

Field progeny testing programme of crossbred cattle

a boon for genetic improvement of cattle under rural conditions

S. K. Rathee¹, A. K. Das², Ravinder Kumar³, T. V. Raja⁴, Rani Alex⁵, Sushil Kumar⁶, Umesh Singh⁷, S Tyagi⁸, B Prakash⁹, K. Anilkumar¹⁰

Central Institute for Research on Cattle, Grass Farm Road, P.B. No.17 Meerut Cantt (Uttar Pradesh) 250 001

Central Institute for Research on Cattle, Meerut is co-ordinating a field progeny testing programme since 1992 incorporating farmers' herds in association with Kerala Veterinary and Animal Sciences University Mannuthy, (Kerala), Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana (Punjab), BAIF Development Research Foundation, Uruli-Kanchan, Pune, (Maharashtra) and G. B. Pant University of Agriculture and Technology, Pantnagar. Field progeny testing programme at Kerala Veterinary and Animal Sciences University, Mannuthy is running through seven field units and six artificial insemination centers along with three livestock farms of the university. Since crossbreeding is the accepted breeding policy of cattle in Kerala since 1950s, the programme primarily aims to select superior male germplasm for propagation and genetic improvement of crossbred cattle in Kerala. The project also helps in genetic improvement of non-descript cattle by introducing genes of Frieswal (Holstein Friesian × Sahiwal) for higher milk production. An account of the implementation of the field progeny testing programme and its outcome under the rural conditions of Kerala is discussed here.

Key words: Cattle, Genetic improvement, Progeny, Rural conditions testing programme

THE country retains the pride of highest milk producer in the world and accounts for 18.50% of the world milk production. As per the *Economic Survey 2015-16*, the nation achieved the annual milk production of 146.30 metric tonne during 2014-15 when compared with 137.69 metric tonne in 2013-14, showing a growth rate of 6.25%. Cattle population of India is 190.90 million (*Livestock Census 2012*) which plays an important role in meeting the national demand of milk. However, there is further scope for improving milk production efficiency of Indian cattle by improving their genetic worth. For genetic improvement, there is demand of meritorious crossbred bulls with high

genetic merit. However, milk yield in dairy animals is sex limited and low heritable trait, hence the selection of breeding bulls is done on the basis of performance of their female progenies.

The adequate numbers of progeny tested bulls are not available in India and whatever small numbers of progeny tested bulls are available, they have low repeatability as the progeny tests are based on small number of daughters, mostly reared at the institutional farms. Since the facilities and progenies at institutional farms are limited, it is necessary to extend the progeny testing programme to the farmers' herds so that large number of daughters per bull can be recorded.

TECHNICAL PROGRAMME

The main objective of the field progeny testing programme is production of progeny tested superior crossbred bull by recording of performance data on large number of daughters. The technical programme of the project envisages testing of 30 Frieswal (Holstein Frieswal × Sahiwal) bulls in each batch. Frieswal cattle is a crossbred cattle population developed by CIRC, Meerut in collaboration with Military Farms having 62.5% exotic (Holstein Frieswal) and 37.5% Indigenous (Sahiwal) inheritance and dam's minimum mature equivalent milk yield of 4,500 kg. The bull-dams should be of good conformation. The target is to record a minimum of

40 daughters from each test bull spread over four different units namely Guru Angad Dev Veterinary and Animal Sciences, Ludhiana (Punjab), Kerala Veterinancy and Animal Sciences University, Mannuthy (Kerala), BAIF, Urlikanchan (Maharashtra), and G.B. Pant University of Agriculture Technology, Pantnagar (Uttarakhand). Each time a new batch of 30 Frieswal young crossbred bulls is introduced in the cycle of 15-18 months interval. The ranking of test sires is done to increase the efficiency and accuracy of the programme.

Information on animal identification, its age, sire, dam, date of insemination, pregnancy result and date of calving, data on milk production and reason for loss of data are recorded. Data are also recorded on farmers' socio-economic status, herd size, feeding and housing, land holding and herd management practices. The milk recording was carried out by trained milk recorders on contractual basis. Milk supervisors and senior officers of the project make regular checks to ensure accurate milk production and performance recording.

Salient achievements

The first set of bulls at Kerala Veterinancy and Animal Science University, Mannuthy was executed in January 1992. Subsequently 2nd, 3rd, 4th, 5th, 6th, 7th, 8th, 9th, 10th, 11th, 12th, 13th and 14th sets were

Table 1. Number of bulls inducted, pregnancies confirmed and daughters reached AFC in different sets.

