NATIONAL DAIRY PLAN

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THE NEXT REVOLUTION

Proceedings and Recommendations of the Workshop on "Genetic Improvement of Cattle and Buffaloes under National Dairy Plan I (NDP I)"

18th and 19th September 2013

National Dairy Development Board, Anand

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Proceedings of the Workshop on Genetic Improvement of Cattle and Buffalo:

In his welcome address, Shri Dilip Rath, Mission Director, NDP & MD, NDDB said that to accelerate the process of genetic improvement in the existing cattle and buffalo population, it is necessary to focus on three key areas: establishing infrastructure for production and selection of High Genetic Merit (HGM) bulls of different breeds in their native tracts, strengthening the semen production facilities for production of disease free quality semen and raising the number and percentage of animals bred through artificial insemination using semen of high genetic merit bulls.

He further said that in order to achieve the objective of production, evaluation & selection of breeding bulls, field based Progeny Testing (PT) programmes for pure HF, HF crossbred, Jersey crossbred cattle and Murrah and Mehsana breeds of buffaloes and Pedigree Selection (PS) programmes for Rathi, Kankrej, Gir cattle and Jaffarabadi buffaloes have been initiated under NDP. It is expected that the HGM bulls produced in these and other programmes would meet 100 percent replacement needs of bulls of all semen stations supported under NDP by 2016-17 and thereafter.

The selected 'A' and 'B' graded Semen Stations are being taken up for strengthening in terms of infrastructure and training. He informed that to ensure quality of processes and products in the proposed programmes, detailed Standard Operating Procedures (SOPs) and Minimum Standards (MS) and Evaluation Procedures have been evolved and put in place. To meet the information need of all the stakeholders, a software called INAPH has been developed.

He said that the availability of qualified and experienced manpower and retaining it in the projects is a constraint many EIAs would face. The projects have adequate financial provision for training of manpower in the required areas and up-grading their skill and knowledge.

He hoped that during the workshop all issues would be discussed in detail and recommendations would be arrived at which would improve the efficiency of the programmes.

Dr AS Nanda, Animal Husbandry Commissioner, Dept. of Animal Husbandry, Dairying & Fisheries (DADF), Govt. of India (GOI), in his inaugural address, said that the demand for milk and milk products in the country is increasing at a rate faster than the rate of milk production. It would be difficult to fill up this gap between the demand and supply unless the productivity of our low producing animals improves. To achieve this objective, GOI launched the first phase of National Dairy Plan (NDP) in 2012. He outlined the need for employing the latest genetic tools for increasing the productivity of dairy animals as has been done by the western countries for decades now. Dr Nanda said that though all the projects have been designed meticulously to ensure quality and detailed SOPs, MS and evaluation mechanisms have been put in place, there is always a scope for improvement. The aim of this workshop is to share experiences of other dairy advanced countries and learn from their experiences. We have, therefore, invited renowned experts to guide us in improving the efficacy of the programmes.

He also pointed out to the experts that field conditions in India are different than those in their own countries; therefore, the recommendations should be appropriate to this country and implementable in our situations. Dairying in this country is carried out under severe resource constraints and unfavorable climatic conditions compounded by disease prevalence.

He also requested participants to work out strategies for improving the productivity of our long neglected local dairy breeds. He hoped that with the availability of new biotechnological tools, it would be possible to fast track the improvement in these breeds. He also requested experts to address the issue of sub-fertility or infertility in crossbred bulls and come out with solutions to overcome these problems

While delivering the keynote address, Dr Amrita Patel, Chairman, NDDB underlined the fact that among all the tropical countries in the world, India is probably the only country which has achieved a steady increase in milk production and has emerged as the largest milk producing country in the world. Unlike advanced dairy nations who have the advantage of a temperate climate and farms with large animal holdings, in India, this has been achieved by millions of small producers the majority of them having less than 5 milch animals.

She urged the experts and participants to keep in mind while deliberating the issues related to implementation of genetic improvement programmes, the dairy production system in the country where most of dairy farmers have small hold ings, minimal management facilities, poor feed and fodder availability, prevalence of variety of diseases, limited AI infrastructure, almost non-existent performance recording systems, lack of awareness among farmers etc.. Due to these limitations, we are not able to take up classical PT programmes and what we are beginning with is the young sire programme. Some other important challenges one may face during implementation are: involving farmers in the programme and sustaining their interest; convincing farmers about importance of animal identification and recording information, milk component testing, breeding value estimation procedures under smallholder situation, etc.. She urged the experts to deliberate on: the programme design adopted for progeny testing and pedigree selection under NDP; how to accelerate genetic progress in important indigenous dairy breeds and in the crossbred population; quality control systems and putting in place institutional arrangement for their implementation; the need to introduce genomics etc.

