

Dairy Farming Technologies and Tharparkar Native Cattle Breed Improvement for High Fat-Quality-Milk Yield

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Abstract

The opening balance of Tharparkar cattle as on 01.04.2011 was 154 heads (30 males and 124 females). The M:F ratio of new calvings was 1.00:0.95. The closing balance of the Tharparkar cattle herd as on 31.03.2012 was 98 cattle heads (15 males and 83 females). The overall mortality percent in Tharparkar herd was 4.62%. The overall conception rate in Tharparkar herd was 64.78%. The figures in heifer and adult groups were 63.63 and 65.30%, respectively. The overall calving abnormalities were 34.15%, which included 7.32% abortions, 2.44% unseen abortinos, 7.32 retained placenta, 2.44% premature births, 9.76% prolapses and 4.88% still first calving, service period, dry period and calving, service period, dry period and calving interval were 1056.67±90.22, 230.34±20.63, 292.05±118.36 and 472.46±28.95 days, respectively. Tharparkar cattle produced 21679 kg milk during the current year. Means for overall wet and herd averages were 3.39 and 1.48 kg, respectively. On the basis of analysis of 384 milk samples, the overall Fat, SNF and Total Solids were 4.34, 8.77 and 13.12% respectively. The least squares' means (LSM) for overall live body weights at birth, 3, 6, 12, 18 and 24 months of age were 21.27±0.48, 56.18±2.33, 108.52±3.27, 171.34±7.77, 230.79±2.56 and 260.06±3.98 kg, respectively. The opening balance as on 01/04/2010 was 143 heads (23 males and 120 females). The Tharparkar produced 38,001 kg milk during current year which was 1,546 kg more than that of previous year (36,455.0 kg). Means for overall wet and herd averages were 3.86 and 1.50 kg, respectively, under suckling system. On an average, 28.25 of total adult females were in the milk during the year, 2010-11. On the basis of 574 milk samples the overall fat, SNF, and total solids % were 4.52, 8.84 and 13.36, respectively.

Keywords: breed, Tharparkar, milk, cattle, yield, fat, SNF

1. Introduction

Traditional, cultural and religious beliefs have also contributed in the continuance of these activities. They also play a significant role in generating gainful employment in the rural sector, particularly among the landless, small and marginal farmers and women, besides providing cheap and nutritious food to millions of people. Livestock production and agriculture are intrinsically linked, each being dependent on the other, and both crucial for overall food security. Livestock sector is an important sub-sector of the agriculture of Indian economy. It forms an important livelihood activity for most of the farmers, supporting agriculture in the form of critical inputs, contributing to the health and nutrition of the household, supplementing incomes, offering employment opportunities, and finally being a dependable "bank on hooves" in times of need. It acts as a supplementary and complementary enterprise.

According to NSSO 66th Round Survey (July 2009-June 2010) on Employment and Unemployment, 15.60 million workers as per usual status (Principal status plus subsidiaries status) were engaged in farming of animals, mixed farming and fishing. Whereas as per estimate of NSS 68th Round (July 2011-June 2012) survey on Employment and Unemployment, 16.44 million workers as per usual status (Principal status plus subsidiaries status) were engaged in the activities of farming of animals, mixed farming and fishing. Animal Husbandry and Dairying activities, along with agriculture, continue to be an integral part of human life since the process of civilization started. These activities have contributed not only to the food basket and draught animal power but also by maintaining ecological balance. Owing to conducive climate and topography, Animal husbandry and Dairying Sectors have played prominent socio-economic role in India.

2. Methods and Materials

Under ICAR-IVRI Research Projects various experiments have been conducted on cattle and buffalo farm. There are more than 1100 animals on the C&B farm. Under animal nutrition Fodder farm and Feed plant are main source of green and dry feed, concentrate supply to these animals. A team of Animal Breeders, Animal Nutrition expert, Reproduction Scientists, Medicine-Surgery scientists and livestock production scientists and including one Agronomy Scientist work together under the Vridawani, Tharparkar cattle improvement and Murrah buffalo improvement net work project under ICAR-IVRI funded research projects. The projects are in long term basis. During 2010-11 and 2013-14 major findings have been observed which may bring advancement in dairy farming and milk industry. Through native cattle breed Tharparkar.

