Buffalo recording systems in India

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Brief description of buffalo recording systems

Buffalo recording has been carried out under the programme referred to as " Dairy Herd Improvement Programme Actions (DIPA)" in six districts in the State of Gujarat. The first DIPA programme was started in 1987 by the Mehsana District Cooperative Milk Producers' Union in the Mehsana district for selective breeding of Mehsana buffaloes. Later, in 1989 the Kheda District Cooperative Milk Producers' Union initiated a DIPA programme in the Kheda district for upgrading of local non-descript buffaloes with Murrah bulls. In 1992 another four cooperative unions namely the Sabarkantha District Cooperative Milk Producers' Union, Baroda District Cooperative Union, Panchmahals District Cooperative Unions and Surat Cooperative Milk Producers' Union in collaboration with the Sabarmati Ashram Gaushala (SAG) initiated a similar programme for upgrading the local non-descript buffaloes with Murrah buffalo bulls in their districts. These district milk cooperative institutions are farmer-owned organizations collecting, processing and marketing milk of their member producers. In 1998-99 these six cooperative unions collected and processed an average 3.2 million litres of milk a day. These organizations also provide technical input services like artificial insemination, cattle feed, fodder seeds and veterinary health care to their member producers. The DIPA programmes have been integrated with other services provided by the unions for enhancing milk production.

Overall input level of the production environment

Dairying is an important source of income for the majority of farmers in these six districts. More than 70 percent of the households have cows and buffaloes. Livestock holdings are very small. Usually farmers have one to five animals.

Milk production takes place in many households each contributing a small quantity. Together, however, they produce a very large quantity of milk. Farmers live near to each other and keep buffaloes with them. As farmers live in conglomerations, they learn from each other and often follow common management practices. Livestock are managed by family labour

and fed largely on crop residues and supplemented with green fodder and concentrate. The farmers of the six districts could be put into low to medium input production systems.

Number of herds and buffaloes involved in recording

These districts have proportionally more buffaloes than cows. The ratio of buffaloes to cows is 7:3. The total production of buffalo milk to cow milk is 4:1. Some 218 villages have been involved in buffalo recording systems and about 3.5 percent of buffaloes have been covered under the DIPA programme (See Table 1 for district wise details).

Table 1. Number of buffaloes, milk production, AI coverage and DCSs under DIPA in six districts.

Particulars	Mehsana	Kheda	Sabar	Baroda	Panch	Surat
No. of villages	1 093	970	1 395	1 651	1 908	1 185
No. of households in '000	550	643	325	567	463	629
Breedable females in '000:						
• Buffaloes	362	413	261	202	231	140
• Cows	113	102	112	111	177	98
Predominant buffalo breed	Mehsana	ND	ND			ND
Other		Surati	Mehsana	ND	ND	Surati
Milk production in '000 tons/year						
• Buffalo	437	374	213	157	141	115
• Cow	125	137	81	65	61	56
Total DCSs	984	985	1 556	884	1 107	917
DCSs under AI	435	863	313	420	550	448
DCSs under DIPA	33	50	30	35	30	40
Percent recorded buffalo population	4	6	3	2.5	2	3

DCS: Dairy Cooperative Society; ND: Non-descript buffaloes

Categories of animals included in recording

The recording systems were initiated with the purpose of genetic improvement of buffaloes through a well-planned, field-based progeny-testing programme. When the DIPA programme was initiated in any village, all breedable buffaloes were either eartagged altogether and registered under the programme or they were eartagged as and when they came for insemination. All events of artificial insemination (AI), pregnancy diagnosis (PD) and calving of dams were recorded. In the initial years of the programme, some dams after their calving were milk recorded once a month, morning and evening. This was done in order to know the production levels of foundation stock. However, all female calves born were included in the programme and closely followed from birth to their complete first lactation. Each female calf born under the programme was eartagged in the first 15 days and followed-up for growth by measuring length and heart girth every month. When the daughters born under the programme came into heat, they were inseminated and all events of artificial insemination, pregnancy diagnosis and calving were recorded. All daughters in first lactation were milk-recorded morning and evening once a month throughout their lactation. A sample of milk was collected at every recording in a sample bottle and tested for fat percentage at the dairy cooperative society in the village. Males born under the programme were not recorded for any characteristics except those young sires produced by nominated mating using top proven sires and top recorded daughters to be programme tested. The semen stations directly monitored the growth of young sires with the help of cooperative unions.

