Original Article

Buffalo Bulletin (October-December 2022) Vol.41 No.4
https://doi.org/10.56825/bufbu.2022.4144572

ASSESSMENT OF PRODUCTION TRAITS AND LACTATION WISE ECONOMICS OF BUFFALO IN PUNJAB STATE OF INDIA

Inderpreet Kaur, Nivedita, Varinder Pal Singh and Hanish Sharma*

Received: 10 September 2021
Accepted: 24 December 2022

ABSTRACT

Buffalo is considered as the dairy animal for modern times due to its higher adaptability and productivity in the changing climatic conditions. In India, large part of the milk production comes from small and medium dairy farmers. Buffalo contributes 45.44% to the total milk production in India. With only 3.65% of the total buffalo population of India, Punjab contributes 7.91% of the total buffalo milk production. In Punjab, around 70% milk production comes from small and medium dairy farms with herd size of 2 to 10 animals, another 25% from large/commercial herds and the rest from domestic (1%) and peri-urban dairies (4%), which are concentrated around big cities. In Punjab, buffaloes produce about 56.38% of the total annual milk production in the state. The current study was conducted in three agro-climatic zones of Punjab by selected 90 buffaloes farmers in the district *viz*. Hoshiarpur, Patiala and Mansa by simple random sampling method. The economics of buffalo was calculated on lactation basis. The average age at 1st calving was 43 months, and inter-calving period was 469 days, lactation length (days) was 281 days, dry period (days) was 188 days, average milk yield (liters/day) was 8.3 lts/day. The lactation-wise total cost of rearing buffalo was highest in 2nd lactation i.e. Rs. 95393 and the net profit was Rs. 52335 in 4th lactation period. Thus, buffaloes contribute positively to the income which makes its rearing beneficial financially.

Keywords: *Bubalus bubalis*, buffaloes, management, lactation, production traits

INTRODUCTION

Livestock farming in India is an important subsidiary occupation of agriculture and plays an important role in uplifting the rural economy by providing gainful employment to small and marginal farmers, agriculture labourers and farm women Livestock sector is one of the most important and fastest growing agricultural subsectors in India. It plays an important role in agricultural sector as evident from its contribution to the total agricultural GDP which is recorded as 28% in India during 2019 to 2020 (NDDB, 2020).

India possesses the best milch breeds of the world namely Murrah, Nili Ravi, Surti and Jaffrabadi which had their origin in north - western states of India and have high potential for milk and

College of Dairy Science and Technology, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, Punjab, India, *E-mail: sharma.hanish@yahoo.com

fat production besides being used for work and surplus stock used for meat production. Bovine population of India is 303 million. (Cattle-192 million, buffalo-110 million). Buffalo population in India has increased by 30.45% in last three decades. Female population has increased by 50.43% while male population has decreased by 46.49% during this period. This trend has shown that buffalo has gained prominence in Indian livestock sector in spite of the fact that government policies in India are more tilted towards cattle development.

Punjab is a predominantly agricultural state with 83% arable land area and 180% cultivation intensity. Green revolution has changed the overall scenario of agriculture in Punjab. Punjab is a leading dairy state in India. Dairy sector in state is growing at an annual growth rate of about 3%. Per capita availability of milk in Punjab is 1219 grams/ day, which is highest in the country. With 13.39 Million Tons (MT) milk production (2020 to 2021), Punjab's contribution to the national milk pool is 6.38% (BAHS, 2021). Since 1970 to 1971 more than six-fold increase in milk production has been recorded in the state. Species wise analysis indicates that between 1997 to 1998 to 2019 to 2020 milk production from buffaloes have grown at the highest rate of 2.67% CAGR, while during the same period milk production from cross bread cows and indigenous cows have recorded 2.65% and 0.86% growth on CAGR basis, respectively (ESO, 2020). Livestock sector contributes 36.23% share in the state's agricultural GDP. The total bovine population of Punjab is 6.54 million; out of this, the total buffalo population in Punjab is 4.01 million; out of which female population constitutes 3.83 million i.e. around 95.59% and male population is 0.17 million i.e. around 4.40% (Ministry of Fisheries, Animal Husbandry and Dairying, 2021). The share of buffalo population is 61.32% in total bovine population in Punjab state and 3.65% in India. The share of buffalo milk production in the state is 56.38%.

