Progeny Testing of Bulls: NGO's Experience in India

B.R. Mangurkar

BAIF Development Research Foundation,
BAIF Bhawan, National Highway No. 4,
Warje, Pune, 411 029 India

1. Introduction

Animal performance records have been the major tool for guiding the increases in productivity of all species of farm animals in all developed countries. Development of productive animals requires progressive improvements in both the genetic merit for production and in the feeding, management and health care environment in which the animals live and produce. The animal recording practices are thus essential for progress in both of these areas.

There are several organisations in India that are conducting animal improvement programs. However, the animal recording in the field areas is undertaken by very few of them. BAIF is one such organisation (a NGO) which has been endeavouring dairy animal performance recording and progeny testing of bulls. The purpose of this paper is to share its experience with other organisations in the developing countries.

2. Organisation

BAIF is engaged in development programs with the focus on income generation activities and improvement of quality of life of rural population. Crossbreeding of indigenous (zebu) cows of farmers using frozen semen of exotic breed dairy sires (Jersey or Holstein Friesian) has been one of such activities which is spread over about 7 000 villages distributed across 7 states in India. Majority of the cow-owners are small and marginal farmers or landless families which have traditionally adopted crop-livestock integrated farming system. BAIF provides mobile AI services, so that animals are AI bred at the door-step of the farmers.

Cross breeding programme in Ahmednagar district of Maharashtra is the oldest programme initiated in the year 1970. The herd strength of crossbred cows in this area appears to be adjusted to the local resources of the farmers through their experience and hence stable. Consequently, 143 villages from this district were selected to initiate performance recording.

3. Getting started

As a starting point, the records of artificial insemination (A.I. Register), pregnancy diagnosis (P.D. Register) and calvings (Calving Register) were screaned to identify the prospective herds and animals to be included in recording. It was decided to undertake recording of physical measurements of body size of female progeny of known pedigree (known sire and dam). The difficulties posed were :

- Unreliable information of parentage on large numbers and
- Non co-operation of cow owners for ear-tagging/tattooing of their animals.

These problems were sorted out through:

- Checking earlier identification of animals (Tattoo/ear tag if available), verification by the owner and AI centre incharge (who visits the farm frequently) and cross-verifications of age of the progeny in relation to the AI, P.D., calving dates of their dams, followed by tattoo/ear tagging as token of registration in the progeny testing program.
- Creating awareness amongst the farmers for the importance of animal identification and performance evaluation.

4. Selection of herds

Herds were selected on the following criteria :

- Herd should be located in area of high density of crossbreds. (AI Centre area having minimum 400 crossbred cows).
- Herd should have minimum 2 crossbred cows.(Larger herds preferred).
- Herd should not be located in isolation at far off place (viz. Cluster of herds in the close vicinity were selected).
- Animal owners should be willing to get their animals ear-tagged, get their cows AI bred, allow collection of data on the herd and animal performance, and disallow breeding of their animals by any other agency. (Overlapping of breeding activity by different agencies discouraged).
- Animal sale/transfer should be least as assessed from the history of previous years.

5. A.I. breeding

All the crossbred cows were A.I. bred using frozen semen of either pure-bred Holstein Friesian or crossbred (HF X Zebu) bulls. The A.I. services were made available at door-step of farmers. All the A.I. bred cows were followed to check pregnancy.

6. Selection of recorders

On the assumption of 4 to 7 herd-visits per day by a recorder, 10 milk recorders were appointed on permanent basis and another 10 on contract basis. The operational area covered by these recorders included 143 villages.

A training programme was drawn up to orient the manpower for animal performance recording work.

7. Supervision

The operational area was divided in three clusters and the working of the recorders in individual clusters was supervised by trained supervisors.

Further checks and verifications were entrusted to the respective AI Centre in-charge who were in position to visit the farms regularly.

Senior Scientists and Research Officers cross-checked the data through regular visits and EDP validation.

8. Data collection

Data collection was arranged at three levels as shown in table 1.

Data scrutiny, editing, updatation, storage and analysis was arranged centrally at Uruli-kanchan (Pune).

9. Measurement of growth

Measurements of body-size (heart girth, body length, body height and paunch girth) were recorded at birth, 6 months and then at intervals of 6 months up to 24 months and then at calving. Average of 2 measurements each time was considered adequate. The growth measures were essentially introduced to establish frequent contact with the herd owners and also to maintain track of the female progeny from birth through calving and milk production.

10. System of milk recording

Milk yield in pail for 24 hours was recorded at fortnightly intervals through morning and evening milkings. However, considering the cost factor and operational problems, the herds were visited morning and evening milkings on alternate fortnights later on.

Table 1. Data collection arranged at three levels.

