EVALUATION OF PRODUCTIVE PERFORMANCE OF CATTLE IN DAIRY POCKET AREA OF CHITWAN AND NAWALPARASI DISTRICTS

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ABSTRACT

A study was conducted in major milk pocket area of Chitwanand Nawalparasi districts with the objective of assessing productive performance of dairy cattle reared in those areas. The study also aimed at categorizing the breed based on its breeding value to determine the most elite cow of different breeds.Four years of data send obtained from Animal Breeding Division in the period between (2008-2012) under the Dairy Cattle Improvement Program were reviewed and analyzed. Altogether, 18316 test day records of 728 animals of 172 herds were considered for evaluation. Results of the above study revealed that the overall least square mean and standard errors (LS mean and SE) of Lactation Milk Yield (LMY), fat percentage, and protein percentage were 2841±84.95 kg, 4.43±0.66 % and 3.33±0.1 %, respectively. Moreover, the study also revealed that breed had significant effect on milk yield ($p<0.001$), protein percentage ($p< 0.01$) and Fat percentage ($p< 0.001$). In addition, top dairy cattle are ranked based on its breeding value on productive parameters. Results of the above study suggested that animal of higher breeding value and it's offspring need to be promoted for better productivity in farmer managed condition of Nepal.

Keyword: Breeding value, Test day, LMY, Fat percentage, Protein percentage

INTRODUCTION

Livestock is an indispensible part of Nepalese agriculture and Dairy farming in particular is the most important choice of the people. Dairying is the most important sub-sector contributing about 63% to the total Livestock Gross Domestic Products (LGDP) which is more than 5% of total National Gross Domestic Product (GDP) (MOAD, 2009).In recent days, dairy farming has started as sound agribusiness of Nepal involving many farm families. However, the productivity of the cattle in the country is only 519.56 Kg per lactation (MoAD, 2014) and need lot of improvement. On the other hand, dairy sector has huge potential for growth due to high demand of milk both inside and outside the country. Agricultural Prospective Plan (APP) targeted that share of livestock sector in AGDP can go up to 45% in the last period of 2015 AD (APP, 1995). To achieve this progress increase in milk production and productivity is one of the important areas (NLBC, 2010).

Chitwan and Nawalparasi are two districts in Nepal that have demonstrated progress in commercial agriculture and livestock production. These districts are accessible as these are close to Institute of Agriculture and Animal Sciences (IAAS) and hence this study was focused on these districts. Secondary data analysis to understand the farmer's aptitude and attitude in adoption of new management techniques, breed preference and productivity traits was undertaken.

METHODOLOGY

Data were collected from the animals registered in pedigree and performance recording system (PPRS) under Dairy Cattle Improvement Program (DCIP). Five years of data from the period

of 2008-2012 were reviewed. Those animals in the records were divided into following categories based on the available information;

Table 1. Breed categorization on different classes

Jersey	Having at least 75% of the blood level of Jersey Breed.
Holstein	Breed having at least 75% of the blood level of Holstein Breed.
Jersey* Holstein	Cross of Jersey and Holstein Breed with 40% blood level of either breed
50% Jersey	Having at least 50% of the blood level of Jersey Breed.
50% Holstein	Having at least 50% of the blood level of Holstein Breed.
Other Breed	Breed having unknown ancestry and mixed breed

Breeds are categorized in different groups based on the records of their parents kept by the farmers. The general practice of Pedigree and Performance Recording System is that, from each animal milk was collected at one month interval at morning and evening and kept in the sample vile. In addition, total milk produced by the cow was also measured including the milk that is needed for suckling of calf. The milk collected from this procedure was taken to District Livestock Service Office (DLSO), of each district for examination of different milk constituents. Different constituents in the milk such as milk fat percentage, milk protein percentage and conductivity were measured with the help of milk analyzer. Animals which have eight or more than eight test day milk yield were only taken for analysis and rest are discarded. Data were entered in Microsoft access and analyzed with R software package for statistical computing and Gen-Stat. The model used for dairy animal evaluation are explained below;

Linear Model for estimating breeding value of cow for milk yield and valuable solid

$Y_{ijklm} = \mu + \alpha_i + \beta_j + \gamma_k + \delta l + e_{ijkl}$

Where, Y_{ijkl}= Milk yield / valuable solid of cow at i^{th} type of herd, j^{th} breed type, k^{th} year of calving ,l^{th} age of cow

μ= Overall mean

α_i= Effect of i^{th}type of herd (1,2,……..n)

β_j= Effect of j^{th} Breed type (Jersey, Holstein, J×H, 50% Jersey, 50% Holstein, Others)

γ_k= Effect of k^{th} year of calving (2008, 2009, 2010, 2011, 2012)

δ_l= Effect of l^{th} age of cow (2,3,4…..n),

e_{ijklm}= random error/residual element assumed to be independently and normally distributed with 0 means and common variance σ^2

Productive performance

The overall mean Lactation Milk Yield of cattle in this study was observed 2841±84.95 kg (Table 2). The results of this study revealed that the milk yield was significantly ($p<0.001$) affected

by the breeds. Accordingly, the highest milk production 3173±55.2 kg was observed in pure Holstein cattle among the different breeds.

Table 2. Effect of genetic group on lactation milk yield, protein percentage and fat percentage of dairy cattle in Chitwan and Nawalparasi districts.