Earlier some research works on the economics of milk production has been conducted by the different researchers such as Singh and Agrawal (2007); Bardhan and Sharma (2012); Sunil *et al.* (2016); Chand *et al.* (2017) studied economics of milk production at different part of India but none of the studies based on lactation basis. None of the studies in Punjab have made assessment on production traits of buffalo.

MATERIALS AND METHODS

Materials

Total 90 buffaloes farmers were selected in three agro- climatic zones of Punjab state *viz*. Zone 1 (Sub Mountainous Zone), Zone 2 (Central Zone) and Zone 3 (South- Western Zone) for data collectionin the current study. Three districts, one from each zone were selected *viz*. Hoshiarpur, Patiala and Mansa respectively.

Methods

The information on capital investments, fixed cost, variable cost, price of milk, price of female and male calves werewas collected from the respondent buffalo farmers by personal interview method using a specially designed and pre-tested questionnaire. The tabular analysis was used for interpretation of results and calculation of the Production traits of buffaloes. The analysis was carried out on per farm basis. Per farm analysis included the age at 1st calving, lactation length, dry period, Inter calving period, average milk yield, peak milk yield of buffalo.

For calculating lactation wise cost, the

selected buffaloes were divided into 7 lactations. The cost of each variable was calculated on lactation basis. Income earned from the sale of milk, sale of male calves, sale of unproductive animals and sale of manure were also calculated on lactation basis.

RESULTS AND DISCUSSIONS

Population structure by zones

Total population of buffaloes in the study area of Punjab was 2259; out of which 310 (13.72%) were female calves, 216 (9.56% percent) male calves, 343 (15.18%) heifers, 1390 (61.54%) adult female, 866 (62.30%) in-milk and 524 (36.70%) dry buffaloes are presented in Table 1. In zone wise analysis, total buffalo population found to be highest in Zone 3 with 764 buffaloes, female calves were highest in Zone 2 with 107 number (14.42%), heifers highest in Zone 1 with 124 number (16.48%), male calves highest in Zone 3 with 77 number (10.07%) and adult females highest in Zone 2 with 467 number (61.14%). Out of adult females population; in-milk buffaloes with 303 number (65.44%) highest in Zone 2 while dry buffaloes highest in Zone 1 with 184 number (40%).

Socio economic characteristics by zones

Rural households in typical rural communities in India show great heterogeneity in socioeconomic parameters, and Punjab is no exception. Attempts were made to record key socioeconomic parameters of surveyed households, including literacy, age, primary occupation, and experience in the dairy industry. The information pertaining to the socio-economic details of the sample households of Zone 1, Zone 2 and Zone 3 are presented in Table 2.

The Age group of farmers was categorized into different categories. The maximum buffalo farmers i.e.i.e., 37.77% were in the Age group of 30 to 40 years followed by 23.33% in the 20 to 30 Age group, 22.22% in the 40 to 50 Age group and remaining 16.68% in the <50 Age group. In the zone wise analysis, highest proportion of farmers (53.34%) were in the Age group of 30 to 40 years observed in Zone 2 followed by 40 to 50 Age group farmers (26.67%) found in and 30% in the <50 Age group found in Zone 3.

Literacy level of rural households is considered to have strong effect on the rearing of buffalo and buffalo male calves. As literacy level of farmer goes on increasing accordingly his knowledge, awarenessawareness, and skills regarding scientific rearing of buffalo and male calves get increased. From the study results it was observed that 100% per cent of buffalo farmers are literate in the study area. Amongst the literate farmers; farmers, maximum proportion of farmers i.e. 76.66% were educated up to metric level, 14.46% were taken higher secondary level education and each of 4.44% farmers educated up to middle and graduates and above level. In zone wise analysis, 86.66% of farmers educated up to metric level in Zone 1, 66.66% per cent in Zone 2 and 76.67% in Zone 3.