Purpose of recording systems

The recording systems were initiated with the main purpose of achieving genetic improvement in milk and fat production in buffalo populations. However, as the programme was implemented, it was soon realised that unless farmers actively participated in the programme, the desired results would not be achieved and that the farmers would not participate in the programme unless they had some benefits. To ensure active participation of farmers, some specific programmes were initiated for improving management, nutrition and health care of their animals. Each female calf born under the programme was given five bags of cattle feed (about 350 kgs) in kind over a period of one and a half years. The service of de-worming of calves was given free-of-charge. Special attention was given to the health of all female calves. The information system was also suitably modified to provide information that is relevant to farmers for improving management of their animals. The main purposes of the programme today are: (i) to achieve higher genetic gain in buffalo population; (ii) to exploit genetic potential of buffaloes by improving management, nutrition and health of buffaloes; and (iii) to provide relevant information to farmers to help them in management of their buffaloes.

Type of identification

Buffaloes have been registered under the programme by applying a plastic eartag having an eight digit laser printed number. The last digit of each number is the check digit derived from the first seven digit serial number.

Traits measured and frequency

All events of artificial insemination, pregnancy diagnosis and calving are recorded on a routine basis. Recording of these events provides information on age at first calving, number of inseminations per conception, conception percentage on first service basis, service period, dry period and inter calving period.

All female calves born are followed up for growth by measuring heart girth and length on a monthly basis to provide estimates of body weights and growth rates.

All daughters after their calving are milk-recorded once a month morning and evening throughout their lactation. At every milk recording, quantity of milk produced in litres is recorded and a sample is taken to measure fat percentage in milk. Thus, quantities of milk and fat percentage are the two other traits recorded on a monthly basis. At the end of lactation, the date of drying off is recorded. This provides the information on lactation length, dry period and inter calving period.

Pedigree records have been maintained for all daughters born under the programme.

For each bull being test programmed, data on semen concentration, initial motility, post thaw motility and the number of doses produced are maintained ejaculation wise throughout the period they remain at the station. All bulls are examined for chromosomal abnormalities and tested for all known genetic diseases through DNA typing.

Data analysis

At each participating union, the required computing facilities have been created. Inseminators record events of artificial insemination, pregnancy diagnosis and calving. Milk recorders record milk production and fat tests. Supervisors record heart girth and lengths. They record all data in formats and send them to the computing centre of the Union. At the Union's computing centre, the data are entered and processed using the MIS-DIPA software. The software creates village, animal and bull files. These files are then transferred to the computing centre of the National Dairy Development Board (NDDB). At NDDB a central database has been created collecting data from all unions. NDDB estimate breeding values and pass that information back to the participating unions.

MIS-DIPA

NDDB has developed an in-house software for monitoring of all activities of the DIPA programme covering maintenance of bulls, production, processing and supply of semen doses, recording events of AI, PD and calving, measurement of heart girth and length and supply of cattle feed, recording of milk production and fat tests, etc. The data collected in different formats are processed at semen stations and union computing centres. Many performance reports are produced by the system. Since farmers have one or two animals, supplying information to farmers on performance of their animals is perhaps not very relevant, however, when information is produced for all animals within a village on key parameters then farmers obtain very useful information, as they then can compare their performance with other farmers and adopt good practices followed by better performing farmers within the village. Hence, the system produces performance reports village wise and within village for all animals together and not for each individual participating farmer. Whenever the supervisor visits his assigned village during his monthly visit, he carries with him the village wise performance report and the action list and discusses the reports with the inseminator and farmers and advises them on feeding and management of their animals. The system maintains animal wise information on age at calving, service period, number of inseminations per conception, lactation length, gestation period, dry period, inter-calving period, total milk yield, total milk days, 305 day milk yield, fat yield, etc. The estimation breeding values of bulls and all animals has been done centrally by NDDB.