She requested the experts to share their experiences and learning of implementing the genetic improvement programmes in their respective countries with the participants.

Technical Session I : Genetic Improvement in Advanced Dairy Producing nations

Dr Leo Dempfle from Germany, Dr Vincent Ducrocq from France, Dr Filippo Miglior from Canada, and Dr Helen Leitch from the World Bank presented the dairy situation in their respective countries and narrated the status and the evolution of genetic improvement programmes. Two more country presentations, which were shared with participants, were on USA by Dr Ole Meland and on Switzerland by Dr Fritz Schneider. The speakers also touched upon some basic aspects of genetics and animal breeding.

In most of these countries the number of dairy herds and the total number of dairy animals have been declining, whereas the animals per herd and the per animal productivity have been increasing. The milk production has almost doubled. They were able to sustain the same level of production through less number of animals, thus reducing pressure on the resources and environment. This has been possible only because about 50 years ago they initiated genetic improvement programmes in right earnest and continuously improved the design of the programmes as the science of genetics and animal breeding advanced and newer analytical techniques became available. This led to increased reliability and accuracy in breeding value estimates and faster genetic improvement. Additional traits to improve profitability of dairy business were included in the selection index.

Topics covered during the technical sessions and panel discussions were :

- Genetic improvement in advanced dairy countries,
- Information Network for Animal Productivity and Health (INAPH),
- Breeding Value Estimation methodology, particularly with reference to smallholder production systems,
- Genomics and other latest technologies for genetic improvement of dairy cattle and their relevance to genetic improvement of dairy cattle in India,
- Bio-security measures,
- Human resource development in Germany, France, Canada and USA and
- Strategies for implementing long term genetic improvement programmes in India.

The experts informed how, with the availability of advanced biotechnological tools, these countries have been moving towards genomic selection, away from progeny testing programmes. However, they emphasised that the pedigree information and performance recording of animals would be continued uninterruptedly as it is going to play an important role. Every expert emphasised finally that the "Phenotype is King".

They emphasised that selection of bulls should be based not only on milk production but on a composite selection index which should include besides production, milk components and dairy traits, other traits which affect profitability of dairying such as fertility, longevity, disease resistance etc. They also highlighted and advised that if a village is being considered as a herd, all animals in village should be performance recorded. To increase the number of bulls put under test, it was suggested that different projects carrying out testing for the same breed should share at least 20% of test doses from their test bulls with each other so that daughters of the bulls are produced under different environments and test results of all bulls become comparable.

Speakers informed that a single Central Data Base for storing data and sharing information would be beneficial. They also highlighted the importance of independent institutions for genetic improvement programmes and government support to these institutions at least in the initial years. Designing appropriate training programmes for field staff and managerial staff to improve their skills both technical and managerial was emphasised. It was agreed that attracting and retaining manpower will continue to be a challenge and innovative schemes and incentives need to be evolved to retain the trained manpower.

It was suggested that situations are very different from one country to another with respect to many factors (infra-structure, market demand, etc.). It is therefore necesary to carefully analyse the prevalent situation of the country before Genetic Improvement schemes are designed in order to serve the country best. Just copying might not be a good solution.

The deliberations resulted in many useful suggestions to make the programmes more effective and efficient.

Panel Discussion on Genetic Improvement :

Sr. No.	Issues raised	Suggestions by the Expert panel
1	Previously it was considered to use Micro-satellites as a tool for Marker Assisted selection. Now it is genomic selection through SNPs. How long will the SNP hype last?	Unlike marker assisted selection, the whole genome selection procedures have a very sound theoretical basis and it is likely to be the tool for many years to come. Across the world a very large number of bulls and female animals are being genotyped and the cost of genotyping is constantly going down.
2	If genomic selection is applied what is the possibility of reaching homozygosity (Fixing of genes in population). Where there will be no scope for further selection, is there any possibility that some traits not in selection may be lost	Traits are controlled by 1000s of genes and not by one gene. So there is no possibility of reaching homozygocity through whole genome selection procedures. Traits can be revived by including them in selection index. Selection objectives are changing. Traits having very low heritability showing good results through whole genome selection procedures.

