Benefit of Artificial Insemination to Farmers of Milk Producer Companies Managed by NDDB Dairy Services

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Introduction

Good production and reproduction are two essential components for making dairy farming a profitable enterprise. While good production is the result of overall management practices, good reproduction is achieved by adopting a suitable technology for multiplying dairy animals. A number of assisted reproductive technologies (ART) have been applied for enhancing reproductive performance of dairy animals. Artificial Insemination (AI) plays an important role to increase the milk yielding capacity of dairy animals all over the world. It is a correct and economical way of genetic improvement and realization of breeding goals. It selectively increases genetic gain through increased selection intensity in males. AI has the potential of economic and rapid dissemination of elite male germplasm to a large number of females in a short duration of time. It has become one of the most crucial and proven techniques for genetic improvement of dairy animals as semen from genetically superior bulls is used to impregnate the female animals artificially. This is the most efficient technology accessible to dairy farmers to improve productivity and profitability of dairy enterprise.

AI is very useful in India where availability of high genetic merit (HGM) bulls is inadequate and most of the farmers depend on natural service for breeding. Even though, AI started in India way back in 1939 at Palace Dairy Farm, Mysore when semen of Holstein Friesian bulls was used on Hallikar cows, the coverage of breedable bovine females under AI is still very low. Only 30% of breedable cattle and buffalo females are covered under AI with conception rate of 35%, ranging between 1% in Arunachal Pradesh and 96% in Kerala (*Annual Report 2020-21 of DAHD, GoI*). Hence there is an urgent need to increase the coverage of breedable bovines under AI and to enhance the conception rate.

What is Artificial Insemination?

AI is a technique in which semen is collected from breeding bulls, processed, cryopreserved and manually deposited into the reproductive tract of females during estrus (heat) period for making them pregnant.

Advantages of Artificial Insemination

There are several advantages of AI over conventional method of natural mating;

- It enhances the utilization of bull. In natural mating, a bull donates much more semen than is required to establish a pregnancy. However in AI, artificially collected semen can be diluted and extended to make hundreds of semen doses from a single ejaculate.
- This is cost effective as there is no need to maintain breeding bull for a herd.
- It ensures that disease free and high genetic merit bulls are only used for breeding.
- Bulls are regularly screened for all diseases that can transmit to females through semen. So AI prevents the spread of sexually transmitted diseases (STD).
- Bulls are also screened for breed specific genetic disorders/diseases.
- Routine checks on semen quality and fertility feedback received from the field help in early detection of sub-fertile bulls. Culling of such bulls ensures better conception rate and reproductive efficiency of dairy herd.
- It helps in breeding animals with large difference in their sizes such as crossing of exotic cattle breeds with zebu cattle. Even animals that refuse to stand or accept the male at the time of estrum can be inseminated.
- AI with estrus synchronization in dairy animals offers many advantages to farmers like time saving in heat detection, calving concentration over a desired period and better management of breeding, pregnancy, calving and calf rearing.
- AI services are available at the doorstep of farmers

> **Artificial Insemination (AI) plays an important role to increase the milk yielding capacity of dairy animals all over the world. It is a correct and economical way of genetic improvement and realization of breeding goals. AI has the potential of economic and rapid dissemination of elite male germplasm to a large number of females in a short duration of time. This is the most efficient technology accessible to dairy farmers to improve productivity and profitability of dairy enterprise. Use of sexed semen is the way forward for Indian farmers provided it is available at an affordable price and efficient enough to give better conception rate and desired sex ratio. The AI model of NDS managed MPCs can widely be adopted by other agencies involved in providing AI services in the country.**

who can choose the bull they wish to use on their cows and buffaloes.

- Frozen semen is preserved in liquid nitrogen for future use. This makes it possible to produce progeny of a bull even after its death.
- Frozen semen can be transported over long distances that helps in export/import of semen of top quality bulls.
- It provides an opportunity to maintain the accurate breeding records.