Government and farmer involvement

The participating dairy cooperative unions implement the DIPA programmes under the technical guidance of NDDB. There is no involvement of the State or the Central Government in the programme. Each DIPA programme was initiated with the financial support of NDDB. NDDB met all the cost of implementation of the programme for the first five years. After five years of implementation of the programme, a separate corpus fund for each of the three DIPA programmes was created with the contribution from respective unions and the NDDB. Each programme at present meets its costs from the interest earned from the long-term investment of the corpus fund and does not depend on any external agency for funding. If the cost of implementation of the programme in any particular year is more than the interest earned, the respective unions meet the additional costs. The fact that the Mehsana Union has been running the DIPA programme now for almost 12 years, the Kheda Union for ten years and the other four unions for six years, it indicates that the programme has been well accepted by the farmers and it will be run by farmers themselves for many years to come.

Farmers do not pay for recording. The cost of implementing the DIPA programme has been met through the interest earned from the investment of the corpus fund.

Genetic improvement of buffaloes

Breeding Plan Design

The core breeding strategy adopted for the genetic improvement of buffaloes in all six districts is progeny testing of buffalo bulls involving farmers in selected villages. In the Mehsana districts a straight breeding strategy has been adopted to improve the Mehsana buffaloes of the district. In the Kheda district, a strategy of cross-breeding of local non-descript buffaloes with the Murrah breed has been implemented. Here the plan is to use Murrah bulls obtained from the Murrah breeding tract in Punjab and Haryana for two generations and then follow the strategy of straight-breeding in the resulting upgraded buffalo population as in the case of the Mehsana district. A similar breeding strategy has been planned in the third programme jointly implemented by the Sabarkantha, Baroda, Panchmahala and Surat milk unions and the SAG.

The core design adopted in all three programmes is depicted in figure I. A set of 10-20 bulls has been tested every year in each of three programmes. About 30-50 villages, each village having 200-300 breedable buffaloes, have been selected for the programme in each district. This means, about 6 000 to 10 000 breedable buffaloes in each district or 2 to 5 percent of the total breedable buffaloes of the districts have been selected for the programme. This population is referred to as recorded population of the DIPA programme. At present 40 percent of villages in the six districts have facilities for artificial insemination. This means about 0.65 million buffaloes constitute the target population that is intended to be improved through the DIPA programmes. The cooperative unions have planned to increase their AI service to about 75 percent of the villages in the next five years. The base population will therefore increase to some one million buffaloes in another five years.

Some 2 000 semen doses per bull are distributed in DIPA villages in a way that the number of daughters born to all bulls tested in each village across all DIPA villages would more or less be equal. To achieve this, a bull wise semen distribution schedule is prepared. Semen doses of all bulls tested are distributed every month. Every month each DIPA village receives semen doses from only one bull. Semen doses of different bulls are used in each DIPA village every month and it is ensured that within a year maximum, bulls tested are used in each DIPA village and across all DIPA villages. This ensures production of daughters of bulls tested in most villages and in all months. Apart from test doses, a minimum of 5 000 doses per bull are stored till progeny test results of bulls tested are available. The stored doses of some top bulls are later used for nominated service to produce the next generation of bulls.

Estimation of breeding values

Our experiences indicate that through the distribution of 2 000 semen doses in recorded population about 250 daughters per bull are produced. Many daughters born in the programme, however, are sold by the time they are

in first lactation. About 3 percent of daughters are lost through mortality. Only 50-80 completing first lactation records of daughters per bull finally becomes available for estimating breeding values of bulls.

Presently a sire model using the BLUP procedure is being used to estimate breeding values of bulls.