Sr. No.	Issues raised	Suggestions by the Expert panel
3	A large proportion of crossbred bulls are found to be sub-fertile or infertile at semen collection stage. Is there a method to detect this at an early age?	At present there are no tools to identify sub-fertile or infertile bulls at early age. There is a need to identify traits related to fertility, deciding weightage for each trait, a method of rating fertility based on this score and correlating it with cytogenetic research. It was informed that research is being carried out on Sahiwal crossbred bulls with World Bank aid and the results are awaited. It has been observed that Gircross bulls have less problems. It was suggested to include male fertility in selection index.
4	Exotic blood level, both in crossbred bulls put to test and in the crossbred population on which they are tested, is not known. Can bulls with unknown (different) exotic blood levels be tested together on a population with unknown levels of exotic inheritance?	It was suggested not to worry about blood levels. Ensure all economically important traits responsible for overall profitability are included in a selection index. Testing for only one trait or only production traits may lead to the progress in wrong direction on a long term.
5	Can exotic level in CB be measured?	It is difficult. Only pedigree data can help.
6	Murrah buffalo owners are particular about the appearance of the animal and they do not approve of white patches	Body colour/body patches have not found to be related to economically important production and health traits.
7	If reliability in genomic selection ranges between 20 - 60 % as compared to >70% in PT and about 30% in pedigree selection, what is the advantage of genomic selection?	It was explained that even for traits with less than 20% heritability, one gets about 60% reliability under genomic selection.
8	Many countries have stopped PT and going for genomic selection. Should we not also go for it? Instead of waiting for reference population of 1000s of PT bulls, can we go for a large female reference population? What is minimum reference population required.	It was agreed that it is a good and implementable solution to PT programmes. However one requires a reference population of about 100-200 bulls and about 30000 ***well phenotyped*** females. It was advised to keep storing biological samples of these individuals and wait for cost of genotyping to come down.
9	Is India ready for use of Genomics in Genetic improvement programmes?	Yes. Some agency has to take the lead
10	Why are only 20% of genomically selected bulls put to Progeny test?	It is expected that they would come out to be top on progeny test result also and just testing 20% of bulls reduces the cost of testing.
11	How much time is required to standardize Genomic selection in a breed?	It is the time that is required to create a sizeable reference population.

Sr. No.	Issues raised	Suggestions by the Expert panel
12	How many performance records are required for progeny testing if reliable records are available? Whether to use test day records or full lactation record?	Experts are of the opinion that larger the population recorded, larger the accuracy of selection and thereby larger genetic progress. One has to trade off between the cost and the accuracy. Strong checks and controls in Milk/ Performance recording are required.
13	How can one compare bulls of a breed from different countries?	INTERBULL comparisons are available and breeding values of all bulls on a country scale are available. Choose a country scale most appropriate for India, as India is not participating in Interbull comparison, and select bulls. It was informed by BAIF that in 1975 they imported semen of bulls from four different countries and used in general AI programme. The results revealed that ratings of bulls in their country of origin changed when they were used in India.
14	How to measure adaptability and disease resistance? Can we carry out challenge studies and include results in selection index?	Longevity and fertility could be used as indirect measure of adaptability and disease resistance. Do challenge studies, identify SNPs and include in genomic selection.
15	What is the difference in genetic gain between young sire evaluation and classical PT Programme?	Experts said that they had no idea, however in our country annual genetic gain thru classical PT could be less due to very long test cycles/ Generation Interval.
16	What is the minimum number of daughters which need to be recorded for BV estimation?	Depends on how much reliability of estimate is acceptable. With 100 daughter records in 100 herds the reliability will touch very close to 100.
17	How to improve participation of farmers in the programme?	Provide useful and timely feedback to farmers. Legislation to enforce compulsory ear tagging and milk recording. Incentives could be useful during initial period
18	How to promote AI?	Educate farmers on utility of technique. Include leaders in village in the programme and use them as motivators.
19	Can reference population of one country be used in other country?	No.
20	How do two PT programmes for a single breed exchange test semen if unequal number of bulls are under test in two programmes?	Ignore unequal numbers. Test the bulls in each other's area.
21	How was animal identification popularized in your countries?	State funding for a long period. Thereafter incentives, penalties and legislation in that order.

Technical Session II : Bio-security measures in bull production

Dr David Kelton in his presentation emphasized the importance of health, which is a major contributor to animal's capacity to express its genotype to the fullest. He opined that high level of health, both in target and nucleus population will expand the candidate pool from which the best high genetic merit animals may be selected.

