Role of Indian Dairy Cooperatives in Combating Climate Change
National Dairy Development Board (NDDB)

➢ 1965: NDDB was founded and registered as a society under the Societies Act 1860
  • For providing technical services to implementing agencies in building up their dairy projects on co-operative lines on Anand pattern

  • NDDB was merged with Indian Dairy Corporation (a public-sector company formed in 1970)
  • The new body corporate was declared an institution of national importance by the Act
Objectives of NDDB

❖ To promote Anand Pattern of Cooperative across the Country

❖ To promote, plan and organize programmes for dairy development, allied industries and biologicals

❖ To promote, finance and support producer-owned and controlled organisations & recommend national policies that are favorable to the growth of such institutions.

➢ NDDB has established subsidiaries to further its objectives
Indian Dairy Sector Overview

• **India is the largest producer of milk** in the world.

• The Indian dairy sector is **growing at a rate of 6% CAGR** whereas the global growth rate is 2%.

• **Milk is the single largest agricultural commodity**, valued at Rs 9 lakh cr.

Source: Basic Animal Husbandry Statistics- 2023
Indian Dairying
A Smallholder Phenomenon

- Predominantly practiced by small and marginal farmers
- 95% of the dairy farmers rear 1 to 5 animals
- Bovine ownership, more equitable than the land holdings

Source: Livestock Census 2019, NSSO 12-13, BAHS 2021
The Strength of Indian Dairy Cooperatives

• The dairy cooperatives have been instrumental in providing Rs 77,000 cr annually to rural India.

• Dairy Cooperatives contribute 5% to the national GDP.

• The structure of dairy cooperatives makes it possible to replicate farm level interventions on much larger scales.
GHG emission profile of India

**GHG emissions by sectors**

- **Energy** 75%
- **Agriculture** 14%
- **Industry** 08%
- **Waste** 03%

**Enteric fermentation** (55%)
**Agricultural soils** (19%)
**Rice cultivation** (17%)
**Manure management** (7%)
**Crop residues** (2%)

**GHG Emission Profile of Indian Agriculture**

Source: MoEFCC Third Biennial Update Report to UNFCCC
Climate Smart Dairying

Feed production, processing & distribution

- Good agriculture practices
- High biomass yielding crops
- Scientific fodder production
- Securing crop residues
- Improving soil health
- Carbon sequestration
- Local feed ingredients
- Optimising feed formulations
- Production efficiency of feed plants
- Renewable energy (solar & biogas)

Farm management

- Genetic improvement
- Reduce herd overhead
- Ration optimisation, TMR
- Feed use efficiency
- AFC & conception rate
- Vaccination & deworming
- EVM - reduce antibiotic usages
- Anaerobic digestors
- Community level biogas plants
- Renewable energy (solar & biogas)

Milk processing & distribution

- Maintenance of BMCs
- Solar PVs for power & hot water generation
- Biogas for boilers
- Effluent management
- Route optimisation
- Sustainable packaging, milk vending machines
- Recycling of waste
NDDB’s Strategy Towards Climate Smart Dairying

Interventions for a small holder dairying system appropriately incentivizing Dairy farmers and other stakeholders in dairy value chain ensuring sustainability
NDDB’s areas of Interventions

Feed Management

*(Reduces input cost and increases milk yield for farmers)*

- Ration Balancing Programme
- Crop residue management
- Total Mixed Ration
- Feed additives

Manure Management

*(Saves fossil fuel based energy cost, organic fertilizer, Income from sale of manure, carbon financing)*

- Zakariyapura Model
- Banas Model
- Varanasi Model

Improving Productivity

*(Improves Milk Yield)*

- Progeny Testing
- Pedigree Selection
- AI Services

Use of Renewable Energy & Improving Energy Efficiency

*(Saves electricity cost/income from sale of solar energy)*

- On Dairy Farms
- In processing
Feed Management: Ration Balancing

**Ration Balancing** envisages balancing the nutrient requirement of dairy animals as per their production and stage of lactation with locally available feed ingredients.

**INAPH & e-Gopala**

- Animal Registration
- Assessment Of nutrient requirement
- Assess nutrient supply from Current feeding
- Assessment of nutrient surplus/ deficit
- Formulation of least cost balanced ration

Ration balancing at farmer’s doorstep
**Impact of Ration Balancing**

*Methane measurement in animals fed balanced rations*

- 11.80% Reduction in feed cost per kg of milk
- 27.26 Rs. Increase in net daily income per animal

13.7% reduction in CH₄ emission
31.6% reduction in carbon footprint of milk
Total Mixed Ration (TMR)

Total Mix Ration (TMR) is an efficient system of delivering nutrients to dairy cattle and buffaloes. Feeding “complete rations” or TMR has been prevalent since the 1950s in developed countries.

In conventional TMR, chopped green fodder or silage are blended with cereals, cereal by products, protein sources, mineral, vitamins and feed additives in order to provide balanced ration to the dairy animals.