About 50% farmers were having 10 to 20 years of experience, 28.88% farmers having 5 to 10 years of experience and remaining 21.12% farmers having 1 to 5 years of experience. In zone wise analysis, the proportion of farmers have experience of 5 to 10 years were 33.33% in Zone 1 and 63.33% of farmers have experience of 10 to 20 years in Zone 2. Siddiki *et al.* (2015) stated that 83.42% farmers had above 5 years of experience which is in line with the findings of the present study.

The information regarding the main

occupation of the household is useful to analyze the adoption status of dairy farming as main or subsidiary occupation. About 87.77% of the household have dairy farming as their main occupation, while crop farming as main occupation adopted by only 6.66% of the households while the remaining 5.57% households either business or service as their main occupation. In zone wise analysis, highest proportion of farmers having dairy as their main occupation was found in Zone 1 (90.1%) and highest proportion of farmers having crop farming as their main occupation was found in Zone 2 (10%) and highest proportion of households having business and service as their main occupation was found in Zone 3 (6.67%).

Production traits of buffalo

The information regarding the physical parameters of buffaloes on buffalo farms in Punjab has been presented in Table 3. A table informed that age at 1st calving (months) on farm was 43 months and Intercalving period (days) was 469 days and lactation length (days) was 281 days and dry period (days) was 188 days and Average milk yield (liters/day) was 8.3 lts/day and Peak milk yield (litres/day) was 13.09 lts/day and AI per conception was 2. In zone wise analysis, age at 1st calving, Intercalving period (days) and lactation length was to be found highest in Zone 2 i.e. 45 months, 472 days and 287 days respectively and dry period (days) and average milk yield (lts/day) was to be found maximum in Zone 3 i.e. 190 days and 8.4 lts/day respectively. Peak milk yield (lts.) was maximum in Zone 2 i.e. 13.33 litres. As per the study conducted by Singh and Kaur, 2018, age at Ist calving was 44 months, lactation length was 284 days, dry period was 187 days, inter-calving period was 471 days. The results are in accordance with the study conducted by (Singh and Kaur, 2018); (Marques *et al*., 2020).

Lactation wise cost and returns from buffaloes in Punjab state

As per Table 4, during first lactation 20.75% of the total cost incurred on fixed cost while 78.75% incurred on variable cost. In variable cost 80.74% of expenses were incurred on feed cost alone while rest of the expenses were incurred on labour, veterinary and miscellaneous charges. In second lactation, 19.55% of the total cost incurred on fixed cost while 80.45% incurred on variable cost. In variable cost 81.66% of expenses were incurred on feed cost alone while rest of the expenses were incurred on labour, veterinary and miscellaneous charges. In third lactation, 20.74% of the total cost incurred on fixed cost while 80.31% incurred on variable cost. In variable cost 79.26% of expenses were incurred on feed cost alone while rest of the expenses were incurred on labour, veterinary and miscellaneous charges. During fourth lactation, 20.67% of the total cost incurred on fixed cost while 79.32% incurred on variable cost. In variable cost 80.10% of expenses were incurred on feed cost alone while rest of the expenses were incurred on labour, veterinary and miscellaneous charges. During fifth lactation, 20.71% of the total cost incurred on fixed cost while 79.78% incurred on variable cost. In variable cost 79.92% of expenses were incurred on feed cost alone while rest of the expenses were incurred on labour, veterinary and miscellaneous charges. In sixth lactation, 19.59% of the total cost incurred on fixed cost while 80.40% incurred on variable cost. In variable cost 74.41% of expenses were incurred on feed cost alone while rest of the expenses were incurred on labour, veterinary and miscellaneous charges. In seventh lactation, 19.44% of the total cost incurred on fixed cost while 79.90% incurred on variable cost. In variable cost 74.49% of expenses were incurred on feed cost alone while rest of the

Table 1. Distribution of buffaloes across agro-climatic zones of Punjab state, 2018-2019: (in numbers).