He elucidated the key elements responsible for the success of any bio-security programme, namely, (i) informed and committed people (ii) unique animal identification (iii) traceability and animal movement control (iv) herd health (v) disease surveillance capability and capacity and, (vi) outbreak management and control expertise. He said that peer learning through focus farms or demonstration projects were very strong tools in disseminating the message of bio-security to the farmer.

Dr. Kelton highlighted the need of individual animal identification and the crucial role it plays in tracing the source of outbreaks, epidemiological surveillance, traceability and documentation. He informed that in Canada and in many other countries, not one but two ear-tags are applied in case one of the tags falls, animal is still left with the unique identification. He opined that scientific progress in animal productivity and health is not possible without unique identification of each animal.

He then went on to explain the bio-security protocols being followed by dairy herds in Canada through various examples. While doing so, he stressed the importance of strong regulations that need to be juxtaposed with the process for effective implementation, a case in point being the mandatory annual sign-off by a veterinarian on animal health and drug use on every farm in Canada.

With respect to disease control, he explained that the main strategies and tools employed in Canada have been (i) test and slaughter/treat (ii) strategic vaccination (iii) risk mitigation and then went on to explain the experiences in the country on specific disease control programmes like IBR, BVD, leptospirosis etc.

Referring to disease testing for bulls, he revealed that bull calves and bulls are tested at least 4 times at various stages from source farms till they reach the semen station, apart from testing of their dams. In the semen station, the testing is done on a regular and periodic basis. The bull calves and bulls should test negative for the following diseases: (i) Brucellosis (ii) TB (iii) Leptospirosis (iv) Bluetongue (v) Johne's disease (vi) Enzootic Bovine Leucosis (EBL) (vii) Epizootic Haemorrhagic Disease of deer (EHD) (viii) Bovine Viral Diarrhoea (BVD) and (ix) Infectious Bovine Rhinotracheitis (IBR). He also mentioned that semen stations have facilities for the maximum bio-security and detailed SOPs and MS which are strictly enforced. He also added a word of caution that "test free" herds/animals need not necessary be "disease free", given the dynamics of the diseases and the mediocre sensitivity of most of the tests available to detect them.

In his concluding remark he opined that Biosecurity is a mindset that needs to be shared by everyone and implemented always.

Panel Discussion on Biosecurity

In his opening remarks, Dr R K Singh Chairman of the session opined that bio-security cannot be neglected anymore and steps should be initiated to put in place Biosecurity measures. If all required measures cannot be implemented at once due to limited resource availability, those possible should be taken up immediately and others may be added gradually.

Dr V A Srinivasan mentioned that unlike advanced dairy nations, India neither has an animal identification system nor it is free from important diseases like TB, Brucellosis etc. The lack of identification is further compounded by uncontrolled animal movement and absence of disease prevalence reports. He also gave a brief description of the two National Disease Control Programmes (DCP) that have been initiated by the GoI, i.e. FMDCP and National Brucellosis Control Programme (NBCP). He also informed that a comprehensive Biosecurity protocol document has been submitted to the GoI by NDDB, which includes all the major facets of Biosecurity with regard to bull procurement and Semen Station.

Dr G K Sharma briefly described the concepts behind and importance of creating disease controlled zones in PT and PS project areas and around the pre-quarantine, quarantine, rearing and, finally around the semen station. He also threw light on important epidemiological aspects of BVD infection.

The important discussion points and the recommendations provided are given below :

Sr. No.	Issues raised	Suggestions by the Expert panel
1	Procurement of disease free calves: Introduction of two new diseases – IBR & BVD, in health protocols adversely affects achievement of targets for bull production in PT and PS projects. Project documents were prepared and targets were set taking into consideration only TB, JD and Brucellosis.	Procurement from bull mother farm: (i) Move towards maintaining a closed herd. If females are to be inducted, maintain the purchased animals in a transit farm for a period of 2-3 years, regularly test for diseases, mix only disease negative animals with the main herd. Procurement from village: (i) Avoid procurement of calves from villages where prevalence of disease is very high. (ii) All animals of the selected farmer should test negative for the diseases in question before the male calf is selected. (iii) Some methodology may be devised wherein the farmer is sensitized on the importance of male calves of test negative dams to be reasonably segregated, given the constraints of the village. (iv) When the calf remains for longer periods with the dam, confirm that the dam has tested negative before selecting the calf and also ensure that the calf is lifted within the minimum possible time lag after the result is known.