AI Service Providers in India

During the year 2019-20, a total of 80 million AIs were carried out in India. Majority of inseminations were done by the State Animal Husbandry Departments, Livestock Development Boards and Agencies. Dairy Cooperatives, NGOs and Breeding Companies also provided AI services in their area of operation. Each

Photo 1: Compulsory Ear Tagging of All Inseminated Animals

service provider maintains an AI network and engage trained Mobile AI Technicians (MAIT) for providing AI services. Regular supply of quality frozen semen doses and liquid nitrogen is crucial to successful AI program. AI Service Providers aim at the following;

1. Providing timely, hygienic and quality AI services at the doorstep of dairy farmers.
2. Compulsory ear tagging of all inseminated animals (**Photo 1**).
3. Follow up service to alert farmer to observe for heat signs after 21 days of AI.
4. Pregnancy diagnosis after two-three months of insemination.
5. Follow up service to alert farmer for calving and registration of calf born.

NDDB Dairy Services as Facilitator to Provide AI Services

NDDB Dairy Services (NDS), a not-for-profit company under Section 8 of the Companies Act, is a wholly owned subsidiary of the National Dairy Development Board (NDDB). The objective of NDS is to facilitate the dairy farmers to setup Milk Producer Companies (MPCs) and to foster the genetic improvement of milch animals in order to boost their productivity.

NDS facilitated setting up of six large MPCs in Rajasthan, Gujarat, Andhra Pradesh, Punjab, Uttar Pradesh and Bihar. NDS also facilitated setting up of five MPCs funded by TATA and five MPCs funded by National Rural Livelihood Mission (NRLM). AI service is an integral part of all the MPCs established by NDS as this is the fastest and cost-effective method for genetic improvement of the dairy animals.

NDS manages two largest semen stations in the country *i.e.* Sabarmati Ashram Gaushala in Gujarat and Animal Breeding Centre in Uttar Pradesh. In addition,

AI services

NDS has setup two mega semen stations namely Alamadhi Semen Station in Tamil Nadu and Rahuri Semen Station in Maharashtra. These semen stations produce top quality semen doses under the brand name: 'Superior Animal Genetics' (SAG) which is the largest selling semen brand in the country. About 42 million semen doses were supplied to various State Governments, Dairy Cooperatives and Private customers during 2020-21.

In the AI delivery model suggested by NDS for the MPCs, AI is carried out by well-trained and qualified MAIT at the doorstep of farmers by adopting the prescribed standard operating procedures and using semen of high genetic merit bulls. The salient features of this model are given below:

1. AI services are provided to producer members through MAIT and monitored by Veterinary Executive/PES Facilitator.
2. MAITs identified by NDS and engaged by MPC are assigned a group of villages. An updated list of members is provided to them from time to time for rendering AI services.
3. Members avail of AI services through 'Service Coupons' and hence there is no cash transaction with MAITs.
4. Veterinary Executive provides coupon booklets to Sahayak of village milk collection center and maintains the record of the same.
5. There are two types of coupons
   ● **Green coupon** - For milk pouring members
   ● **Red coupon** (Cash Coupon) - For members currently not pouring milk
6. Members pouring milk collect Green coupon from Sahayak free of cost.
7. Members currently not pouring milk collect Red coupon (cash coupon) from Sahayak by paying a fee prescribed by MPC.
8. Sahayak verifies the current pouring status of the member before issuing the coupons.
9. MAIT does not provide AI service to the member without AI service coupon (either green or red).
10. MAIT collects coupons (green or red) from the member after providing AI service.
11. MAIT submits bill along with AI coupons to MPC, Head Office through Veterinary Executive.
12. After verification of coupons, payment is released to MAIT.
13. AI service fee is deducted from member's milk bill against Green coupons and cash is collected against Red coupons by Sahayak and deposited by Veterinary Executive to bank account of MPC.

A diagrammatic presentation of "Model AI Delivery System" adopted by MPCs is given in **Chart 1**.

