conducted on Nili Ravi buffalo in Pakistan. There was least milk reduction in third parity followed by 2,4,1,5 and 6 and this result indicates that third parity is best in dairy buffalo for milk production in Pakistan (Khan, 2008). Total LY as high as 2486 liters in fourth parity and as low as 2061 liters in sixth parity in Haryana in Murrah buffalo was observed (Verma *et al*., 2017). In Nepal, high yield in second parity (2301 lit) and low yield in fifth-sixth parity (1176 lit) in standard 305 days MY in Murrah and indigenous breed of Terai region was reported (Hayashi, 2006) (Fig. 4).

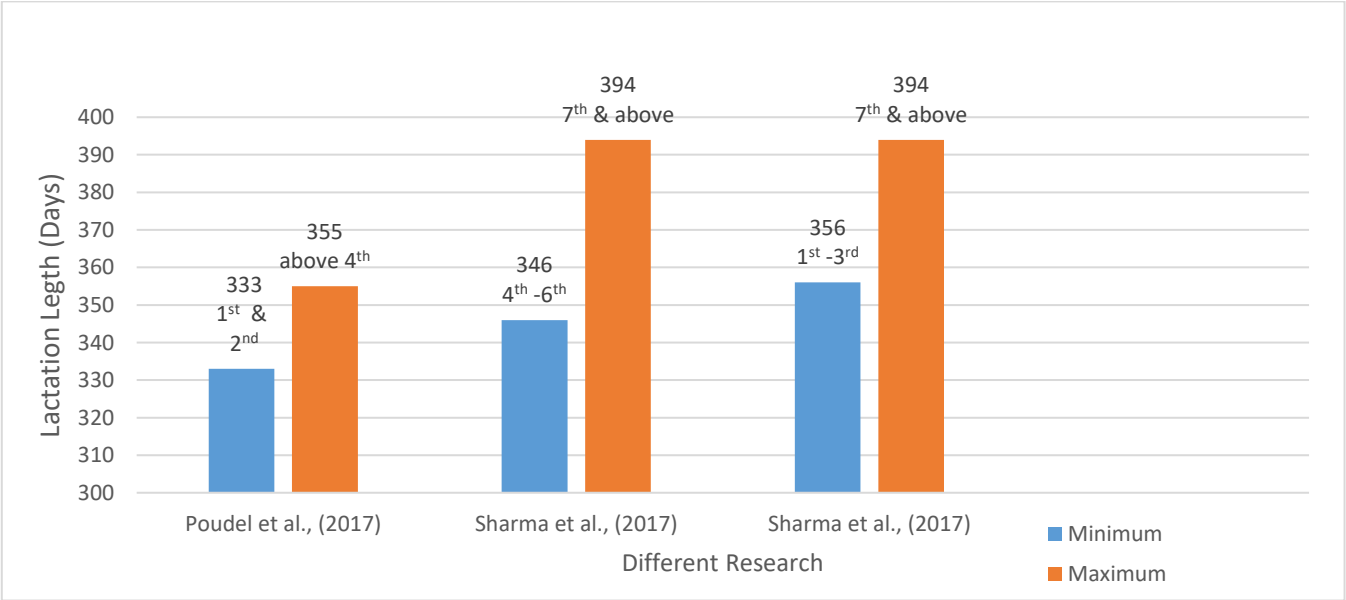

Fig 3: Maximum and Minimum Lactation Length in Different Parity. Above figure indicates difference in lactation length per parity as concluded from different articles.

