Information Technology in Improving Animal Productivity

Information Network for Animal Productivity and Health

INAPH

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Introduction

Dairying is an important sector in our country. We are the highest milk producing country in the world, but productivity of our animals is low. To be competitive, we will have to increase productivity and efficiency of resource use.

Improving productivity of animals requires building of infrastructure for producing quality bulls through genetic improvement programmes, producing disease free semen from high quality high genetic merit bulls and making it available to farmers at their door-step for Artificial Insemination (AI) so that their animals are bred with high quality semen, building of infrastructure for producing cattle feed, feed supplements, fodder seed etc. so that it provides balanced nutrition to their animals, and building of infrastructure for creating facilities for veterinary treatment, disease diagnosis, vaccination, de-worming etc. so that farmers' animals are protected against prevalent diseases.

Besides building an infrastructure for making available quality semen, cattle feed, fodder seeds, vaccines etc. to farmers for improving the productivity and health of their animals, the modern tools of Information Technology and Telecommunications are required to be welded with these services to provide reliable, easy-to-access and timely information to farmers, service providing organizations and policy makers for informed decision making at all levels.

National Dairy Development Board has developed an information network tool **"Information Network for Animal Productivity and Health – INAPH"**, covering all areas of productivity enhancement of bovines such as Reproduction, Breeding, Nutrition, Health (both Preventive and Curative) and Advisory Services.

The information network is based on field force automation, using internet based technology. Field force is provided with Hand held devices (Netbooks/PDA/Smart Phone/Android Tablets) to record activities (transactions) in real time with proper validation and generate information for monitoring & control of their daily activities at the village level. Field level workers synchronize their data (device) with the INAPH central server. The Web-based version of the information network is made available on desktop for entering data and generating information for supervisors, managers and other decision makers to help them analyze the past, monitor and control the present and plan for the future. The system also has facility to send SMS messages to farmers on their cell phones to alert them on what is due on animal(s) they have.

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Objectives of developing the information network

The main objective is to make available to producers, productivity enhancement service providing organizations and others involved in the sector, information which can be used to improve productivity and health of dairy animals. Within this objective, other objectives include:

1. Establish an IT infrastructure for Service Providers involved in Productivity Enhancement & Health services.
2. Develop a Field Force Automation system for implementation of field based programs.
3. Provide a tool for field force to monitor & control day to day activities efficiently in the field.
4. Enable a System for managers to analyse past and plan for future.
5. Enforce Standard operating procedures (SOPs) of the domain.
6. Build a rich database for policy makers, scientists and analysts.
7. Develop a national level database on productivity enhancement related activities.

Key distinctive features:

- An Integrated application covering almost all key areas of the domain viz Animal Identification & Registration, AI Delivery, Genetic improvement programs, Animal Nutrition, Animal Health, Laboratory Analysis, Extension activities.
- A single database for all services and for all service providers, enabling analysis of impact of one service on the other.
- Designed to incorporate all processes based on existing scientific domain knowledge with minute details.
- A system containing a single application for all service providers ensuring uniform and standard logic for generating all parameters.
- It ensures uniqueness of Animal, Bull, Semen, Animal Owner across country enabling tracking of Animals.
- Each & every activity is recorded individual animal-wise. A rigorous, uniform transaction validation mechanism is built in the system.
- It is capable of handling complex scenarios, where multiple agencies working in the same geography providing different services on the same animal.

Services offered by INAPH

The main services offered by INAPH include:

- **Animal Identification and Registration**: Objective here is to identify and register animals each with a unique identification number.
- **Artificial Insemination and Natural Service**: Objective is to get female animals conceived as early as possible and reduce their inter-calving intervals.