Journey So Far

Using this model, a total of about 2000 trained MAITs have been deployed in the MPCs, covering about 13,500 villages. Since inception, a total of about 4.12 million AI (**Photo 2**) have been carried out. About 11,617 infertility management camps and 1,330 calf shows (**Photo 3**) were organized by the MPCs. All the AI done and female calves born in the MPCs are registered in INAPH database.
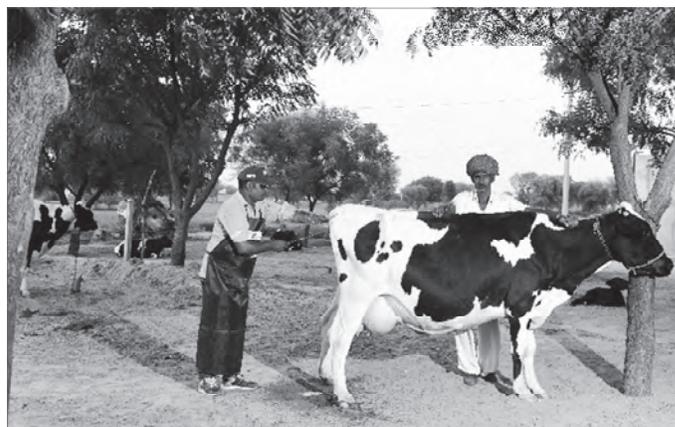

Photo 2: MAIT Performing Artificial Insemination

NDS is also providing technical support to West Assam Milk Union Limited (WAMUL) for implementation of the AI delivery project initiated under the World Bank assisted Assam Agribusiness and Rural Transformation Project. So far, more than 4.58 lakh AIs were carried out by 491 MAITs covering 3180 villages in Assam.

Issues Associated with AI in India
1. Poor Adoption

Due to low adoption of AI technology, only 30% of breedable bovine females are covered in AI programs. The farmers' response to AI is lukewarm for want of effective 'Extension Services' to educate the farmers about the importance and benefits of AI (**Photo 4a & 4b**). They are not aware of benefits they would get by adopting the AI using semen of best bulls.

2. Pregnancy reduces milk yield – A Myth

Many farmers believe that milk production will go down when their cows are made pregnant. So they avoid breeding when cows come in heat after calving and wait till the time milk yield declines. This delayed breeding entails in prolonged inter calving period and substantial

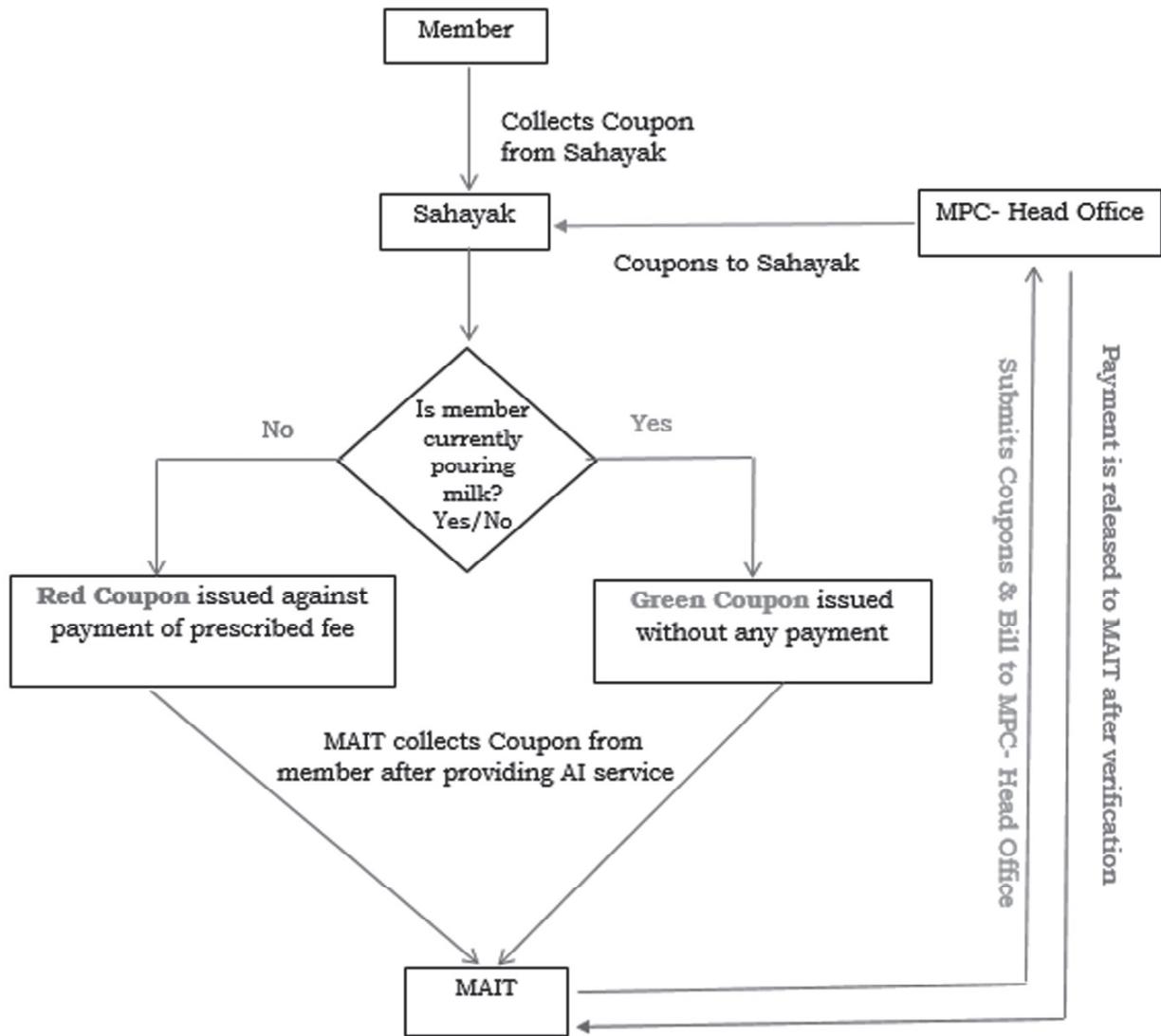**Chart 1: Diagrammatic Presentation of 'Model AI Delivery System'**