Zones	Total buffaloes	Females calves	Heifers	Male calves	Adult	In-milk	Dry
Zone 1	752 (100)	100 (13.29)	124 (16.48)	68 (9.04)	460 (61.19)	276 (60)	184 (40)
Zone 2	743 (100)	107 (14.42)	102 (13.75)	71 (9.52)	463 (62.31)	303 (65.44)	160 (34.56)
Zone 3	764 (100)	103 (13.48)	117 (15.31)	77 (10.07)	467 (61.14)	287 (61.46)	180 (38.54)
Punjab	2259 (100)	310 (13.72)	343 (15.18)	216 (9.56)	1390 (61.54)	866 (62.30)	524 (36.70)

Table 2. Socio- economic parameters Buffalo farmers across zones in Punjab.

Socio-economic parameters		Zone 1	Zone 2	Zone 3	Punjab
Literacy level	Up to Middle	0 (0)	3 (10)	1 (3.33)	4 (4.44)
	Metric	26 (86.66)	20 (66.66)	23 (76.67)	69 (76.66)
	10+2	4 (13.34)	4 (13.34)	5 (16.67)	13 (14.46)
	Graduate and above	0 (0)	3 (10)	1 (3.33)	4 (4.44)
	Total	30 (100)	30 (100)	30 (100)	90 (100)
Age (Years)	20-30	7 (23.33)	7 (23.33)	7 (23.33)	21 (23.33)
	30-40	12 (40)	16 (53.34)	6 (20)	34 (37.77)
	40-50	7 (23.33)	5 (16.66)	8 (26.67)	20 (22.22)
	<50	4 (13.34)	2 (6.67)	9 (30)	15 (16.68)
	Total	30 (100)	30 (100)	30 (100)	90 (100)
Experience in dairy farming (Years)	0-5	8 (26.67)	3 (10)	8 (26.67)	19 (21.12)
	5-10	10 (33.33)	8 (26.67)	8 (26.67)	26 (28.88)
	10-20	12 (40)	19 (63.33)	14 (46.66)	45 (50)
	Total	30 (100)	30 (100)	30 (100)	90 (100)
Main Occupation (On the basis of annual income)	Crop farming	1 (3.33)	3 (10)	2 (6.67)	6 (6.66)
	Dairy farming	27 (90.1)	26 (86.66)	26 (86.66)	79 (87.77)
	Business	1 (3.33)	0 (0)	2 (6.67)	3 (3.34)
	Govt./ Private job	1 (3.33)	1 (3.33)	0 (0)	2 (2.23)
	Total	30 (100)	30 (100)	30 (100)	90 (100)

Table 3. Production traits of buffaloes in Punjab state.

Particulars	Zone 1	Zone 2	Zone 3	Punjab
Age at 1st calving (months)	42	45	40	43
Intercalving period (days)	468	472	465	469
Lactation length (days)	281	287	275	281
Dry period (days)	187	185	190	188
Average milk yield (liters/day)	8.3	8.2	8.4	8.3
Peak milk yield (liters/day)	12.96	13.33	13	13.09
AI per conception	2	2	2	2

Table 4. Lactation wise cost and returns from buffaloes of Punjab state.

Particulars	Lactation (nos.)						
	1	2	3	4	5	6	7
Fixed cost (Rs. per animal per lactation)							
Depreciation on Building	1290	1290	1290	1290	1290	1290	1290
Depreciation on equipments 10%	3250	3250	3250	3250	3250	3250	3250
Depreciation on purchase of animals 5%				2813	2813	2813	2813
Appreciation on purchase of animals 5%	2813	2813	2813				
Interest on capital Investment 10%	11294	11294	11294	11294	11294	11294	11294
Total fixed cost	18646	18646	18646	18646	18646	18646	18646
Variable cost (Rs. per animal per lactation)							
Cost of green fodder	13105	13045	13296	13292	13334	13232	13266
Cost of dry fodder	11235	11175	11250	11235	11310	11175	11220
Cost of concentrate	32780.78	38451.66	32687.16	32780.78	32772.3	32536.02	32614.78
Veterinary Expenses	2000	2200	2000	2400	2000	2000	2800
Labour Expenses	7725	7825	8025	7931	7969	13579	12750
Misc. Expenses	4000	4000	4000	4000	4000	4000	4000
Total Variable Cost	70746	76747	71258	71539	71835	76522	76651
Total Cost	89839	95393	89904	90185	90031	95168	95927
Income (Rs. per animal per lactation)							
Sale of Milk	100040	98400	114513	119720	117252	105780	100983
Sale of animals	18000	20000	22000	20000	19000	16000	15000
Sale of dung	2000	2800	3000	3200	3000	2600	3375
Gross Income	120040	121200	139513	142520	139572	124380	119358
Net Return	30201	25807	49609	52335	49721	29212	24061