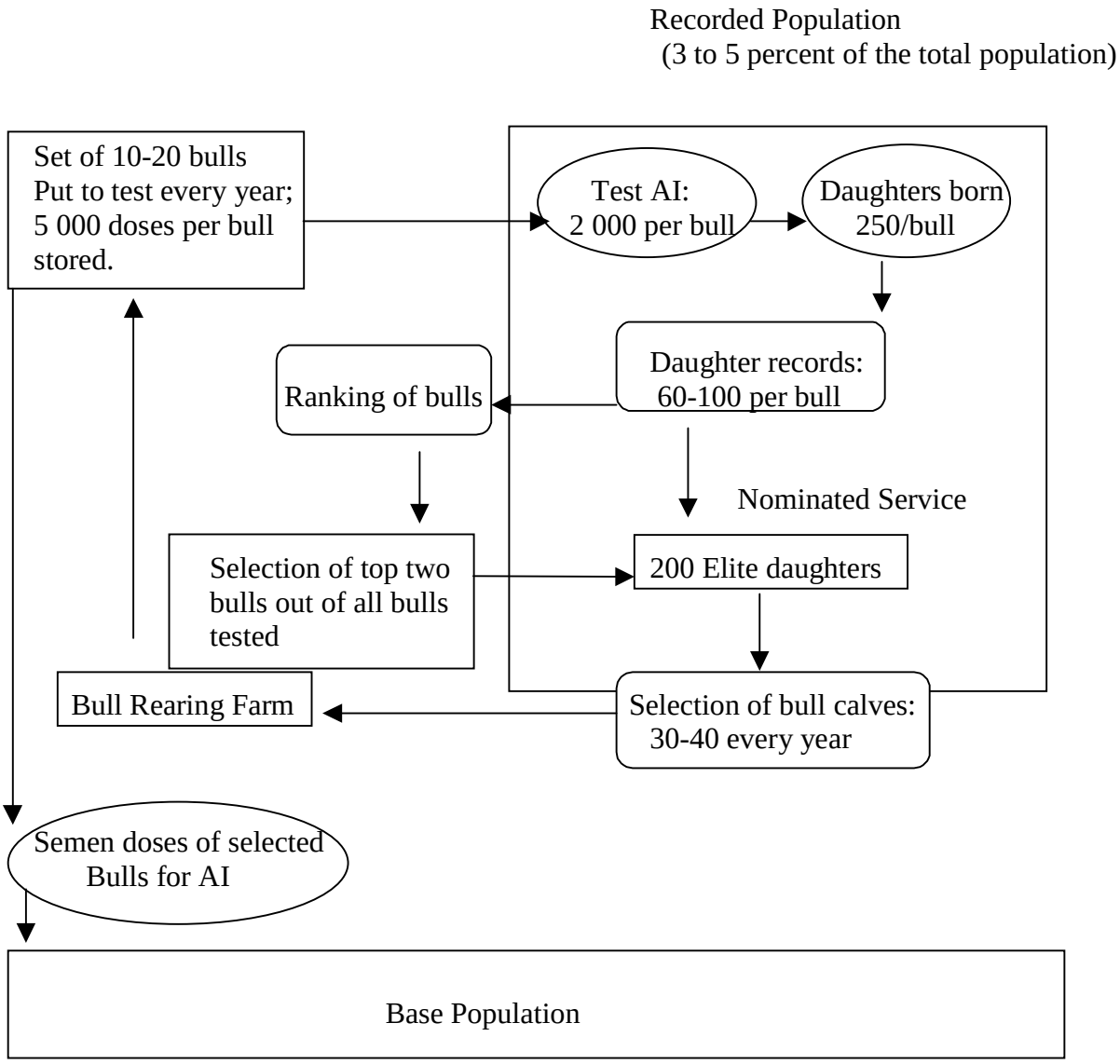

Figure 1. Breeding Plan of DIPA Programme.

Persons involved

NDDB is responsible for estimating breeding values of bulls. To date, two officers have been involved in estimating breeding values at NDDB. All unions now have internet facilities and they send their validated files to NDDB through internet. A central database has been created at NDDB. At union level, a team of three to four officers is involved in the implementation of the programme. A supervisor appointed by the participating union, one for ten DIPA villages, supervises implementation of all activities such as supervision of AI and PD, recording of all events of AI, PD, calving and milk recording, measurement of heart girth and length, distribution of cattle feed, supervision of milk recording, advising farmers on feeding and management using the feedback received from the MIS-DIPA system, etc. in their assigned villages. The village level inseminator carries out all insemination at village level. Either the inseminator or a separate person carries out monthly milk recording in every village. The milk recorder at every milking takes a sample for fat testing and estimates fat content of every sample at the dairy cooperative society in the village.

Dissemination of improved genetics

Improved genetics are passed on to the base population through the AI infrastructure created by each participating union. Every year each semen station uses the top two progeny tested bulls and about 200 top recorded daughters to produce the next generation of 20-40 young sires to be tested. About 50 percent of the young bulls after completing their test mating are retained for one to three more years at the semen station for producing semen doses to be used for the normal AI programme. Thus, the benefits of the programme have not only been passed on to the participating DIPA villages, but also to all villages that have AI facilities.