Member

Collects Coupon from Sahayak

Sahayak ← Coupons to Sahayak ← MPC- Head Office

Is member currently pouring milk? Yes/No

No → Red Coupon issued against payment of prescribed fee

Yes → Green Coupon issued without any payment

MAIT collects Coupon from member after providing AI service

MAIT

Submits Coupons & Bill to MPC- Head Office

Payment is released to MAIT after verification

Photo 3

A Show of AI Born Calves

Photo 4a

An Officer Interacting with Owner of AI Calf

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AI services

Photo 4b: An Extension Worker Educating the Farmers on Benefits of AI

financial loss to farmers. The farmers must know that there is pregnancy related reduction in milk yield and that this happens after mid gestation and is insignificant. The farmers are to be educated and convinced to stop this practice.

3. Lack of profit perception

Farmers are not fully aware of profit which is associated with the use of AI technology. To obtain the best performance, it is necessary to ensure an intensive management of AI born progeny like a sound nutrition program, an efficient herd health program, reproduction management with precise heat detection and good record keeping. AI provides opportunity for management control of reproduction in a dairy herd. This improves the reproduction efficiency which results in profitability by increasing the number of AI born superior replacement heifers and culling of female animals having poor breeding efficiency. Good management practices will result in increased milk yield and higher income to dairy farmers.

4. Counterfeit semen

Counterfeit bovine frozen semen produced from bulls of unknown genetics and disease status is getting access to Indian semen market. The use of bogus semen results in production of inferior and diseased calves. Such diseases are communicable to human being through consumption of contaminated milk. So there is an urgent need to check the production and distribution of counterfeit bovine frozen semen.

5. Untrained MAIT

Many untrained technicians are performing AI and causing immense loss to animals' health and income of their owners. As a result, reputation of AI is damaged and dairy farmers lose faith in AI. This has to be stopped and only trained and skilled technicians are allowed to perform AI.

6. Indiscriminate breeding practices by MAIT

Most of the States have bovine breeding policies to be followed in the respective States. Enforcement of the provisions contained in the Policy is an important matter but overlooked in certain cases. This gives an opportunity to MAIT to ignore the breeding policy and use inappropriate semen disregarding the breed of cattle and buffaloes presented to him/her for AI. This is a very bad practice and has a long lasting impact on the type of future dairy animals as per policy in that State. It is therefore essential to check indiscriminate breeding of dairy animals by strict enforcement of the breeding policy. In addition, AI service charges should be fixed based on the genetics of bull (semen). A decent remuneration to MAITs for using best genetics shall encourage them to use semen as prescribed in the breeding policy.