3. Result and Discussion

Advances in Technological Development: Following observations were recorded and found that Tharparkar cattle improved in milk yields.

Tharparkar Herd Strength: Overall Management Effect: The opening herd strength of Tharparkar cattle as on 01/04/2013 was 129 heads (26 males and 103 females). Additions in the herd were due to birth of 26 female and 24 male calves (50 heads). In all, 63 animals were deleted from the herd. The male:female ratio of new calvings was 0.92:1.00. The closing balance of the Tharparkar cattle herd as on 31/03/2014 was 116 cattle heads (24 males and 92 females). Tharparkar as on 01/04/2014 were 116 heads (24 males and 92 females). New calving male female ratio was 1.06:1.0. Upadhyay et al. (2014) reported performance of Tharparkar calves.

Mortality, Morbidity, Culling and External Transfers: The overall mortality per cent was 3.91%. The female mortality was 3.88%, whereas for males it was 4.00%. The overall culling per cent was 27.37. The external transfer per cent of males in Tharparkar herd was 14.0. The mortality per cent in Tharparkar herd during 2014 was 4.64 well within permissible limits.

Reproductive Performance: The overall conception rate was 59.25%. The respective figures in heifer and adult groups were 61.29% and 58.0%, respectively. The overall calving abnormalities were 10.0%, which included 4.0% unseen abortions, 4.0% retained placenta and 2.0% prolapses. The least squares' means (LSM) for age at first calving, service period, dry period and calving interval were 1145.91+98.33 days, 115.93±20.89 days, 285.88+25.60 days and 399.38±19.27 days, respectively. The overall conception rate in Tharparkar herd was 55.84% during 2014. The respective figures in heifer and adult groups were 73.33 and 51.61%, respectively. The overall total calving abnormalities were 25%, which were included 18.18% abortions, 2.27% unseen abortion and 4.55% retained placenta. The means for age at first calving, service period, dry period, and calving interval were 1019 days, 103 days, 184 days and 425 days, respectively. Similar results were reported by Soni et al. (2013).

Milk Production Performance: Tharparkar cattle produced 34582 kg milk during the current year. Means for overall wet and herd averages were 3.90 kg and 2.01 kg, respectively, under suckling system of calf management. On an average, 51.57% of the total adult females were in the milk. The overall fat, SNF and total solids were 4.18%, 8.97% and 13.15%, respectively. The LSM's for total lactation milk yield, total lactation length, milk yield per day of total lactation length, 305 days' milk yield, milk yield per day of 305 days lactation period, peak yield, days to attain peak yield and weight at calving were 1554.76±55.65 kg, 303.32±6.08 days, 5.02±0.19 kg, 1407.37±96.23 kg, 4.62±0.32 kg, 854±0.29 kg, 48.68±12.09 days and 383.74±9.34 kg, respectively. Tharparkar cattle produced 27649 kg milk. Means for overall wet and herd average were 4.26 and 1.91 kg, respectively under suckling system of calf management. On an average 45.60% of the total adult females were in milk. On the basis of analysis of 338 milk samples (April-December, 2014) the overall fat, SNF and total solids were 4.25, 8.99 and 13.24%, respectively. The means for total lactation milk yield 1294 kg, total lactation length 226 days, milk yield per day of total lactation length 5.6 kg, 305 milk days yield 2083.5 kg were recorded in 2014.

Growth Performance: The least squares' means (LSM) for overall live body weights at birth, 3, 6, 12, 18 and 24 months of age were 22.23±0.49, 56.95±2.15, 109.17±3.31, 183.89±6.89, 232.86±7.14 and 290.62±7.84 kg, respectively.