Breed	No of Obs.	Least square mean for milk yield(kg)	Least square mean for protein percentage	Least square mean for fat percentage
Overall Mean	728	2841±84.95	3.33±0.17	4.43±0.66
Jersey	327	2735±38.7^{c}	3.31±0.009^{c}	4.46± 0.34^{a}
Holstein	165	3173±55.2^{a}	3.33±0.016^{a}	4.21±0.06^{b}
Jersey × Holstein	122	2948±54.4^{b}	3.28±0.013^{d}	4.54±0.05^{a}
50% Jersey	61	2631±89.5^{c}	3.32±0.020^{bc}	4.51±0.08^{a}
50% Holstein	25	2849±139.8^{b}	3.22±0.037^{e}	4.22±0.13^{b}
Other Breeds	28	2711±132.1^{c}	3.34±0.028^{b}	4.51±0.13^{a}
Level of Significance		***	* *	***
C.V %		24.5	5.2	14.9

Usman et al.,(2012) in Pakistan found similar finding for milk yield of Holstein cattle 3438±887.19L. Similarly, Sattaret al. (2005) observed mean yield of 2772.76±76 L for Holstein Friesian in Pakistan. Ahmad et al. (1985) in Faisalabad of Pakistan found that LMY of HF × Sahiwal cows was 3056.3±106.5 kg, which was slightly lower than present finding.**.** Also, Shrestha and Sherchand (1997) reported LMY from crossbred cattle in Nepal was 465-3350 kg, which were lower than present finding. While Freitas et al. (1995) found lower lactation milk yield (ranges from 1695±640-1950±780 liters) than present finding.

The average protein content of cattle was found 3.33±0.17 % and the effect of genetic group on protein content was found significant($p<0.05$). In addition, the study revealed that fat content of cattle was 4.43±0.66 % and it was significantly affected by breeds ($p<0.001$). These finding were similar to the finding bySimianer*et* al. (1991) and Campos *et al.* (1994) of 3.3-3.6% .while it is in disagreement with the finding by Feritas et al.(1995) as he found slightly lower 2.88±0.34-2.85±0.33% and slightly higher,Clunyexports (2008) and Moya et al. (1985) in Brazil.

Genetic Correlation among Lact. Milk, Lact.F%, Lact. P% and Val. Solid

The genetic correlation between milk yield and various milk consistuents are presented in the table. Farthing and Legates (1957) reported higher negative correlation between milk yield and fat percentage to be 0.38; similarly, Tabler and Touchberry reported it 0.33. Batra et al. (1969) in Illinois herd USA reported higher negative correlation of -0.44 between milk and fat percentage in Holstein and Guernseys breeds of cattle. Low negative correlation between milk yield and fat percent in case of Nepalese cattle suggest that more selection towards milk yield can be done with less compromise

on fat percentage. This might be due to the low selection intensity adopted towards the cattle as well as due to the inheritance of indigenous germ plasma.

Table. 3 Interrelationship between different milk constituents.

Paramaters	Lact.Milk	Lact.F%	Lact.P%	Val-Solid(kg)
Lact.M.Y(kg)	1	-0.13	-0.25	0.93
Lact.F%		1	0.07	0.21
Lact.P%				-0.15
val Solid(kg)				

Breeding value estimation

Breeding value of cattle was calculated and listed in Table 4. Results revealed that breeding value of cattle ranged between -697.7 to +697.7 in milk yield. The best mother cow under this study was observed with breeding value of 697.7 with production of 5743.7 kg of milk and valuable solid of 409.53 kg. Similarly, breeding value of cattle for valuable solid ranged between -45.6 to +45.6. The breeding value of the best cow under this study was observed 45.6 which produced the valuable solid of 409.53. Moreover, the best yielders of the study was found consisting of Jersey and Holstein crosses. These elite cows can be used as a benchmark for the establishment of pedigree and progeny recording system. In addition, these females can be used as a source of replacement stock by the farmers.

Table 4. Estimated breeding value of top cows of Chitwan and Nawalparasi districts in milk yield

Rank	ID of Cow	Herd ID	Milk Yield(kg)	Milk Fat%	P	V Solid (kg)	EBV
1	3503	351409001	5743.7	4.12	3.01	409.53	697.7
2	3897	350701024	5369.85	4.62	3.49	435.49	561
3	3968	353301063	4993.45	3.58	3.33	345.05	543.9
4	2478	353307103	5097.5	3.57	3.59	364.98	512.2
5	3890	350701024	5279.65	3.86	3.35	380.66	490.5
6	3422	353305110	4268.15	3.72	3.28	298.77	430.6
7	3680	353007019	4512.45	4.09	3.19	328.51	423.8
8	7344	494107028	5858.4	3.98	3.39	431.76	419.7
9	3562	351406030	4254.7	3.96	3.13	301.66	399.1
10	3740	353305010	4825.5	4.47	3	360.46	390.3

CONCLUSION

Among the different breeds of cattle under this study, Holstein and its crosses have higher productivity than other breeds and need to be promoted provided that there is better feeding and management conditions. However, reproductive performance, longevity and health status of cows also contributes towards economic returns in the long run and need to be considered for overall improvement in the breed. In addition, cattle having higher breeding values are the important germplasma of the country for productive traits and need to be used as seed stock by the farmers as well as country for increasing productivity in long run.

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