7. Fertility Management

Infertility/sub-fertility in dairy animals is a common problem. This hampers the reproductive efficiency and interfere with the conception rate. To overcome this problem, camps are to be organized for the treatment of such animals by veterinarians. This will reduce inter calving period and ensure better returns to farmers.

8. Conventional Trading of Dairy Animals

Cattle and buffaloes are traded in cattle fairs and local cattle markets where seller and buyer assemble to trade the animals. Farmers buy animals based on their physical appearance and verbal information given by the seller. There is no document/details to verify the quality of animal. Now online shopping of dairy animals is slowly replacing the conventional trading but buyers are not satisfied with the photo of animal and its price only, which are available on the website. They also want to know documented information/details. Recorded AI provides such details to substantiate the fact that the calves born to AI are superior and have a capacity to produce more milk. The seller and buyer of replacement stock must understand the importance of value addition in progeny born through AI. Such animals have superior genetic makeup and hence must fetch better market price.

The Way Ahead

Creation of a platform for AI Technicians

Like any other service, AI should have a platform for rendering timely and efficient services to dairy farmers. The system should be simple, easy to manage and financially sustainable. MAITs need to be organized at this platform. They should be rated not only for conception rate they achieve but on their skills, service quality, value of calves born and milk produced by these calves as well as improvement in genetics. Top rated MAIT should be

suitably rewarded. To sharpen their AI skill and gain knowledge of latest development in the technology, MAITs should be sent for refresher training/exposure visits by the organizations they work for.

Use of INAPH Database

To get AI and other services, it is essential that animal is ear-tagged and registered in INAPH (Information Network for Animal Productivity and Health) which has been recognized as a National Digital Database for Livestock. Hence large scale ear-tagging is to be done, which should be mandatory. After conducting AI, MAIT should enter the details in INAPH. He/she should be responsible for follow up of AI till calving and upload the data of each event in INAPH to build up a database of inseminated animals in respect of their reproductive efficiency. Moreover, milk performance recording of dairy animals has to be accelerated. In addition to exiting organizations engaged in milk performance recording for identification of better milk producing cows, the performance recording must also be carried out by professional agencies and data is entered in INAPH database. This will add value to the calves born to recorded dams and high genetic merit bulls.

Use of Sex Known Semen

In the current situation when it is very difficult to cull useless male cattle, the use of sexed semen is crucial to produce the calves of desired sex. On one hand it helps farmers to get rid of unwanted male calves and on other hand it helps to get more female calves which means more milk production and income. Since there is hardly any documented record of performance and economies of using sexed semen in India, it would be interesting to undertake some studies on performance of sexed semen and to suggest the ways to improve the conception rate and accuracy of male-female ratio. Higher conception rate and sex accuracy will help in reducing the cost of AI with sexed semen and its acceptance by Indian dairy farmers.

Conclusion

The members of MPCs are getting benefitted from AI services delivered at their door steps by trained and skilled MAITs. It has increased breeding efficiency and milk productivity of animals owned by the members of MPCs. AI is the best and the cheapest way of breeding dairy animals. This brings about the improvement in the genetic makeup of calves born and minimizes the risk of sexually transmitted diseases. Performance recording of milking cows and buffaloes will add the value to the AI born progeny and fetch better price for animals born to recorded dams and top sires. There is a need to make dairy farmers aware of the advantages of this technology, good management of animals and their role in detecting heat (estrus) in animals for timely breeding which results in better conception rate. Availability of trained and skilled MAITs is necessary to operate the local AI network. MAITs need to be dedicated and responsive to the requirement of AI services needed by the farmers. Moreover, follow up of all inseminations is must up to calving and registration of calf born in INAPH database. Uploading the detail of every event related to the breeding of animals in INAPH will provide appropriate information for reproductive management of dairy herd in future. This will increase the reproductive efficiency of dairy animals and thereby making the dairying a profitable business. Use of sexed semen is the way forward for Indian farmers provided it is available at an affordable price and efficient enough to give better conception rate and desired sex ratio. Sexed semen should be used with caution as it contains less number of sperms than conventional semen, which affects the conception rate. The AI model of NDS managed MPCs can widely be adopted by other agencies involved in providing AI services in the country.

References

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