expenses were incurred on labour, veterinary and miscellaneous charges. The lactation wise income earned was 83.33%, 81.18%, 82.08%, 84%, 84%, 85.04%, 84.60% from sale of the milk in 1st, 2nd, 3rd, 4th, 5th, 6th and 7th lactation respectively. Net returns were positive in all lactations.

CONCLUSION

This study primarily focuses on the current scenario of breeding, productive and diverse breeds being reared in different regions of Punjab. The cost and income measures of milk production obtained in this study showed that buffalo milk production is relatively profitable. Thus, there is sound economic logic in persuading dairy farmers to keep buffalo to increase their income from milk production. Delayed animal maturity, seasonal breeders, long calving intervals, and low estrous signs are major obstacles to the reproductive efficiency of female buffaloes. There is need for right kind of subsidies and policy interventions for promoting buffalo farming in Punjab state. The buffalo farmers in three agro-climatic zones rely on commercialization of buffalo farming as their source of livelihood. The major constraints faced by the buffalo farmers were high age at first calving, high cost of rearing of heifer, inadequate knowledge about production traits of graded breed, longer inter-calving period. There is a need to overcome these constraints so that cost of rearing of buffaloes can be reduced. It is necessary to increase the lactation yield up to 3000 litres so that farmers can achieve the higher returns. Buffalo breeding has a positive outlook in Punjab as milk and meat production is increasing and there are proven indigenous buffalo breeding programmes that will help make buffalo farming more profitable. It may be possible to implement systematic AI-powered breeding programs using semen from bulls.

REFERENCES

Bardhan, D. and M.L. Sharma. 2012. Economics of milk production in Kumaun region of Uttarakhand. *Indian J. Dairy Sci*., **65**: 416-422. DOI: 10.5146/IJDS.V65I5.25436. G11828

Chand, P., S. Sirohi, A. Mishra and V.P. Chahal. 2017. Estimation of costs and returns from dairying in Malwa region of Madhya Pradesh. *Indian J. Anim. Sci*., **87**(3): 381-386.

ESO. 2020. *Statitical Abstract of Punjab.* Economic and Statistical Organisation, Department of Planning, Government of India, India.

GOI. 2013. Punjab State Farmers' and Farm Workers Commission. Government of India, India

Ministry of Fisheries, Animal Husbandry and Dairying. 2021. *Basic Animal Husbandry Statistics.* Department of Animal Husbandry and Dairying, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India, India.

NDDB. 2020. *Annaul Report 2020-2021.* National Dairy Development Board, Gujarat, India.

Siddiki, M.A., M.R. Amin, A. Kabir, M.O. Faruque and Z.H. Khandaker. 2015. Socio-economic status of buffalo farmers and the performances of buffaloes at Lalpur Upozila of Natore district in Bangladesh. *Bangladesh Journal of Animal Science*, **44**(3): 157-165. DOI: 10.3329/bjas.v44i3.26366

Singh, R.K. and S.B. Agarwal. 2007. Economics of milk production in Imphal west district of

Manipur. *Indian J. Dairy Sci*., **60**(6): 441-446.

Singh, V.P. and I. Kaur. 2018. Economics of buffalo in livestock production system in Punjab: Current status and future prospects. *International Journal of Current Microbiology and Applied Science*, **7**(10): 2702-2708. DOI: 10.20546/ijcmas.2018.710.314

Sunil, V.R., B.S. Chandel and G. Makarabbi. 2016. Economics of milk production in Mandya district of Karnataka. *Economic Affairs*, **61**(4): 659-665. DOI: 10.5958/0976-4666.2016.00081.4