Summary and Conclusions
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Hariana is one of the most important dual purpose breed originally developed and reared in the northwest part of India, providing livelihood sustenance to millions of rural households. The bullocks are good for agricultural operations and the milk yield of Hariana cattle ranges from 809 to 1731 kg. Owing to these attributes, the breed has extensively been used for grading up the non-descript cattle particularly to improve their draft ability in Indo-Generic plains. The main objectives of present study entitled “Production system analysis of Hariana cattle in its breeding tract” were to find out population in its breeding tract and other relevant information on existing animal husbandry practices, production performance and economics of milk production of Hariana cows, collected through structured schedule. The study was conducted in Rohtak, Hisar and Jhajjar districts of Haryana, which lie in the breeding tract of Hariana cattle. Multistage stratified sampling procedure was used to select the districts, villages and respondents. The data generated from the study were analyzed through tabular and least squares analysis of variance by using suitable mathematical models.

The major proportion of Hariana cattle population was located in Hisar district followed by Rohtak and Jhajjar districts, respectively. The higher percentage of Hariana specimens in Hisar district might be due to the fact that this belt is an integral place of origin for Hariana breed. Cattle and buffaloes were most preferred livestock species by the sampled households with average numbers of 4.36 and 4.80, respectively. The average number of cattle in respondent households was 4.36± 0.39 and the proportion of lactating cows, dry cows, breedable heifers (> 3 yrs), young stock, bull and bullock was 44.72, 24.31, 10.77, 8.94, 6.65 and 4.58 per cent, respectively. Artificial insemination practice was being
used by about 50% of the respondents for the insemination of their cows in heat by mating with the semen of the best available bull’s semen. However, about 42.50% respondents preferred natural service with whatever bulls available. In contrast, some of the respondents used both AI as well as bull. The main reason for adopting natural service was the belief that success rate through AI is lesser than the natural one. About 67.50% respondents planned mating as against the 32.50% where no control over the mating existed and animals were covered indiscriminately with any approachable bull’s what so ever available. Majority of respondents (71.87%) practiced castration in their male calves using Burdizzo castrator at the age of 1-2 years (61.25% respondents). The cattle housing practices revealed that all the respondents followed close housing system with stable housing structure. The location of cattle shelter inside or near human dwelling was being followed by 67.50 per cent respondent families and separate from human dwelling by the remaining 32.50 per cent farm families. Majority of respondents (76.25%) housed their cattle for most of the period except the time of grazing, however, 23.75 per cent housed only at night. The housing structure was pucca type in most of the respondents families (85%) as against the 15% respondents had kutcha type of houses for their animals. Pucca manger was used by majority of the respondents (77.5%) and on the other hand kutcha manger by 22.50 per cent respondents for feeding their cattle. Mostly the cattle houses roof structure of respondents (90.00%) was of Pucca/wooden type and about 10% respondents were having the provision of thatched roof. The floor of the shed was usually kutcha in which animals feel more comfortable. Women were generally accomplishing the task of milking (78.75%) and only about 14.37% men among the respondent families were engaged in milking of their cattle. Knuckling method was more common method (42.5%) for milking by the respondents followed by full hand
method (30%) and stripping (11.87%). About 15.62% respondents did the milking by combining the methods. Most of the respondents used hygienic measures during milking. Mostly calf was allowed to suckle for let down of milk and in latter stage of lactation, calf was replaced with concentrate feed for initiation of milk let down stimulus. Therefore, weaning was not being practiced by most of the respondents (92.5%). The milk was staple food for the predominantly vegetarian society in this area and about 44.38% respondents utilized milk at home either as raw milk or curd/butter milk. Among these households some (23.75%) churned part of the milk produced into butter milk and Ghee and sold surplus ghee to fulfill their monetary requirements partially besides its consumption at home. On the other hand, 31.87 per cent respondents who generally lived in densely populated villages and/or lived near the town or city sold their surplus milk to get cash price. Health care practices followed by respondents revealed that majority of respondents (88.75%) were adopting prophylactic measures against various prevalent diseases in cattle viz. BQ, FMD, HS, Brucellosis etc. Most of the respondents (80%) did control of endo-parasites