

Genetics on Wheels –

An innovative way to propagate available best genetic resources of indigenous cattle and buffalo breeds

The need

In some well-managed Gaushalas and in some cattle shows one finds very high yielding animals of some of our indigenous breeds of cattle and buffaloes, but when one looks at country's average yields of local cows and buffaloes, they are pretty low. This is perhaps because no scientific genetic improvement programmes are put in place for the development of indigenous breeds in the country. Dairy farmers have been selecting breeding bulls for natural service mostly based on physical appearance. As bulls have been selected based on physical appearance and not on the basis of measurement of their important economic traits, there has been little change in the productivity of cattle and buffaloes. And because of very low productivity of the majority of indigenous breeds of cows, the dairy farmers are losing interest in indigenous breeds of cattle and shifting to crossbred cows as crossbred cows in F1 generation on an average produce two to three times more milk than their dams of indigenous breeds. However, the productivity levels of crossbreds are often not maintained in F2 and subsequent generations primarily due to the use of unselected crossbred bulls for breeding F1 and subsequent generations of crossbreds.

Genetic improvement is a long and tedious process; there are no shortcuts. To initiate a process of genetic improvement in the indigenous breeds of cattle and buffaloes, NDDB, under the **National Dairy Plan**, has initiated genetic improvement programmes for important indigenous cattle breeds such as *Gir*, *Sahiwal*, *Rathi*, *Tharparkar*, *Kankrej* and *Hariana* and some buffalo breeds namely *Jaffarabadi*, *Nili-Ravi*, and *Pandharpuri*. As in native tracts of some of these breeds, the infrastructure of artificial insemination (AI) is very poor; pedigree selection has been adopted as a tool to bring about genetic improvement in these breeds to begin with. However, it is envisaged that, as AI infrastructure is built in their native tract,

Mobile Laboratories- a strategy for Development of Indigenous Breeds

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more efficient methods of selection such as progeny testing and genomic selection could be employed for faster genetic progress.

Meanwhile, till these genetic improvement programmes provide quality genetics, it is thought prudent to employ all available means to make use of existing elite animals to give initial boost to quality of bulls in use for AI in these programmes. Many religious institutions traditionally have been maintaining very high producing animals of some of our important dairy breeds such as Gir, Kankrej, Sahiwal, etc. Some farmers have also established medium to large herds of indigenous breeds. Many of these institutions and farmers have been following their own protocols meticulously for selecting breeding bulls for their use in their farms. They not only consider milk production potential of dams as their selection criterion, but also consider physical appearance of bulls, bulls' sire and bulls' dam that conform to true to breed characters. They have been using their traditional wisdom to select bulls for breeding. These institutions, in many places provide breeding service through natural service to animals in surrounding villages. Farmers from distant places visit these Gaushalas and procure surplus cows and breeding bulls. However, benefits of these herds remain with a very few selected farmers belonging to nearby villages or those who succeed in obtaining either heifers or bulls from these herds. In general, farmers have faith on these institutions and they believe that the animals available with these institutions are of very high quality. Many farmers owning indigenous breeds are very much interested to use breeding bulls maintained by such religious institutions. However, their use is limited.

The question then arises how some high quality bulls maintained by such religious institutions and farmers could be used for their wider use in the country. One simple way could be to buy such high quality bulls, bring them at semen stations, produce semen doses and use their semen doses extensively in the country. But there are some problems in bringing in such bulls from farms/villages to semen stations. One of the biggest problems is the risk of bringing in diseases. Even if bull is free from all contagious diseases, the existing bio-security protocols precludes their bringing into semen stations once they are in herds that are not free from the contagious diseases. Sometimes even when all conditions are satisfied from the bio-security perspectives, many owners having exceptionally good animals may not be willing to sell/ part away their best animals.

One of the solutions to circumvent the above-mentioned problems is to have a mobile lab having semen and embryo processing facilities. Such a mobile lab can be taken to the identified Gaushalas'/ farmers, collect semen /embryo from the selected best elite animals, process and freeze semen doses / examine and freeze embryos, test the semen doses for specific pathogens and, move semen doses that found negative for the pathogens/embryos to semen stations/ laboratories. The semen doses can later be used for AI /embryos for transferring to recipients. Here, every batch of the semen doses produced from a bull, which has already been tested negative for diseases, can also be screened for various diseases like Infectious Bovine Rinotracheitis (IBR).

The experiences of NDDDB in establishing a mobile lab and its use by Sabarmati Ashram Gaushala have been described here.