Set No.	Date of start	Number of bulls in the set	Total inseminations performed	Total AIs followed	Total pregnancies confirmed	Conception rate (%)	Followed for calving	Born	Female calves Reached AFC
1 st	01-01-1992	12	23,351	6,722	24,20	36.0	1,902	956	319
2 nd	01-04-1994	11	12,817	4,800	1,680	35.0	1,300	603	240
3 rd	01-09-1995	11	9,331	3,942	1,324	33.6	1,065	757	89
4 th	01-11-1998	15	11,750	3,753	1,501	39.9	1,489	676	178
5 th	09-11-2001	19	3,437	3,261	1,136	34.8	847	401	139
6 th	24-06-2003	20	8,173	7,683	2,582	33.6	1,689	746	216
7 th	16-03-2005	24	5,759	5,211	2,281	43.7	1,298	597	180
8 th	30-08-2006	22	5,703	5,514	2,472	44.8	1,538	768	160
9 th	05-02-2008	16	3,393	3,131	1,181	37.7	801	394	81
10 th	01-07-2009	24	5,781	5,612	2,124	37.8	1,324	664	162
11 th	25-05-2011	21	4,820	4,401	2,006	45.6	1,280	659	219
12 th	10-10-2012	28	6,045	5,531	2,357	42.61	1,302	642	111
13 th	14-03-2014	15	5,211	4,850	2,063	41.97	1,114	545	0
14 th	22-07-2015	30	6,481	5,101	2,186	42.85	689	336	0
Total		268	1,12,052	69,512	27,313	39.29	17,638	8,744	2,094

* AI: Artificial Insemination

inducted in 1994, 1995, 1998, 2001, 2003, 2005, 2006, 2008, 2009, 2011, 2012, 2014 and 2015, respectively. A total of 268 bulls in fourteen different sets have so far been inducted in the programme. A total of 1,12,052 artificial inseminations have so far been carried out. More than 2,094 female progenies (breedable females) produced through the use of semen of the test bulls (Table1).

A total of 1,644 daughters from first eleven sets have completed their first lactation. The first lactation 305-day-milk yield showed an increasing trend among the progenies of different sets. The average first

lactation 305-day-milk yield was 1,958 kg in first set which increased to 2,767 kg in 11th set indicating an increase of 809 kg milk production (41.32 %) in the daughters of bulls under test. A trend of decreasing age at first calving was also observed in subsequent sets of bulls. The average age at first calving of progenies was 1,136 days in progenies of first set of bulls, which has reduced up to 1,020 days in 11th set daughters (2011) which indicated a sharp decrease of 116 days in age at first-calving. Recording of first lactation milk yield of cows of 10th set of bulls were completed up to 2016.

Inseminations of 13th set and 14th set of bulls were completed. The average conception rate of 14th batch used was 42.85 %. Predicted average birth weight of female calves in the project was 30.85 ± 0.30 kg. Average fat content of morning milk during 2016 was 3.50%, 3.77%, and

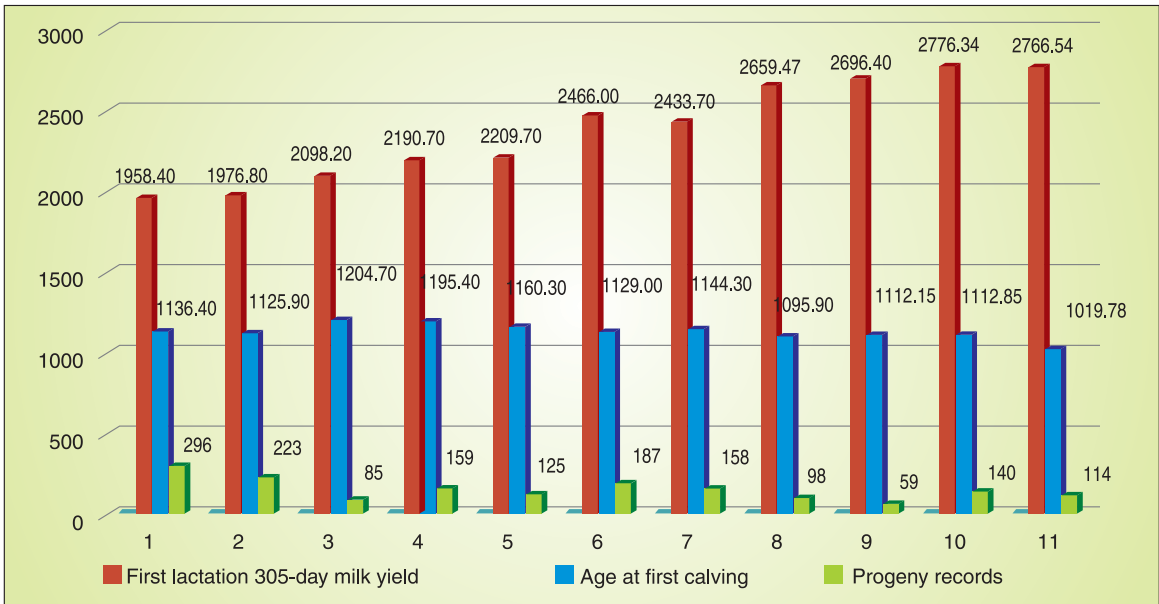


Fig. 1 Performance of the crossbred daughters of bulls inducted in different sets