by using anthelmintic in cattle, as against 20% who did not used any anthelmintics with the hypothesis that indigenous animals were less prone to such infections. About 40% respondents used tick spray to control tick infestation, however, others still did not willing to use any kind of spray. Some of the respondents (17.5%) had now started the practicing of segregation of diseased animals, however, this requires further orientation of the farmers so that normal healthy animals can be prevented from getting the infection often and easily. The data on the treatment of sick animals reflected that about 35% respondents attempted conservative approaches for the treatment of sick animals. On the other hand, 65% respondents got benefited from the state veterinary health care workers/veterinary. The
common health problems in cattle reflected that diarrhoea, impaction, indigestion and
tympany were the common digestive disorders observed in cattle. Pneumonia and infection
of upper respiratory tract were the major respiratory disorders, especially during the winter
season. Anoestrus, repeat breeding, abortion, prolapse, delayed puberty & sexual maturity
and retained placenta were the key reproductive disorders observed in cattle. The infestation
of ecto-parasites as ticks, mites (caused mange), lice and maggots in wounds were
frequently observed. Mastitis, Brucellosis, Black Quarters, Hemorrhagic Septicemia were
the common bacterial diseases frequently observed by the veterinarians in the field.
Ephemeral fever and Foot-and-mouth disease were sporadically observed viral diseases in
cattle. Among parasitic diseases the trypanosomiasis and stomach worm infestation were
frequently observed. Though Hariana cattle were thought to be considered less prone to
diseases but due to less information available on these aspects, it is difficult to pinpoint the
common and most occurring health problems. The information available was mainly from
the organized herd that may vary at farmer’s door. The major constraints in cattle production
system (faced by more than 50% respondents) revealed that disposal/ marketing of male
calves in particular and dry animals in general (68.75%), degradation of breed due to
indiscriminate breeding (61.25%), non- availability of timely veterinary and AI services
(57.5%), scarcity of fodder during summer (55%) and reduction in grazing area (51.25%)
were the major constraints faced by respondents. Constraints faced by farmers might vary
from location to location and species of livestock. However, some of the problems remained
same throughout the country and considered as the common problems related to livestock
management practices. The feeding system of cattle whether grazing or stall fed depends on
the irrigation as well as monsoon rainfall and seasons. Animals were turned out for grazing
between 9.00 a.m. to 4.00 p.m. every day. The lactating cows were offered concentrate as an incentive at the time of milking. During the winter and summer, animals were kept in sheds and given additional feed supplement to fulfill their additional nutrients requirements. The region had some fallow land as well as common panchayat land for grazing by livestock. The common panchayat were accessed by all. The households with small or marginal landholding suffered more during the summer season when the grasses were not available. Wheat bhusa, bajra and jowar stalks were the major dry fodder resources for cattle feeding. Farmers also supplemented animal feeding by cotton seeds, cotton seed oil cake, mustard oil cake, cereal grains and millet as concentrates especially for feeding high milk yielding cows and working bullocks. Thus grazing alone did not provide sufficient nutrients. The herds were usually stall fed and supplemented with available greens and dry crop residues and concentrates. The common water resources (ponds, canals and tube wells) and personnel underground water supply tanks and hand pump were the customarily available watering resources. The frequency of watering was generally 2-3 times a day. The least squares mean of body condition score of Hariana cattle in different categories (heifer, dry cow and lactating cow) revealed that the mean body condition score of heifers, dry cows and lactating cows were 2.95±0.03, 3.25 ± 0.02 and 3.45 ± 0.01, respectively, which differed significantly (P<0.01) from each other. The mean body condition scores of cattle in summer, rainy and winter seasons were 2.98±0.01, 3.30±0.02 and 3.49±0.01, respectively. The overall body condition score of cattle was 3.23 ± 0.10 on six point scale of body condition score (scores; 0-6) applied in this study. The information of production parameters of selected Hariana cows under existing field condition of its breeding tract were recorded by individual performance recording sheet and revealed that the overall mean of monthly test day milk
yield of Hariana cows was 4.30 ± 0.57 kg/day. Peak milk yield was observed in the second monthly test day recording. The mean value of peak milk yield was 7.80±0.83 kg/day with a range of 7.0 to 9.5 kg/head/day. The mean of estimated 305 days milk yield of selected Hariana cow was observed as 1311.50±143.20 kg and ranges from 1210 to 1790 kg.