On the basis of project data and recent reports following advancement in milk production technologies were observed. The means for overall live body weight at birth, 3, 6, 12 and 24 months of age were 21.9, 58.1, 104.9, 169.9, 226.2, and 311.4 kg respectively. The weight at first calving was 343.3 in 2014.

Advances in Milk Production Technologies Development: There have been findings which will make advancement in dairy farming and milk production technologies. During the period 2012-13 and 2013-14 following observations were added to increase the milk yield per lactating animal. Khan et al. (2013) reported lifetime milk prediction of crossbred cattle strain Vrindavani of North India.

BCS: Tharparkar cows with ≥ 4 BCS at pre calving stage expressed highest peak yield, calf birth weights and days to attain peak yield, while postpartum interval to estrus was lowest at precalving BCS of 3.5-4.0.

Body Conformation: Most of the body conformation traits were of intermediate nature and of desirable type, except stature, body depth, angularity, central ligament, rear udder height, udder depth, rear udder width and teat thickness, which expressed scope for further improvement.

Phenotypic Correlation: The phenotypic correlations between body conformation and reproductive traits with milk production traits were weak and negative or positive. The phenotypic correlations of growth and reproductive traits with milk production traits were in desirable direction with low magnitude. Soni et al. (2014) reported progesterone profile in repeat breeding cows.

Milk Quality Traits: In Tharparkar cows, for important milk constituent traits, it was observed that most of the non-genetic factors (stage of recording, lactation order, age at first calving, age at current calving, year/season/month of calving) expressed significant effects on teat and milk quality traits considered.

Bowl Shape Udders: The bowl shaped udders produce significantly higher milk fat, total solids %, whereas SNF, Lactose and Protein% were highest in goatly udders.

Somatic Cell Counts: Somatic cell counts were higher in goatly udders as compared to bottle shaped teats and disc shaped teat orifices as compared to round udders with conical teats and funnel shaped teat orifices.

Phenotypic Correlation: The phenotypic correlations among milk constituent traits were positive and low-very high in magnitude. Teat length/diameter had a negative low-medium phenotypic correlation with all milk quality traits except SCC.

Teat Height From Ground: Teat height from ground had a positive very low-medium correlation with all milk quality traits. Teat height from ground had a negative medium-high correlation with udder traits except udder height from ground.

Udder Size Traits: Udder traits have positive medium-high correlation with each other except udder height from ground, which has negative correlation.

Coat and Milk Quality Traits: Coat and milk quality traits are affected by species, breed, age at calving class, month of calving, season of calving and parity. The significant effect of species and breed on coat and milk quality traits revealed that Murrah buffaloes, Tharparkar and Vrindavani cattle possessed an entirely different coat and milk quality characters from one another.

The Coat, Milk and Age Trait: The coat and milk quality traits vary from one age class to another age class and leading to different types of hair coat and milk quality traits in different age class with certain variation between all three breeds. These traits were found to be maximum in magnitude in between 6 to 7 year age class.

Parity, Coat and Milk Yield: Parity had shown non-significant effects on almost all coat and milk quality traits with effect of coat traits on milk quality of Murrah buffaloes, Tharparkar and Vrindavani cattle older (5 to 8 years) animals showing higher values for most of the traits and milk yields were found to be maximum in 3rd to 5th lactation in Tharparkar and Vrindavani cattle.

Hairy Density and Performance: Hair density was maximum in winter and minimum in summer in all three breeds which is due to the adaptation to climate for optimum transfer of energy between animals and environment during different season.

Season of Calving and Performance: With regards season of calving, coat thickness and weight of hair coat were maximum in Spring while, hair density, hair length and hair diameter in Winter season in Murrah buffaloes. Whereas, in Tharparkar and Vrindavani cattle, milk yield were maximum in Autumn season of calving while coat traits varied from season to season.

Phenotypic Correlation and Milk: The phenotypic correlation of coat traits with milk quality traits were found to be non-significant positive for almost all parameters but few were significant and positively and negative correlated in Murrah buffaloes.