Sr. No.	Issues raised	Suggestions by the Expert panel
2	Undue delay in testing which is leading to delay in culling of positive animals, inability of the SS to sell semen batches under testing and delay in inclusion of clean animals in the herd. This delay not only leads to loss of genetics but may result in spread of diseases. A timeframe needs to be prescribed for reporting results of the test.	(i) These issues are being addressed by the ICAR/NDDB/IIL joint panel which has been set up to harmonize the testing procedures, standardize reagents and tests and identify new labs also. (ii) The possibility of allowing universities to do the testing for semen stations as a part of MSP may be explored. (iii) Parallel scheme of testing using different tests for the same disease may be employed to avoid ambiguities in test results.
3	Identification of good university labs that could perform the tests.	
4	Lack of accreditation process for the labs.	
5	Establishment of reference lab(s)	
6	There is a general perception that disease control measures, namely vaccination against FMD and brucellosis and, HS, BQ and Theileriosis (in endemic areas) around 10 Km radius of semen station is not being carried out by the State AHD in true sense and spirit.	On the request of the Mission Director, NDP I, most States have now formed District Level Coordination Committees (DLCC) to monitor and review the vaccination, sero-monitoring and disease reporting in this ring vaccination zone around SS and in the PT/PS taluks/ tehsils. The respective PCs have been made conveners of the committee. Reviewing the progress on vaccination, sero-monitoring, ear-tagging and disease reporting should be made a regular agenda item in the management committee meetings of the projects. Animal identification is the need of the hour and is the starting point to initiate documentation of all the interventions carried out on the animal.

Sr. No.	Issues raised	Suggestions by the Expert panel
7	(a) High IBR sero-prevalence in field and on semen stations. (b) All efforts taken in procuring a sero-negative animals are set at naught when they eventually become positive by virtue of their constant contact with sero-positive bulls, the proportion of which is very high in most SS.	Though excretion of virus in semen is <3%, OIE has prescribed RT-PCR for testing each ejaculate before releasing the straws in the market which is a cumbersome and expensive proposition. Control measures have to start at some point and reasonable segregation of positive and negative animals can prevent spread since transmission is by direct contact. Care should be taken that there is no direct contact between positive and negative animals. Possibility of implementing a vaccination programme in the bull production areas may be explored.
8	Lack of knowledge on sero-prevalence of BVD. Lack of adequate laboratory facilities for BVD testing	A random sero-sampling and testing may be carried out to ascertain the sero-positivity in SS and in the field. Testing facilities need to be created to meet the demands of bull production projects and semen stations

Summing up the session, Dr R K Singh once again stressed the need for a change in mindset for implementation of bio-security protocols.

Concluding Remarks by Shri Dilip Rath, MD, NDDB

He informed that the decision to hold the workshop at this stage was primarily taken as majority of projects are just taking off and such a discussion among the participants and exchanges with the experts at this stage would greatly benefit the participants in bringing in efficiency in implementation process. The objective was to discuss the implementation issues among ourselves and also to get valuable advice from the experts from developed countries which have also faced these or similar challenges in the past.

He expressed confidence that all participants benefitted from the excellent presentations made by the experts and the detailed discussion thereafter.

He was happy that important issue of BIOSECURITY in production of Disease-free HGM bulls has been deliberated in detail. Vaccination in project areas is the responsibility of the State Governments and projects should follow up with the State AH departments. A few state governments have already formed District Level Coordination Committees (DLCC) for disease control.

He thanked all the participants and experts from abroad for attending this workshop, particularly Dr Helen Leitch for her constant support in organizing this workshop.

Healso thanked the Chairman and Panellists and also the AB and AH groups for their support in organizing this workshop.

He assured the participants that all efforts would be made to put in practice all the recommendations of the workshop to make the programmes more effective and also assured that such interactions with national and international experts will continue in the future.

Recommendations of the Workshop

Recommendations of the Workshop on genetic improvement of cattle and buffaloes:

A two-day workshop was organized to sensitize the project officers of the ongoing Progeny Testing (PT) and Pedigree Selection (PS) Projects on Genetic Improvement Programs being carried out in different advanced dairy nations. Experts from Germany, France, Canada, North America and India were invited to share their experiences and recommend changes required in the current design of genetic improvement programs under NDPI. Subsequent to the workshop a meeting of the invited experts, NDDB officials and Project Coordinators of a few selected projects was held. During the meeting various issues related to Genetic improvement programs under NDP I was discussed. The recommendations that emerged from the discussions are given below:

1 Farmer level interventions

1.1 Participation of women in project activities should be further strengthened. Extension efforts should be directed towards women members by conducting village level awareness programmes exclusively for women.