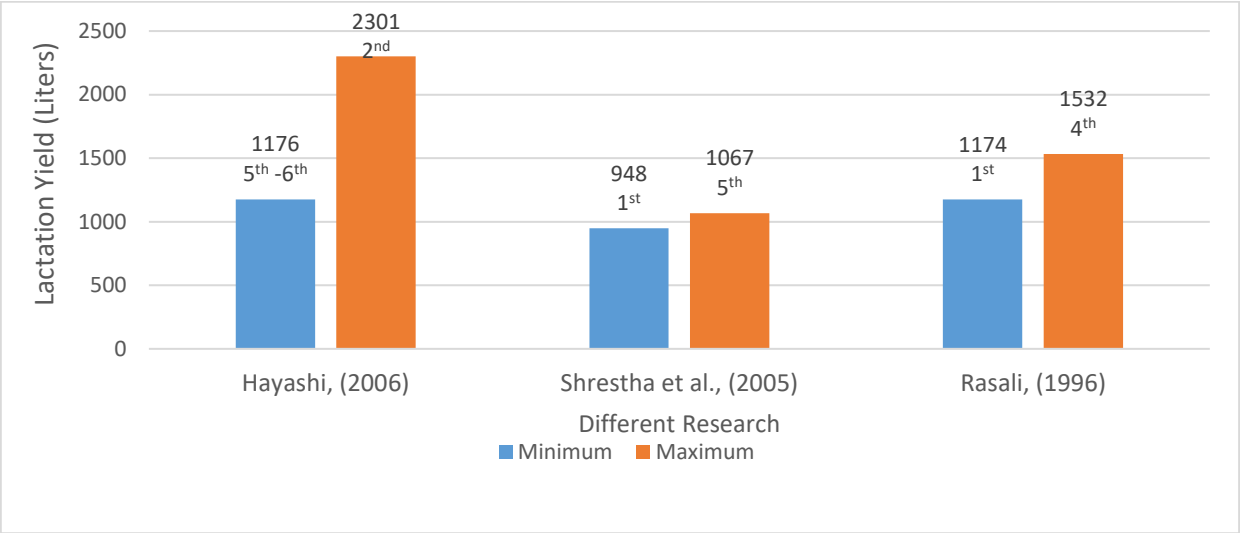

Fig 4: Maximum and Minimum Lactation Yield in Different Parity. Above figure indicates difference in total lactation yield per parity as concluded from different articles.

In standard 305 days MY, 948 lit MY in first parity in indigenous buffalo which was lowest and 1067 lit MY in fifth parity which was highest was reported (Shrestha *et al*., 2005) compared to the report of (Rasali *et al*., 1996) where, MY was high in seventh and lowest was in ninth parity in western hills of Nepal. In local breed, LY was highest in first parity and lowest in seventh-eighth parity compared to LY of Murrah crossbred which was reported highest in fifth parity and lowest in sixth and above (Shrestha *et al*., 1994). It was found that, in 305 days MY, 1174 liters was produced in first parity which increased in later parities and was highest in fourth, but it was in decreasing order after fourth in local as well as Murrah crossbred (Rasali *et al*., 1996). TLY of water buffaloes in Venezuela was found to be 1327,1362 and 1345 liters in first, second and third parity which showed not much variation in total lactation yield (Nava-Trujillo, 2018). Average daily MY of Lime was 1.96 liter in first-third parity, 2.52 liter in fourth-sixth parity which was high and again MY decreased to 1.84 liter in seventh and above compared to Parkote which has high MY in first-third parity and was low in seventh and above in western hills of Nepal (Bhattarai *et al*., 2018).

Colostrum Period

Colostrum period of 3-5 days is generally reported after calving and then milk composition is normal. Colostrum period of first to fourth parity was reported as 5 days whereas colostrum period above fourth parity was 6 days (Poudel *et al.*, 2017). There was not much variation in colostrum period of Murrah buffaloes in Central Nepal. 3 days of colostrum period in first to sixth parity and 2 days in seventh and above in Lime breed whereas 3 days of colostrum period in Parkote breed in all parity (Sharma *et al*., 2017). Similar values of colostrum period in both Lime and Parkote was reported and parity had no significant effect on colostrum period. It was suggested that colostrum period of Murrah is up to 5 days irrespective of management practice (Smijisha *et al*., 2012). There will be higher economical return if there is low number of colostrum days (Poudel *et al*., 2017).

Days to reach peak milk yield

The time required for maximum milk production after calving is called as days to reach peak milk yield (DPMY). It is considered that shorter the time of DPMY, it is economically more profitable but there must be persistency in milk yield. Days to reach peak milk yield (DPMY) was recorded as 21 days in third-fourth parity but it was 24 days in first, second and above fourth parity in Murrah crossbred in central Nepal (Poudel *et al*., 2017). It was reported DPMY of 14 days in first to third parity and 13 days in fourth and above in Lime breed but DPMY was high in seventh and above parity in Parkote breed (Sharma *et al*., 2017). This research suggested there was no difference in the value of DPMY with respect to parity in both Lime and Parkote. The value of DPMY was not different in both Parkote and Lime breed whereas higher value of DPMY (5-6 weeks) was observed in case of Murrah crossbred (Poudel *et al*., 2011). DPMY of Lime breed was around 36 days. There was not much effect of parity on DPMY and average DPMY was 48 days in Nili Ravi breed in Pakistan (Chaudhry *et al*., 2000).

Reproduction Traits

Different reproduction traits that are considered in this study are Calving interval, Dry period and Service period. These traits are also considered economically important and greatly affect the lifetime production of animal. Also, these traits are affected by increasing parity.