- **Genetic improvement – Progeny testing and pedigree selection**: Objective is to improve genetic potentials of animals with respect to milk production, milk components such as fat, protein, lactose, somatic cell count, fertility, health and type characteristics.
- **Nutrition (Ration balancing)**: Objective is to provide advice on ration balancing to exploit full genetic potential of animals.
- **Healthcare**: The healthcare services include Curative, Preventive, Diagnostic and Epidemiological information with an objective of keeping the animals healthy and fit.
- **Laboratory services**: The laboratory services include Feed and Forage Testing Services, Milk Component Testing Services and Disease Diagnostic Services.
- **Extension and Communication**: Objective is to enhance knowledge and skill of farmers on management of their animals

Main users of INAPH

The main users of INAPH include:

1. Dairy Producers

2. Service providing organizations:
    a. Identification and Registration Services: State Governments, Milk Unions/Federations
    b. Artificial Insemination Services: Milk Unions, NGOs, State governments, state livestock development boards, private AI service providers etc.
    c. Genetic Improvement Services: Organisations implementing progeny testing programmes, state governments and livestock development boards implementing progeny testing programmes
    d. Bull/Semen stations
    e. Ration Balancing services: Organisations implementing RBP - milk unions and federations, state governments and livestock development boards, NGOs etc.
    f. HealthCare Services: milk unions, state governments, private veterinary practitioners etc.
    g. Milk Component Testing Services, Feed Testing Laboratories services, and Disease Diagnostic Services: all laboratories providing these services
    h. Planners and decision makers: NDDB, state animal husbandry departments, livestock development boards, GoI etc.

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Unique Animal Identification System

The key points include:

- Animals are identified by 12 digit unique Ear tag numbers, as re-commended by ICAR(International Committee for Animal Recording)
- First 11 digits of Ear tag number are running serial numbers, and the 12th digit is a check digit (Parity bit)
- Ear tagging with a unique number is a mandatory requirement for the use of INAPH Application.
- NDDB is centrally managing uniqueness of Animal Identification system by assigning numbers across the country

Geography/Locations Identification

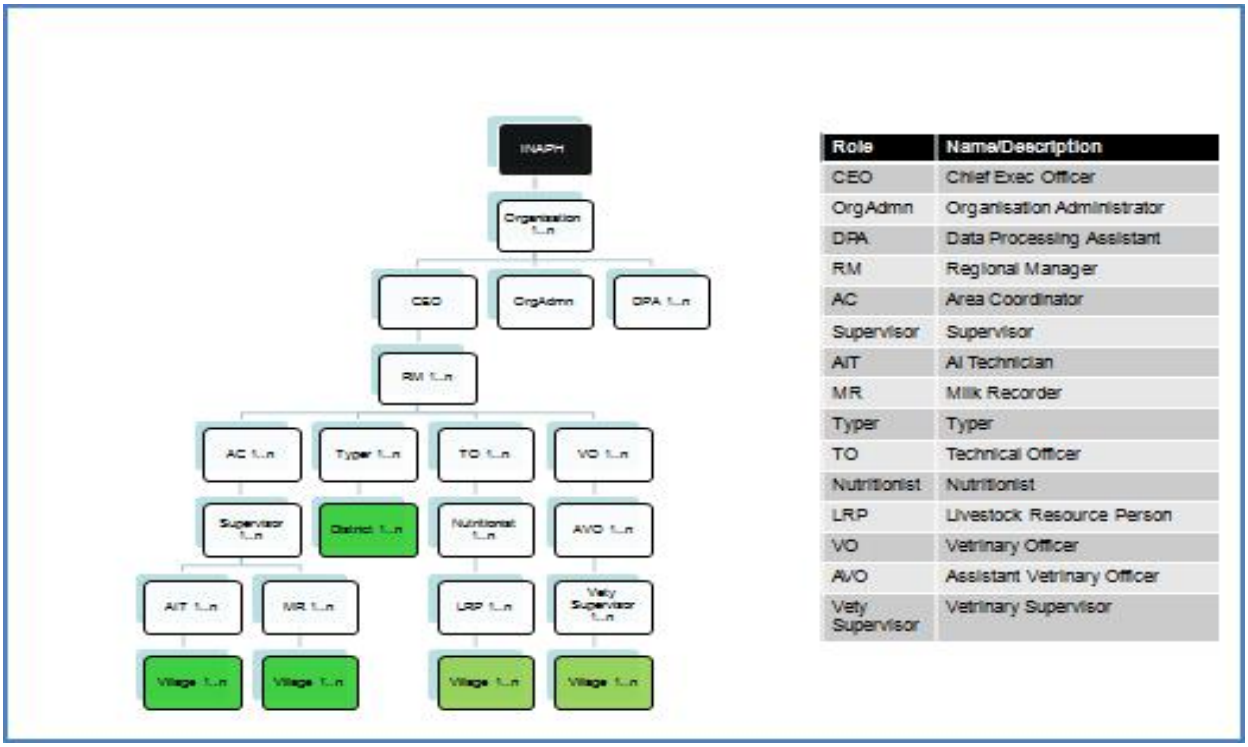
The assignment of location is done as follows:

- GOI has prescribed four tier location hierarchy Viz. State, District, Taluka & Revenue Village and uniquely identified all 6.5 lac approx revenue villages in the country.
- The INAPH Application uses the unique location identification system prescribed by GOI. It also has provision to capture hamlet/sub-village within a revenue village, if any.
- The INAPH application captures these unique location identification codes with each transaction recorded in the system.
- Following of this location identification system enables the INAPH database to map with other databases of agencies like NDDB, GOI and other institutions.

Users, their Roles, Hierarchy & Area of Operation

The key considerations include:

- Many service providers/ organisations can join the INAPH network and work simultaneously, even in the same area.
- Each organisation can create its field force hierarchy using 5 tier system available in the application.
- Users are grouped as per their roles in the system.
- Area of operation/locations are allocated/de-allocated to the lowest level user in the hierarchy.

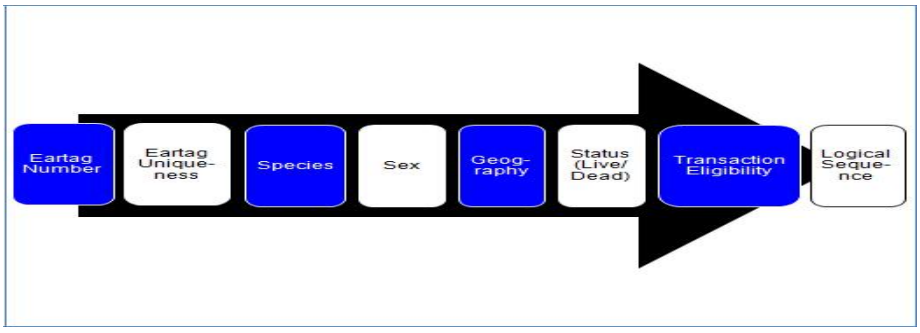


Role	Name/Description
CEO	Chief Exec Officer
OrgAdmn	Organisation Administrator
DPA	Data Processing Assistant
RM	Regional Manager
AC	Area Coordinator
Supervisor	Supervisor
AIT	AI Technician
MR	Milk Recorder
Typer	Typer
TO	Technical Officer
Nutritionist	Nutritionist
LRP	Livestock Resource Person
VO	Vetrinary Officer
AVO	Assistant Vetrinary Officer
Vety Supervisor	Vetrinary Supervisor

Activity Recording & Validation mechanism

The key provisions made in the application include:

- The INAPH Application uses a robust validation mechanism at the time of recording any transaction in the system to ensure the quality of data.
- Each and every transaction passes through these validation checks. When all conditions are fulfilled by the transaction, then only the system allows to proceed.



- **Few of the validation checks are as under**:

    - The parity of ear tag number: All twelve digits should be as per the identification system.
    - The uniqueness of ear tag number: Already registered animal with a particular ear tag number cannot be registered.
    - Specie of the Animal: Specie conflict is checked; for example, buffalo semen cannot be used to inseminate a cow.
    - Sex of the Animal: Sex conflict is checked; for example males cannot be inseminated.
    - Geographic location of the animal: Animal's location is validated; for example an animal must be available in the area of operation (assigned villages) of the user. In case, physical movement of animal has happened due to purchase/sale then it should be recorded in the system properly through movement transaction assigning to a new location.
    - Status of the animal: The System doesn't allow any transaction against dead animals.
    - Transaction eligibility of the animal: The System validates the eligibility of the animal to receive the transaction against the present status. All domain related logical validation checks are carried out. For example, already pregnant animals cannot receive AI transactions, milk recording cannot be allowed unless calving transaction is recorded, calving transaction cannot be recorded for non-pregnant animals etc.
    - Logical Sequence: For each and every animal, the system accepts transactions in chronological order only.