Phenotypic Correlation and Coat Traits: The phenotypic correlation of coat traits with milk quality traits were found to be significant ($P < 0.05$) to highly significant ($P < 0.01$) positive correlation for almost all parameters but few were non significant and negatively correlated in Tharparkar and Vrindavani cattle.

Selection of Desirable Hair Coat for Milk Quality: Selection of desirable hair coat depending upon the climatic conditions and age group of animals may helpful to bringing out improvement in coat and milk quality traits in all three breeds.

Integrated Nutrient Management and Weed Control Practices in Forage Based Cropping System: Advances in Technologies in Weed Control Developed-Crop Science: Trials on maize and Teosinte crops were conducted to test weed control practices through Integrated Weed Management (IWM). Higher seed rates (25% and 50%), Crop Rotation, Conserve Tillage, Minimum Irrigation at Critical Stage and Green Manuring with Sesbania in Situ at Flowering Stage were found to reduce Weed Population from 20% to 45% at Fodder Farm of The Institute during May-October, 2014 (Singh, 2014).



Advancement in Fodder Production Technologies: For Milk and higher fat production. The fodder farm of the Institute comprises 330 acres (132 hectares) of cultivated fertile land. The farm is divided into 18 plots inter-connected with underground irrigation channels and concrete roads (Singh et al., 2014).

Table 1. Dairy farm cattle and buffalo herd milk yield (kg) performance during 2013-14

Breed (Cattle/Buffalo)	Herd/Head	Female Nos.	Conception %	Milk Yield (Kg)	Mean Wet (kg)	Mean Herd (kg)	Fat %	SNF %	Total Solid %
Vrindavani	384	340	54.60	52047	9.64	8.12	4.11	8.91	13.02
Tharparkar	129	103	59.25	34582	3.90	2.01	4.18	8.97	13.15
Murrah	165	127	54.13	97999	5.85	3.91	7.62	9.00	16.62

Table 2. Dairy farm cattle and buffalo herd, milk yield (kg) performance during 2014-15

Breed (Cattle/Buffalo)	Herd/Head	Female Nos.	Conception %	Milk Yield (Kg)	Mean Wet (kg)	Mean Herd (kg)	Fat %	SNF %	Total Solid %
Vrindavani	424	373	45.10	622443	10.54	9.13	4.11	8.94	13.05
Tharparkar	116	92	55.84	27649	4.26	1.91	4.25	8.99	13.24
Murrah	175	129	51.96	107597	6.80	4.49	7.87	9.92	17.78

The herd strength, total heads as an opening balance on 01-04-2013 and 01-04-2014 were recorded. Overall conception rate %, milk produced (kg), mean for wet average (kg), mean for herd average (kg), and overall fat %, overall SNF %, overall total solid % were calculated are given Tables 1 and 2. Graphic depiction of data recorded is given in Figures 1 and 2.