Levels	Type of data
Milk Recorder	Herd status, animal growth, feeding practices, milk production.
Supervisors	Random checks on milk data, fat testing, health status.
Centre in-charge	AI, P.D., calving and animal identification.

Each of the milk recorders attended milking at 2 to 4 herds every day for 5 days a week (Direct Recording). After the milking hours, they visited adjoining herds and collected the records through personal enquires with the farmers (Indirect Recording).

Milk samples from cows in 2nd, 5th, and 8th month of their lactation were analysed for estimation of butter fat percentage. The milk samples for butter fat test were gathered by the milk recorders and transmitted to supervisor for analysis.
Data on feeding practices, health and herd management was collected during routine milk-recording schedule.

11. Outcome

The observation and inferences based on the performance recording undertaken during the period from 1988 to 1993 were as follows.

The number of A.I. required per recorded female birth was 8.5. The herd survival rate of female progeny from birth to completion of first lactation was estimated to be 46% and the number of A.I. required to obtain one milk recorded daughter to be 18.4.

The growth measures on the female progeny were the body length, height at withers, chest girth and paunch girth. Analysis of variance indicated that sire differences were significant at 6 months age for all measures, except for paunch girth. The location effects were consistently significant across all the age groups whereas year of birth and feed group effects were significant up to 12 months age.

The mean age at first calving of the crossbred progeny was 32.8±0.7 months and the mean 305 day milk yield 2 863±309 kg. The average milk yield from 1st to 5th lactation ranged from 2 671±60 kg to 2 995±102 kg. The average butter fat percentage varied from 4.07% in 2nd month to 4.16% in the 8th month of lactation.

Various sampling plans (Combination of Morning and Evening Records) were used to estimate the lactation yields. The estimated yields by these plans were compared with Standard Lactation (based on fortnightly morning+evening test records). The recordings based on evening recording alone underestimated the lactational milk yield while those involving only morning milkings overestimated. The means of first lactation estimated by alternate morning and evening recording appeared to give mean lactational yield nearer to standard lactation. When all lactations were considered, AM/PM uncorrected gave estimate comparatively more nearer to standard.

Test Interval, average yield and centering date methods were used to estimate lactation yield from test day records. The average yield method overestimated the yield while centering date method underestimated it. The difference between the methods were highly significant.

Lactation yields were estimated using different intervals of recording i.e. fortnightly, monthly and bimonthly interval. The estimates were obtained using both test interval and regression methods. As the interval of recording increased, the absolute errors also increased. Yields estimated by monthly interval either by test interval or regression method gave similar absolute errors. The absolute errors estimated from bimonthly records were the largest. Based on various results obtained, it was concluded that Test Interval method would be more suitable and convenient for computation of lactation yield.

Regression analyses were carried out to study the effect of the test-day on the test-day yields during 1st to 20th fortnights. It was evident that the test day yields needed to be adjusted during the initial and end phase of lactation. The correction factors for extending the incomplete lactations to 305-day yields were developed, taking into account these regressions.

The estimated yields were subjected to statistical analyses to study the effect of genetic and non-genetic (environmental) factors. The effects of centre-year-season subclasses and parity contributed to most of the explained variation. The effects of exotic blood level and age at first calving were non-significant.

Six different models (using different "herd-production-levels" as independent factors and inclusion/non-inclusion of Age at first calving as a covariate) were tried. The correlations between rankings by different methods ranged from 0.50 to 0.96.

The rank correlation between BLUP values based on 10 daughters had very poor correlation with those of larger progeny groups of 20 and 25. The rank correlations markedly increased when the progeny groups were 15 per sire. The rank correlations of the BLUP values based on progeny groups of 20 and 25 showed consistent improvement. Based on the results so far, it was concluded that more than 25 daughters per bull would be needed to get reliable estimate of progeny test of bulls.

In addition to Mixed Model Solution (MMS) procedure, the bulls were ranked by Contemporary Comparison (CC), Least Square Analysis (LS) and Relative Breeding Value (RBV) estimates. The ranking by LS was very similar to BLUP. The correlation of BLUP with CC were highly significant but of lower magnitude.

The studies showed that the progeny testing of 10 cross-bred bulls per year would require cross-bred population of minimum 20 000 heads of breedable females and testing of a batch of bulls might require minimum 8.5 years period beginning from the date of their birth. The scheme could provide considerable opportunities for identification of superior cows as bull dams.

On the background of the experience gained, it was recommended that further research is required to be undertaken to focus on milk-recording intervals, use of anxillary data (Like feeding practices), grouping of herds for simulating bigger herds, use of entire herd data, correlating early sire proofs with later proofs, and development of suitable area specific correction factors for adjustment of data.

12. Acknowledgement

Author acknowledges the financial assistance received from the Indian Council of Agricultural Research, New Delhi, for undertaking research on field performance recording and progeny testing.