The Mobile lab and its usage

The lab is fitted on a big van and is fully air conditioned with an inbuilt, clean-air system. Modern equipment for bovine semen processing such as Phase Contrast



Mobile Lab

Microscope, photometer, automatic filling and sealing machine, cold handling cabinet, bio-freezer, etc. are provided in the mobile van for processing of semen in the field. Similarly, facilities for processing of embryos such as stereo zoom microscope, embryo freezer with programmer, etc. are also provided.

The Mobile lab is used both for production and processing of semen and for embryo collection, embryo freezing and embryo transfer in villages as well as at institutional herds. Let us illustrate its usage with an example.

The Mobile Lab is extensively used by Sabarmati Ashram Gaushala, Bidaj (SAG, Bidaj) – managed by a sister concern of NDDDB: NDDDB Dairy Services.

SAG, Bidaj is the largest and the most modern semen station in the world. It maintains about 450 bulls of 20 breeds producing some 14 million doses in a year. It sources its major requirement of bulls from its two large field progeny testing programmes one for Murrah buffaloes and other for HF crossbreds. Recently, it initiated pedigree selection projects under the National Dairy Plan, one each for Gir cattle and Jaffarabadi buffaloes in the Saurashtra region of the state of Gujarat. The initial survey carried out by SAG in the Gir and Jaffarabadi



Inside Mobile Lab

areas indicated that although the productivity of Gir cattle and Jaffarabadi buffaloes is average in the Saurashtra region, there are a few religious institutions and a few farmers that have exceptionally good animals. SAG thought they could put their Mobile Genetic lab to best use in this area. To start with SAG located two herds having excellent Gir cows, one named Rajmoti Gaushala at Kodinar village in Junagadh District, owned by Sh. Dinubhai Solanki, a private farmer and another herd belonged to Swaminarayan Sansthan at Kundal village of Bhavnagar district. SAG first briefed both the herds about their Pedigree Selection project being implemented in their district for genetic improvement of Gir cows and expressed the desire to collect semen doses from some of their elite bulls. Realizing noble aims to help farmers to improve productivity of their animals both the religious head and the owner gladly agreed to the request and allowed to collect semen from their bulls following the standard protocol.

To begin with the herds were screened for the presence of diseases like Brucellosis and all the bulls whose semen doses had to be collected were screened for TB, JD, Brucellosis and IBR. When the herds and bulls were found negative for the presence of the pathogens, the SAG decided to take their mobile van to the herd. One fine day the van was taken to Rajmoti Gaushala at Kodinar village. The two bulls selected for semen collection had very high genetic potential; their mothers had yielded more than 5000 litres of milk in a lactation.



Mother's Lactation yield: 6000 litres



Mother's Lactation yield: 5400 litres

Soon the team realized that collecting semen from the elite bulls, which are very shy, aggressive, and habituated to Natural service, was very difficult. But with the admirable, perusing and perhaps daring efforts by SAG team, they collected semen from the two elite bulls and processed and frozen semen doses successfully in the Mobile van. The team then visited the herd of Swaminarayan Temple and collected semen doses from another three bulls. The team produced in all 2000 doses from the selected five bulls.



Semen collection at Rajmoti farm



SAG Team with their Mobile Van

Learning

Using a mobile lab for semen collection and processing as well as for embryo transfer could become a powerful tool to make use of some of the extra ordinarily high quality animals of indigenous breeds of cattle and buffaloes that the country has. Such limited number of high quality animals have not been optimally used primarily because of disease risks involved while bringing them to semen stations and secondarily because such high quality animals are with a few select institutions and farmers who are often not ready to sell their animals. Other important advantage of using a mobile lab could be to maintain a large variability in the population. Many semen stations due to limited demand for semen doses of Indigenous breeds end up using only one or two bulls for semen production for a long period of time. On cost considerations, regular replacement of indigenous bulls becomes the last priority. But if they have an option of getting small number of semen doses from many equally good bulls using a mobile lab without actually bringing in such bulls at their semen station, the strategy may not only work out to be a very cost effective, but would also add to their product profile and help in increasing the sales of semen doses of indigenous breeds. In the process, the country would benefit in terms of maintaining required genetic variability in the population and preventing bad effects of inbreeding. Such a strategy would also help in capitalizing the faith of those farmers, who had been depending on Gaushalas' and elite farmers for their needs of quality genetics, and bringing them in the fold of semen stations and in the process making better quality genetics available to them at a lesser cost and in more a convenient way.

At the national level, NDDB would like many institutions to have mobile vans for producing high quality genetics in the form of semen doses and embryos from the limited elite animals that a few institutions and farmers have. Thus disseminating high quality genetics to as many farmers as possible, enabling them to have better producing indigenous animals and helping the country in turn to conserve and develop indigenous breeds and maintain bio-diversity.