Production parameters of Hariana cows under existing field conditions of its breeding tract on the selected cow number revealed that the mean service period was found to be 179.43±12.80 days in selected Hariana cows and it ranged between 58-267 days. The mean services per conception recorded were 1.50±0.12, which ranged from 1 to 3 services required for the conception in selected cows under field condition. The mean dry period was estimated to be 144.12±9.99 days with a range of 35 to 242 days. On the other hand, the mean lactation length of Hariana cows was 310.42±14.36 days which ranged from 295 to 336 days in selected stock. The mean calving interval observed was 454.54 ± 24.35 days with a range of 344 to 503 days in studied Hariana cows. The mean age at first calving was 52.42 ± 0.28 months, which was higher than that reported under most of the farm studies. The mean service period and dry period were 184.20±2.45 and 153.77±2.55 days, respectively which was also higher in comparison to the cows selected for the production performance through individual card approach. The mean lactation length was observed 317.20±17.37 days, while the mean calving interval was reported as 470.40±2.32 days in Hariana cattle. The relevant costs of milk production of milch cows of Hariana breed showed that the overall fixed cost was Rs 3.46 cow/day, which contributed only 12.66 per cent to gross cost. The cost of feed was the major contributor in gross cost i.e. 58.33 per cent, which considerably fluctuated with seasons as Rs.19.50, 11.66 and 18.00/cow/day during summer, rainy and winter season, respectively. The overall mean of feed cost was Rs. 16.38/cow/day. The average labour cost
was Rs 5.94/cow/day, contributed 21.66 per cent to the gross cost of milk production. In the miscellaneous expenditure, the main component was veterinary expenses which contributed 7.33 per cent in the gross cost of milk production with the value of Rs 1.97/cow/day. Thus, the total variable cost contributed 87.33 per cent to the total gross cost incurred on milk production. The average daily milk yield (herd average) was recorded as 4.00, 4.20 and 4.4 litres in summer, rainy and winter, respectively and the cost of milk production came to 6.75, 5.19 and 6.25/litre during summer, rainy and winter, respectively with overall mean cost being Rs 6.06/litre. The overall net returns from milk production was Rs 7.93/litre which fluctuated to Rs 8.25, 8.81 and 6.75/litre during summer, rainy and winter, respectively. The net profit margin was 56.56 per cent and it varied between seasons, with the profit margin being 55.00, 62.78 and 51.92 per cent during summer, rainy and winter seasons, respectively.

**Conclusions:**

On the basis of the results of the present investigation, the salient points can be drawn that will helpful to deign any research program meant for improvement of Hariana breed in its breeding tract.

1. The major proportion of Hariana cattle population was located in Hisar district followed by Rohtak and Jhajjar districts, respectively.
2. Artificial Insemination was practiced by 50% of the respondents only with 67.50% having planned mating.
3. The common health problems in cattle were diarrhoea, tympany, pneumonia, anoestrus, repeat breeding and parasitic infestation and mastitis, brucellosis, HS and FMD were the most common diseases.
4. The major constraints in cattle production system were disposal/marketing of male calves, degradation of breed due to indiscriminate breeding, non-availability of timely veterinary and AI services, scarcity of fodder during summer and reduction in grazing area.

5. During the lean period, animals were given additional feed supplement. Wheat bhusa, bajra and jowar stalks were the major dry fodder resources for feeding.

6. The overall mean of monthly test day milk yield of Hariana cows was 4.30 ± 0.57 kg/day. The mean of estimated 305 days milk yield of selected Hariana cow was observed as 1311.50±143.20 kg. The average age at first calving, mean service period, calving interval and mean services per conception recorded were 52.42 ± 0.28 months, 58-267 days, 344 to 503 days and1.50±0.12, respectively.

7. Feed was the major contributor in gross cost of milk production. The overall net return from milk production was Rs. 7.93/litre with net profit margin of 56.56 per cent.