INAPH Logical View (Modules & Functionalities)

This section provides a brief description of different services/ modules and functionalities available in the INAPH application. The Transactions capturing UIs along with their attributes and related algorithms are explained. Different report classes and list of reports available in each class are explained.

The Windows Application on desktop/netbook contains all functionalities and reports, whereas the application on PDA/Handheld contains subset of functionalities primarily to capture transactions and generate operational reports.

The following services could be used to build the data and generate reports:

1. Animal Identification & Registration
2. Animal Reproduction (AI Delivery)
3. Milk recording (Progeny Testing & Pedigree Selection)
4. Animal Nutrition (Ration Balancing)
5. Animal Health Services
6. Laboratory Services.

Analytical Reports

Apart from operational and review reports, the INAPH Application produces **Analytical Reports** that help in building knowledge about productivity and health. It produces comparative performance reports on many fertility and production parameters, which help in identifying factors that influence fertility and productivity. It produces comprehensive performance reports for individual animal, individual village and individual bull as well as comparative performance reports for villages and bulls. The INAPH Application produces the following Analytical Reports:

1. Individual Cow report
2. Herd Status Report – (Individual animal wise for all animals)
3. Village Status Report – Reproduction
4. Village Status Report – Production
5. Village Status Report – Completed Lactation
6. Reproductive Performance of Bulls – General doses
7. Reproductive Performance of Bulls – Test doses
8. Test dose Analysis
9. Bull wise Milk Production and Milk Component Analysis
10. Nominated Mating Report
11. Bull wise Breeding Values
12. Bull wise Typing Report

SMS Application

The **SMS Application** interacts with the central data base and sends SMS messages to farmers' mobiles. At the time of registration of animal, information on mobile number is captured. Provisions are being made to send SMS messages in local language to farmers.

Breeding Value Estimation

The breeding value estimation procedure is divided into three steps: generating a pedigree and a data file from INAPH database; estimation of breeding values of bulls and daughters using third party breeding value estimation software, and updating estimated breeding values in the main INAPH database.

Generation a Pedigree and a data file: INAPH Application provides functionality by which both data and pedigree files are generated as text files having fixed column width separated by space. Animals flagged for wrong parentage in the animal master are not considered for processing.

Training and Capacity Building

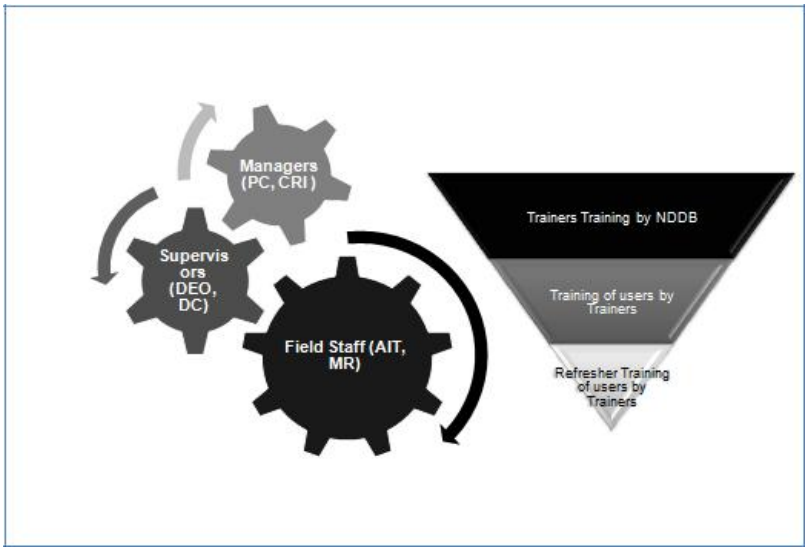
Training is key component in implementation of INAPH in an organization. NDDB provides three types of training programs.