1.2 Explore the possibilities of sensitizing children on the importance of genetic improvement and scientific management of dairy animals by conducting awareness programmes in schools.

1.3 The projects should give regular and useful feedback to farmers based on the data collected from them. To start with information on lactation records can be given to the farmers. Regular alert messages could be sent to farmer on actions he needs to take on his animals. It is also important to demonstrate to farmers the benefit of record keeping and the use of information for better management of their herds. The farmers should see tangible benefits in participation in data recording.

2 Ownership of the programmes by End Implementing Agency

2.1 It was feared that the EIAs still consider these programmes as GoI programme/ NDDB's programme, and hence whole-hearted efforts are not visible. Whole-hearted participation of EIAs in the programme will go a long way in sustaining these programmes. GoI should get commitment from EIAs that they would continue these programmes on their own beyond NDP I as these are long-term programmes and benefits accrue only after sustained efforts for a long period of time.

2.2 It was recommended that the required autonomy and delegation of powers to project coordinators should be ensured by all EIAs for efficient implementation of the projects. It is important that the project cell members are delegated with sufficient powers and autonomy, so that the day-to-day operations and various procurement activities can happen without any delay.

2.3 The EIAs must ensure the deployment of dedicated manpower with an undisturbed tenure required for the animal breeding projects (PT/PS and Semen station) for the project period in order to achieve the targets set under NDP I.

3 SOPs for Progeny Testing (PT) and Pedigree Selection (PS) Programmes

3.1 It was recommended that performance recording of all the animals of the participating farmer (total herd), irrespective of bovine breeds, should be carried out complying the ICAR (International Committee for Animal Recording) guidelines so as to select bull mothers and young bulls in an unbiased way. The present system of including only the daughters of the test bulls and elite animals needs to be reviewed. Though this would have financial implications, the additional gains in terms of better accuracy of estimates would compensate the additional cost.

3.2 It is also recommended that absolute milk yield should not be the criteria for bull dam selection. The bull dams should either be selected on the basis of breeding value or in worst cases, on the basis of deviation from the herd mean after correcting for other non-genetic effects.

3.3 Exchange of semen doses of test bulls between PT projects of the same breed should be started immediately. Possibility of testing the same bull under different projects also would improve the accuracy. It was recommended that a document on guidelines, explaining details on exchange of bulls between the projects should be prepared and circulated among all EIAs.

3.4 It is recommended that the possibility of applying 2 ear tags (one in each ear, both bearing the same number) should be explored to ensure that the animal is never without an identification number even if one tag is lost.

3.5 There should be performance recording rather than only milk recording, which includes Milk and components, Fertility parameters, Calving related information, Disease incidences and any other traits which are important in Indian conditions. Selection of bulls and bull mothers should be based on an appropriate selection index giving weightage to all economically important traits.

3.6 An operating document should be prepared that gives details on how to measure a particular trait. All EIAs should then follow this document to measure all traits. The training of project personnel on animal typing be initiated to start recording body confirmation traits of all daughters born under progeny testing programmes.

4 Human resource development strategies for implementing PT/PS programmes

4.1 Human resource development strategies should be planned and executed for project personnel implementing PT/PS programmes as well as for specialists in the area of Breeding values estimation, Body type scoring, information systems, breeding strategies, genomics etc..

4.2 It is recommended that general project management training programmes be organized for the Project personnel.

4.3 Possibility of establishing linkages with various national and State universities and research institutions by allowing Masters and PhD students to undergo training in implementing PT and PS projects and undertake research on topics important for improving the efficiency of implementing these projects should be explored.

5 Suggestions for further improving the INAPH Application

5.1 The application needs to be popularized among various service providers and organizations working in various genetic improvement programmes, so that its user base can be enlarged. In the process informed decision making and planning would happen across organizations leading to faster genetic progress over a larger population. It can also facilitate research and evolve better tools for managing genetic improvement programmes.

5.2 The experts opined that the current architecture of the INAPH application having a centralized server is very good for data collection, processing & analysis. Developed countries started with capturing the data through de-centralised, distributed database systems. They shared the difficulties, complexities & constraints involved in collecting and processing data through de-centralised databases in their respective countries.