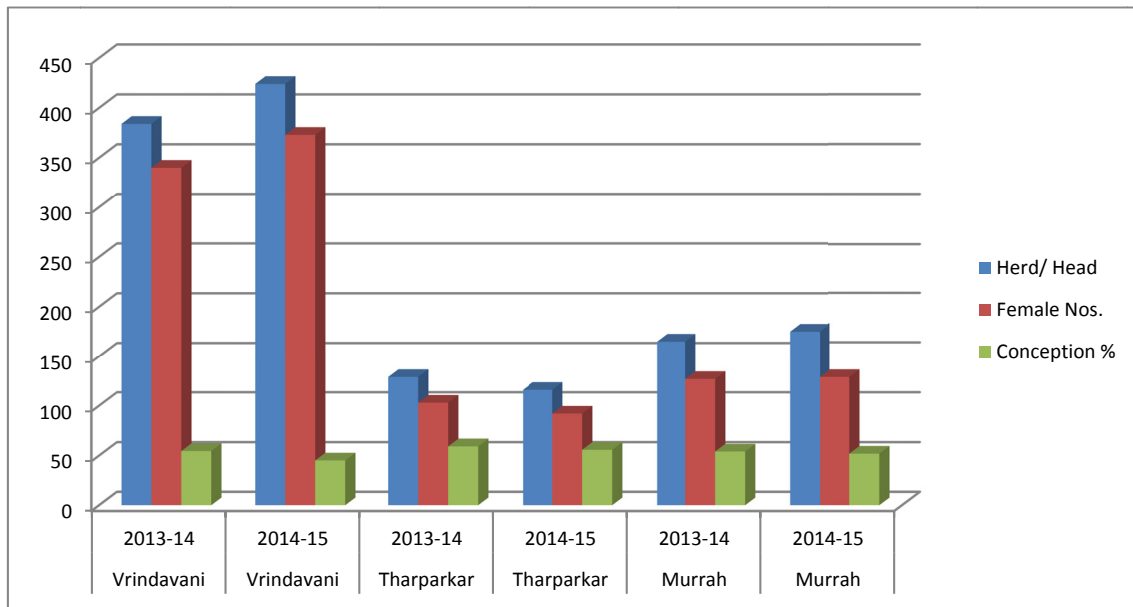


Figure 1. Herd strength, female numbers and conception % of Vrindavani, Tharparkar and Murrah

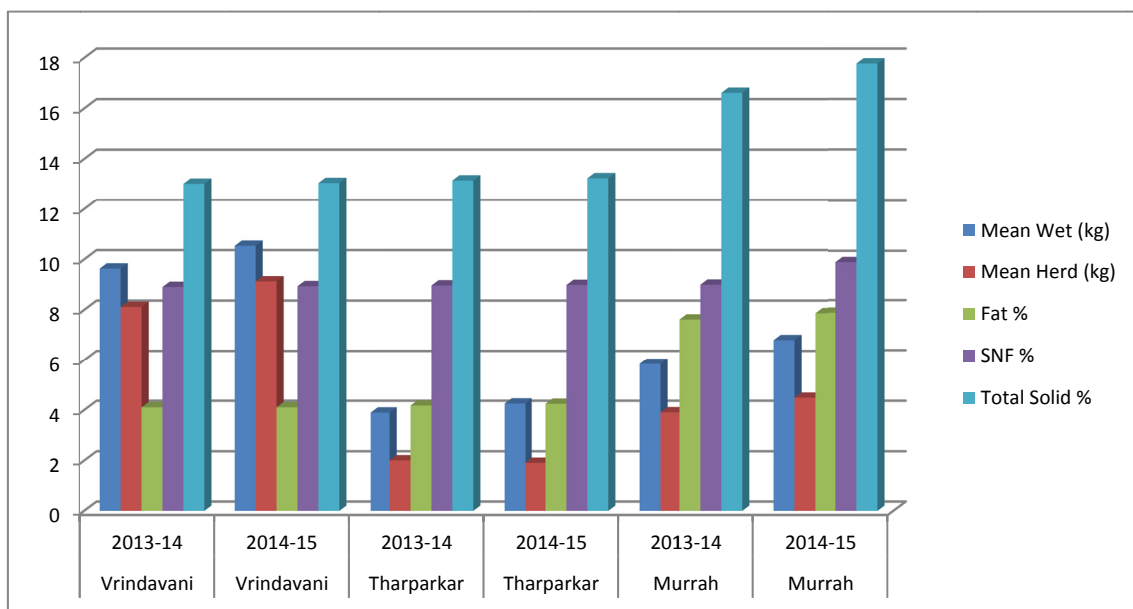


Figure 2. Milk yield mean: wet (kg), mean herd (kg), overall fat %, SNF % and total solids %

Round the Green Fodder Supply: Variety and Crop Rotation Effect: On Milk Quality: The farm section produces and quality green fodder of high yielding varieties (HYVs) RI released under different fodder crops time to time. Sorghum eir (single and multi-cut), maize, cowpea, oat and berseem fodder crops are grown at the farm around the year.