Calving Interval

In buffaloes, one calf for every 15 months is considered profitable. Available evidence shows that calving interval (CI) of buffaloes is between 12-15 months. CI of 470 days (longest) in first parity and shortest i.e. 451 days in fifth

parity (Jamal *et al*., 2018) and CI of 467 days in first parity and 438 days in third parity (Sanker *et al*., 2014) was reported in study conducted in India in Murrah buffaloes. The CI for water buffaloes in Venezuela was 497 days in first parity and 418 days in third parity and more (Nava-Trujillo., 2018). CI of 645 days was recorded in the study conducted by Mishra in Gaddi buffaloes in Dadeldhura and Baitadi in 2002. In another study (Rasali, 1996), longest CI of 624 days was reported in tenth parity and more and shortest i.e. 505 days was found in ninth parity and 521 days of CI was reported in fifth parity in indigenous buffaloes in western hills of Nepal. Similarly, longest CI of 646 days was reported in sixth parity and 476 days which was shortest CI was reported in fifth parity in Murrah crossbred and indigenous hill buffaloes in Nepal (Rasali, 1996). Average CI of Murrah cross was shorter (545 days) compared to Lime (600 days) and Parkote (604 days) in research conducted in NARC, Lumle (Shrestha *et al*., 2005).

Dry Period

Dry period of 175,135 and 105 days in first-third, fourth-sixth and above sixth parity was recorded respectively in Lime and Parkote (Sharma *et al*., 2017). Value of dry period decreased with increase in parity. The dry period is longer (290 days) in 1st parity in Nili Ravi buffalo and there was gradual decrease in value of dry period in later parities (Basir *et al*., 2015). Similar result i.e. gradual decrease in dry period value with increasing parity was also reported (Kandasamy *et al*., 1993). Dry period was high (135 days) in first-second parity and low (87 days) in third-fourth parity in Murrah crossbred in central Nepal (Poudel *et al*., 2017). Dry period of 144 days was reported in different buffaloes which was higher than that of optimum range (Sanker *et al*., 2014).

Service Period

Optimum service period is considered 60-90 days for buffaloes. Service period of Lime, Parkote and Gaddi was recorded as 190, 175 and 350 days respectively (Neupane *et al*., 2007). Service period of 198,195 and 212 days in Lime, Murrah cross and Parkote respectively (Shrestha *et al*., 2005). Service period of 112 days was recorded in first parity and its value was declining and was lowest (57 days) in tenth parity and more in local and Murrah crossbred (Rasali, 1996). Longest service period was 214 days in first parity and shortest was 152 days in sixth parity in Nili Ravi buffaloes in Pakistan (Cady *et al*., 1983). Longest service period was observed in first parity (157 days) which had significant differences from other parities and shortest service period was recorded in sixth parity (137 days) in Murrah buffalo in India (Jamal *et al*.,2018).

General Remarks

Generally, past research works conducted in Nepal as well as in India, Pakistan and other countries to evaluate production and reproduction traits of different breed of buffalo clearly shows great range of variation. Research in Nepal showed that the traits such as lactation length and total milk yield were low during early parity and increased mostly during mid parity and then declined gradually in later parities but the traits such as service period, calving interval and dry period had high value in early parities and gradually decreased in later parities. The reasons for variation in production and reproduction traits may be due to differences in climatic condition, management practices, nutrition, proper health care and differences in breed as well. But there was not much variation in colostrum period and days to reach peak milk yield with respect to parity. Also, low performing animals were culled after third and fourth parity and only high performing animals were kept for production and thus this might be the reason for better performance of animals in later parities as shown in some research. Due to culling of animal after fourth and fifth parity, there was low availability of animal for research purpose.

In Nepal, the performance efficiency of Murrah crossbred was found comparatively higher than that of indigenous breed such as Lime, Parkote and Gaddi. There has been some increase in production and reproduction performance as a result of the national programme of crossbreeding the indigenous buffalo with Indian Murrah. Efforts are being made to improve the productivity of indigenous buffaloes. Several researches were conducted in research centers in the past to evaluate and improve the productivity of indigenous buffaloes. Thus, appropriate breeding or mating plans along with proper nutrition supply and good management practice would be a key to improve the reproduction and production efficiency of local buffaloes.

Conclusion

It is clear from the information presented in this review that the some of the performance traits of buffalo breeds of Nepal is highly variable in relation with parity. However, there is good potential to increase production and reproduction efficiency of indigenous breed by breeding with Murrah buffaloes as well as by providing proper nutrition, good management practices and proper health care. Also, it would be more economical to cull the animals after fifth-sixth parity as there was not much production and reproduction efficiency.

Author's Contribution

All authors contributed equally in all stages of research and preparation of manuscript. Similarly, final form of manuscript was approved by all authors.

Conflict of Interest

The authors declare that there is no conflict of interest with present publication.

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