5.3 It is recommended that an appropriate institutional mechanism should be put in place for carrying out important functions like unbiased estimation of breeding values, data quality control, and carrying out research. This independent organization should be created by pulling resources from various organizations working in the area of Animal Breeding and shall be entrusted with the responsibility of deciding on research agenda, BV estimation procedures, evolving quality control procedures, carrying out research on AB, giving recommendations to various projects on Do's and Don'ts etc.

6 Animal Identification

Importance of individual animal identification in animal health, disease control, genetic improvement programs, animal nutrition, tracking, traceability etc. was emphasized. Scientific progress in animal productivity and health is not possible without unique identification of each animal. It was suggested to put in place a national unique animal identification system (UAIS) in the country. In the beginning it could be promoted through farmer awareness &incentivisation and thereafter be made mandatory through a law. An agency like NDDB may be entrusted to centrally manage the UAIS in the country. The agency will be responsible for generating unique identification numbers (12 digit as per ICAR guidelines) and providing these unique numbers to all stake holders in the country. NDDB has already put in place an IT infrastructure – hardware and software (INAPH) which uses these unique animal identification numbers to record events related to animal breeding, health & outbreaks, nutrition and movement etc. INAPH should be used for implementation and maximizing the advantages of UAIS in the country.

7 Health

7.1 Animal identification is the bedrock for creating a reliable database that would expand the candidate pool of high genetic merit animals. Maximum emphasis should be given on identification of animals in the bull production areas.

7.2 Health care measures, especially vaccinations against endemic diseases in the PT and PS project areas, and, around semen stations is an important tool that enables the animals to express their genetic potential to the fullest. Due importance should be given to this aspect and the progress on vaccination against various endemic diseases, sero-monitoring, disease reporting etc should be monitored on a regular basis at the highest level.

7.3 It was very strongly felt that selection of bulls should not be based only on milk production but should include other important health traits like mastitis resistance, udder conformation, disease resistance, fertility, etc. Presently there is no mechanism available to link such traits with the milk production. It would be prudent to make use of the Animal Health module of INAPH to record these traits in the target population in the PT and PS Project areas so that the selection of the nucleus population can be made considering these beneficial traits also once sufficient individual records are generated.

8 Integrating with other programs

8.1 Linkages between various programs under NDP needs to be enhanced. The villages covered under PT and PS projects should be covered under Ration Balancing Programmes (RBP). Possibilities should be explored to use Milk Recorders as Local Resource Persons (LRP). However, the possibility of preferential treatment to animals in a particular area, which may lead to biased estimation of breeding values, should be avoided. In practical terms, if a village under PT or PS project is included under RBP all participating animals should be included under RBP.

8.2 A monitoring mechanism be developed by the respective institutes for vaccinating all animals in the project area to begin with following animal identification with ear tags and traceability. Necessary funds and training of officials in capturing the data using the current INAPH application be made available for the purpose.

9 International collaborations in the areas of mutual interest

9.1 Genomics: There are no immediate possibilities of starting genomic selection in India for some of indigenous breed where adequate phenotypic data is not yet available. However it is recommended that one agency should be identified which would start collecting biological samples (Blood/Tissue/Hair follicles) from all animals whose phenotypic information is available

and develop warehouse facilities to store these samples. Possibility of extracting and storing DNA from these samples also could be explored. As better SNP chips incorporating information of Indian breeds are available and cost of genotyping comes down, the stored samples could be used for genotyping.

9.2 Import of germplasm in form of semen, embryo and live animals: The guidelines with respect to the genetic protocol for importation should be revisited for facilitating import of bovine germplasm (semen, embryos and live animals) from different countries. In order to compare the performance of bulls of different countries in an unbiased way, the guideline should give a procedure for comparing bulls across countries.

9.3 The present guidelines specifies minimum standard for quantities of milk produced (for HF and Jersey as 11000 Kg and 7000 Kg respectively), fat % and Protein %. It also tells that SCC should be below average of the respective country. Fixing such standards is not appropriate, as the production would greatly depend on the environmental conditions in the country of import. It is recommended that DADF, GOI shall be requested to review the guidelines for import based on an Index rather than merely cut off levels of production. BVs given by Interbull for countries having similar environment to India can be used for selection of bulls for India.

10 General

10.1 Create a strong brand image for these programs. Measures like providing uniform, caps etc. bearing Mission milk logos to various field forces should be explored. Logos should be used on vehicles, containers etc. to popularize the program. Giving media publicity to the program needs to be explored.

10.2 A "Blog" where project team members of various projects can interact with each other regarding project issues and share their experiences leading to learning needs to be explored.