Live Stock Farm Demand of Green Fodder: Crop Intensity Effect: On Milk Yield: The green fodder supplied daily to the Institute's Cattle & Buffalo farms (LPM) and to more than 20 experimental animal sheds of various Divisions (Singh, 2014).

Fodder Conservation: Advancement in Fodder Quality: Higher Milk and Fat Yield: The surplus green fodder is preserved at the farm in the form of "Hay" and "Silage" for its utilization during lean period. The crops are harvested according to need of green and dry fodder. Seed are used from certifying agencies and seeds also produced at fodder farm for own use and for revenue generation.

Seed Production and Revenue Generation: During 2014 the period an amount of Rs 19,80,780.0 (Rupees nineteen lakhs eighty thousand seven hundred eighty) through the sale of Oat, Toria, Paddy, Green Fodder, Straw and farm services. Sale of Oat seed Rs 14,94,885, Toria foundation Seed Rs 1,25,800, Paddy seed Rs 2,16,372 and Green fodder Rs 1,24,873 earned the revenue for 2014 (AR, 2013-14).

The fodder farm has produced 696.50 quintals oat seed (kent variety) during 2013-14. The farm has generated an amount of Rs. 16,83,110.00 (Rupees sixteen lakhs eighty three thousand one hundred ten) through the sale of oat seed (616.50 quintals), green fodder and farm services rendered to the campus employees of the Institute during this period. The farm has generated a revenue of Rs 8,56,900.0 (Rupees eight lac fifty six thousands nine hundred) through the sales of oat seed and farm services rendered to the campus employees in 2010-2011 (AR, 2012-13).

Farm Operation Equipments: Efficient Resource Utilization: The farm has a small workshop to look after the repair and maintenance of farm machinery, tractors, tube-wells etc. Farm is equipped with 11 tractors, 09 deep irrigation tube-wells and adequate agricultural machineries.

Irrigated Crop Area 100% on Farm: Production of Palatable Green Fodder: All the irrigation tube-wells are inter-connected by underground irrigation channels (hume pipes) spread throughout the farm area for better application and utilization of available irrigation potential.

Advancement in Feed Technologies Development: The Feed Technology plant prepares and supplies about 16,000 quintals of animal feed required for animals like cows and buffaloes, sheep and goats, pigs and laboratory animals used for research experiments in Izatnagar and Mukteshwar Campuses (Singh & Gupta, 2009).

Automated Feed Plant: Quality feed and higher digestibility, higher feed conversion ratio: The plant has automatic feed ingredient loading and lifting unit, grinding unit (Hammer mill), mixing unit, conveyor elevator unit, dust separation and collection unit, go-downs and office-cum-feed plant building. The developed machine named Pashu Chokolater (UMM Block making machine) to facilitate efficient mass production of Pashu Chocolates and thereby popularising their use among animal rearing farmers and dairy entrepreneurs. Also reported by Singh et al. (2014).

4. Conclusion

Tharparkar cattle produced 21679 kg milk during the current year. Means for overall wet and herd averages were 3.39 and 1.48 kg, respectively. On the basis of analysis of 384 milk samples, the overall Fat, SNF and Total Solids were 4.34, 8.77 and 13.12% respectively. The least squares' means (LSM) for overall live body weights at birth, 3, 6, 12, 18 and 24 months of age were 21.27±0.48, 56.18±2.33, 108.52±3.27, 171.34±7.77, 230.79±2.56 and 260.06±3.98 kg, respectively. There is hereditary improvement in Tharparkar cattle which were migrated from Rajasthan. Hereditary average has been improved significantly. CO4 Variety of Napier grass and Azolla fern were also introduced for quality feeding of cattle. During 2014 total 1,03,628.0 quintal green fodder, 816.0 quintals of dry fodder (Oat, Paddy) from net sown area 330 acres and gross area 786.5 acres.

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