- **Training of field staff (AI Technicians, Milk Recorders etc.):** This training includes use of application for transaction recording, generation of operational reports, Alerts etc.

- **Training of Supervisors & Middle level managers:** This training includes complete understanding of the application, including technical aspects, communication infrastructure, Application deployment, troubleshooting etc.

- **Training to Senior Managers & Analysts.:** This training focuses on generation of information from different INAPH resources and their use in analysis. This training also includes export and import of data to and from INAPH database to other standard formats for local analysis, if any.

- NDDB also arranges training for trainers and refresher training programs on regular intervals.



Implementation Support

NDDB provides INAPH implementation support to all service providers in a systematic manner. It has set up an INAPH Help Desk. The INAPH Help desk is available to all concerned for logging the requests and tracking the resolution in progress. The following arrangement is made by NDDB to help all users:

- Each implementing agency is to identify one IT officer to coordinate with the NDDB INAPH implementation team to resolve issues, if any.
- INAPH coordinators have been placed by NDDB in all 4 regions in the country. Number of coordinators in a region are placed depending upon the number of projects in that region.
- A central INAPH implementation team at Anand takes care of all issues escalated by regional coordinators in consultation with domain professionals.
- A technical team at Anand takes care of all IT and software related technical issues escalated by regional managers.

Current Scenario

- INAPH is the software being used since inception of National Dairy Plan I (NDP I) for capturing data of bovines under different Progeny Testing Programmes (PT), Pedigree Selection Programmes (PS), Pilot AI Delivery projects because of the inbuilt robust validation mechanism which ensures accuracy of the data.
- Ration Balancing Programme – RBP (Nutrition) module is being used across the country under NDP I approved projects. Several agencies have started using INAPH-RBP module to facilitate augmenting balanced ration for their cows and buffaloes using the locally available feed and fodder resources with them.
- Government of India has advised Banks, General Insurance Companies to use ear tags with unique identification numbers generated by for INAPH.
- Department of Animal Husbandry and Dairying (DAHD), Govt. of India (GoI) has recognized unique ear tag numbers generated for INAPH for registering bovines under Rashtriya Gokul Mission (RGM), National Project on Bovine Breeding (NPBB) etc,.
- All the State Animal Husbandry Departments / State Livestock Development Boards have been instructed by GoI to carry out their AI operations through INAPH and capture all the events related to AI so that the information is accessible to DAHD at national level on real time basis.
- Central Herd Registration Schemes, Central Cattle Breeding Farms and other GoI entities have been instructed to use INAPH for capturing their data so that DAHD has access to the progress of these agencies on real time basis.
- NDDB has been facilitating Training of Trainers (TOT) Programme for all the nodal officers of different state AH Departments implementing INAPH so that these trained trainers would train the related officers and technicians in their ambit.
- Some of the NGOs who are into AI operations in different states have been using INAPH as their information network software.

Apart from completing TOT for Department of AH officers in the state of Kerala all the stake holders under Department of AH in Kozhikode district have been trained in INAPH data entry by November 2017 end. Registration of animals and other data entry has been in progress already in Kozhikode district which has a total breedable bovine population of around 58000 (2012 Census) of which around 41000 would be available for breeding during the year. Kerala Livestock Development Board has been carrying out their PT project under NDP I covering the districts of Kozhikode, Kannur and Wayanad.

As on 26th December 2017 in the district of Kozhikode:

- KLDB has registered 17421 bovines
- AH Dept has registered 2663 bovines
- Total bovines registered is 20084. This amounts to registration of around 50% of the available breedable bovines in Kozhikode district.
- For the state of Kerala already more than 47000 bovines have been registered in 3 districts.

At National level, as on 26th December 2017, the following progress has been achieved:

- Projects : 226
- Users : 79,092
- States : 22
- Districts : 371
- Villages : 74,707
- Farmers : 57,69,221
- Animals registered : 95,33,295.

In the coming days, it is expected that more and more animals would be inducted into INAPH system by all the stake holders and country would progress towards better accuracy in bovine productivity enhancement activities.

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