Table 2 Education, occupation, land-holding and herd size of owners of progenies

Categories	No. of obs.	Percentage	Average 1 st lactation 305 days milk yield (kg)	
			Average	No.
Overall mean	491	100	2,781.38±39.9	97
<i>Education of owner</i>				
1. Illiterate	7	1.43	2,832.50	2
2. Up to primary	111	22.61	2,643.85	13
3. Up to metric	140	28.51	2,784.32	22
4. Up to secondary	203	41.34	2,826.65	56
5. College level	30	6.11	2,552.72	4
<i>Occupation of owner</i>				
1. Agricultural farmer	402	81.87	2,788.99	79
2. Agricultural labour	60	12.22	2,739.67	15
3. Government Job	11	2.24	2,789.50	3
4. Private Job	11	2.24	0	0
5. Business	7	1.43	0	0
<i>Land holding</i>				
1. Landless	0	0	0	0
2. Below 10 cents	41	8.35	2,853.50	5
3. 10-49 cents	161	32.79	2,780.36	21
4. 50-99 cents	79	16.09	2,674.17	18
5. 1-2 acre	121	24.64	2,776.67	32
6. 2-3 acre	69	14.05	2,848.75	16
7. 3-4 acre	16	3.26	2,895.00	4
8. >4 acre	4	0.81	2,990.00	1
<i>Herd size</i>				
1. ≤3	284	57.84	2,745.28	45
2. 4 to 5	138	28.11	2,803.11	33
3. 6 to 10	56	11.41	2,777.56	16
4. >10	13	2.65	3,104.17	3
<i>Feeding system</i>				
1. With fodder	122	24.85	2,735.29	21
2. Without fodder	369	75.15	2,794.11	76

3.84% respectively during 2nd, 5th and 8th month of lactation respectively. Mortality of progenies is minimal; only 7 animals during 2016. The progeny born from test bulls of the scheme is producing about 500 litres lactation more milk per than the other crossbred cows in the same area and farmers are getting extra income of ` 16,000/year/cow due to their superior milk production. This advantage is working against the interests of the project as a large number of daughters are sold by farmers as they fetch good price. This causes a significant loss of data due to sale of daughters.

Socio-economic status of the farmers

Socio-economic status of the farmers owning progeny and the performance of progenies in different groups is presented in Table 2. Socio-economic factors of the owners of the animals are influencing the first lactation milk yield of progenies. Owners with an educational qualification of higher secondary

were 41.34%. Illiterate owners were 1.43% and 28.51% having educational qualification of matriculation, 6.11% of the owners college qualifications, and 81.87 % of the progeny owners are agricultural farmers. Landless owners of the progenies were absent. Agricultural labours accounts for 12.22% of progenies and the other occupational groups of owners are negligible. Less than 20% farmers were having more than 1 ha of land. Number of cattle present in houses was taken as herd size were 57.84% of the owners of progenies having herd strength of 3 or less than 3 (Table 3). The herd size of more than 10 was observed only in 2.65% owners of the progenies and first lactation yield was highest in this group.

Herd structure analysis in the area showed (Table 3) that milking cows accounted for around 47% of the population. Dry cows and heifers accounted for approximately 13% and 5% respectively while calves accounted for 35 %. This showed

Table 3. Herd structure in the operational area

Milking cows	47%
Dry cows	13%
Heifers	5%
Calves	35%

that the replacement stock is available in the population. The average number of adult cows and calves per house were 2 and 1.41 respectively, showing the growing interest on cattle rearing.

SUMMARY

A total of 1,644 daughters from first eleven sets of bulls have completed their first lactation. The programme is not only restricted to produce and test the superior crossbred male calves in the field but consistently improving genetic potential of the cows available in the operational area of the programme leading to consistent increase in milk production. The first lactation 305-day-milk yield showed an increasing trend among the progenies of different sets and yield increased from 1,958 kg in first set to 2,767 kg in 11th set indicating an increase of 809 kg milk production (41.32 %) in the daughters of bulls under test. A trend of decreasing age at first calving was also observed in subsequent sets of bulls. The average age at first calving of progenies was recorded as 1,136 days in progenies of first set of bulls which reduced up to 10,20 days in 11th set, indicating a sharp decrease of 116 days in age at first calving. The progeny born from test bulls of the scheme is producing almost 500 litres more milk per lactation than the other contemporary crossbred cows in the area and farmers are getting extra income of ` 16,000/year cow. The contribution of the project to the state in the production of more than 20,000 female progenies (based on total artificial insemination, conception rate and sex ratio) of high genetic merit producing more 2,500 kg milk/lactation is very substantial.

¹Scientist, ²Senior Scientist, ³Principal Scientist, ⁴Director, Corresponding authors' e mail: skratheecirc@gmail.com CIRC, Meerut
⁵Professor, KVASU, Mannuthy, Kerala.