10.3 The system of unique identification through ear tagging should be popularized among various states. DADF should be requested to direct various States, insurance agencies, banks etc. in adopting this system. Presently NDDB is generating unique numbers for various projects under NDP I. Similar system should be extended to other agencies in the country through NDDB/ any other agency identified by DADF.

10.4 Clarity on the responsibility of various institutions be documented project wise which would avoid the duplication in implementing the breeding programmes.

Feedback from Participants

Feedback on workshop on "Genetic Improvement of Cattle and Buffaloes"

During the workshop, participants' were issued with feedback forms in order to provide feedback on the usefulness of the workshop in improving their knowledge and understanding about Genetic Improvement programmes. The participants were requested to evaluate the effectiveness of the workshop on a scale of 1-5 (1 indicating lower level of understanding and 5 higher level of understanding) and offer suggestions. The feedback received was analyzed.

Feedback was received from 57 participants. Twenty four suggestions were also received for making future workshops more effective. The results indicate that the workshop has helped to improve the knowledge and understanding levels of the participants. The following table shows the summary of the average scores before and after the workshop.

Analysis of Feedback received:

Status	Total Feedback forms received	Category			Average score of participants
		No. of participants scoring up to 60%	No. of participants scoring 61-80%	No. of participants scoring >80%	
Before workshop	57	24	26	7	66%
After workshop	57	1	13	43	87%

Comments / Suggestions received from the participants

Genetic Improvement programme related :

1. Apart from progeny testing, we need to find out ways to evaluate our sires quicker. Genomics could be one of the options.
2. Developing a multiple trait selection index for meeting country's need
3. Focusing on indigenous breeds is essential.
4. Should use the same design as used in other countries
5. There is a need for uniform Government Policy and laws for regulating breeding of animals across the country.
6. Animal identification should be implemented on a national level as in case of some districts in Gujarat
7. Need much more discussion on the field level problems like recording different traits including those on health aspects.
8. More emphasis on sharing of field level implementation experiences.
9. Practical difficulties should also be discussed
10. Sharing success stories of other Asian and African countries implementing genetic improvement programmes.
11. More speakers from India with practical experience should be invited
12. Organize field visit to France or Canada to have better understanding.
13. Bring some implementers from abroad to share their experience.

Health related :

14. Ensuring coverage of entire population (all cloven footed animals) of project tehsils under vaccination would be difficult.
15. Focus on more practical measures for implementing Biosecurity
16. Appropriate steps through NDDB, to ensure that local veterinarian issues certificate of vaccination against FMD, Anthrax, BQ, HS etc while purchasing Animals from other states.
17. Need 4-5 clear recommendations from each expert for Indian PT/PS/ Biosecurity projects

General :

18. Motivation of field force (AIT & MR) is a challenge
19. Circulate all the recommendations made by experts in the workshop to all the participants.
20. Prepare some information about the importance of NDP1 in local language
21. Conduct such type of workshops periodically
22. Need for some audio-visual materials on genetic improvement of livestock. The same can be used for awareness programmes.
23. Presentation of the speakers and deliberations should be shared with participants.
24. Invite questions prior to workshop so that the same topics can be discussed at length.

Feedback Form

Please indicate the level by making a tick mark on the level :

Sr. No.	Subject	Rating Level									
		Before Workshop					After Workshop				
1	My understanding of current scientifically planned breed improvement initiatives under NDP I	5	4	3	2	1	5	4	3	2	1
2	Needto further evolve the program so as to take advantage of upcoming new technologies	5	4	3	2	1	5	4	3	2	1
3	Conviction that the current systematic genetic improvement programmescan make a more meaningful contribution in improving productivity our diary animals	5	4	3	2	1	5	4	3	2	1
4	My competence and effectiveness in successfully implement the programme	5	4	3	2	1	5	4	3	2	1
5	My understanding about importance of Bio-security in genetic improvement programs (production of disease free bulls)	5	4	3	2	1	5	4	3	2	1
6	Understanding on "culmination of likeminded EIAs coming together to follow a common approach for taking forward the Genetic improvement programs".	5	4	3	2	1	5	4	3	2	1
7	Effectiveness of conducting the workshop to meet my expectation	5	4	3	2	1	5	4	3	2	1

What additional knowledge, you would have liked to receive in this workshop for better performance of your job ? Give your suggestions :

a. .....

b. .....

c. .....

List of Participants

Workshop on "Genetic Improvement of Cattle and Buffaloes under National Dairy Plan I (NDP I)

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