- **Challenges:**
  - Paddy-Wheat cultivation – harvesting by combine harvesters
  - Crop residue burning: 92 million tonne/year
  - Losses: biomass, soil property & GHG emissions

- **Interventions:**
  - Promotion of machineries for securing crop residues and creating crop residue based dry TMR
  - Conducting pilot - Green paddy crop residue silage
**Conventional TMR**
Uniform and nutritionally complete feed

**Advantages of TMR**

- Reduce feed wastage
- Enables better feed intake
- Promising technology to bridge the gap of perennial shortage of fodder

**Impact on profitability and methane emission**

- **12%** Increase in the milk production
- **11%** Increase in the fat percentage
- **11%** Reduction in CH$_4$ emission (16.3 vs. 14.5 g/kg milk)
- **36%** Increase in net daily income
Development of feed additives (dietary methane inhibitors)

- Many feed additives are being used in other countries for methane mitigation. However, none of them have **dual benefits (milk productivity & methane mitigation)**

- In India, **dairy farmers require feed additives that can improve milk productivity as well as reduce methane emission**. NDDB is already working in this direction

- ICAR-NIANP and CSIR-CSMCRI have developed **anti-methanogenic feed supplements - ‘Harith Dhara’ and red seaweed**, respectively

- Additives having dual benefits can be included in **cattle feed formulations for achieving large scale mitigation**.
Improving Productivity

• If milk productivity is improved, the carbon footprint per kg of milk decreases.
• Technologies such as Progeny Testing and Pedigree Selection
• Accelerated Breed Improvement - IVF and using Sex Sorted Semen for propagation of high yielding animals and production of female calves respectively
• Future breeding programs would focus on genetic selection for less methane emissions and better feed conversion efficiency.
Manure Management

- Traditionally Indian Farming families have been managing dung in multiple ways including manure (raw and FYM), as a supplement to fuelwood, for rituals and air purification, house cleansing etc.

- In present times decentralized anaerobic digestion of dung promises to be the most efficient way

- It has potential to fulfill 50% of India's LPG requirement 40% of India's NPK need.
Zakariyapura Model

- Biogas - Owned by Women
- Household level, Decentralized
- Their own cooperative
  - For collective voice and transactions
  - Two such India’s first of its kind established
- Surplus slurry aggregated by coop and processed
- Slurry based organic fertilizers produced and sold directly to farmers
- ‘SuDhan’ - NDDB’s trademark for common identity

Existing dairy coops are taking up the role of Manure Coop and serving their farmers who are now Prosumers
Centralized large capacity Biogas based Model

- A Banas Model Producing Bio CNG and Fertilizer
- A Varanasi Model satisfying energy needs of Dairy Processing Plant and Producing Fertilizer
- Four upcoming NDDB- SRDI Model Decentralized medium capacity digesters for compressed Bio-methane and Fertilizers

*Aggregation of Dung instead of slurry- the only change*

*Returns on Slurry Based Organic Fertilizers remains key*
Carbon Financing for Manure Management Initiative

• Registering carbon credits for biogas installed and passing on to monetary benefits to biogas owner farmers

• NDDB Mrida Ltd launched Gobar Se Samriddhi programme through carbon financing

• Obtaining carbon credits for Varanasi Model is also under process.
Use of Solar Energy in Village Cooperative Societies

- **Solar Photovoltaic:** Solar PV used to meet power *requirement* in DCS during milk collection; *hybrid net metered connections*

- **Solar Powered Thermal Storage System** to chill the milk in the BMC in absence of *electricity* - trapping freely available solar energy to replace Diesel Generators in DCS
Solar Pump Irrigators Cooperative

• Optimize Solar energy use for Irrigation

• A novel form of cooperative - Mujkuva Solar Pump Irrigators’ Cooperative Entreprise (MSPICE)

• Inaugurated by Prime Minister Shri Narendra Modi in 2018

• The idea of SPaRC (solar power as remunerative crop) has inspired the design of Suryashakti Kisan Yojana and one of the three components of the KUSUM scheme
Energy Conservation and Reducing Water Footprint in Dairy Processing Plants

➢ Reduction in material & energy intensity during processing:
   Efficient processing systems like pasteurizer with high regeneration efficiency and energy efficient motors

➢ Recycling steam condensate, reusing CIP solution, recycling treated effluent for non-critical cleaning, use of agri-waste briquettes, Biogas reusing milk condensate

➢ Application of Concentrated Solar Thermal technology to reduce the annual heat
Climate Smart Dairying and SDGs

- Additional Income
- Job creation
- Reduced Imports

- Improved Human Health

- Women Participation

- Reduced GHG Emissions
- Swachh Bharat
- Improved Soil Health
- Crop Residue Reuse

- Investment in Sustainable Energy Infrastructure

- Access to Clean and sustainable energy
Continued Actions

• Appropriately **incentivising scientific feeding and manure management practices** for smallholder farmers

• **Innovations in feed additives**, newer formulations, farmer awareness, multispectral (energy /fertilizer/ environment etc.) partnerships, efficient data management and knowledge generation

• Appropriate **carbon financing models**

• Propagation of **use of Renewable energy** at various levels of dairy value chain

• Channelizing Policy Support
  • Establishing Dung as Commodity and recognising dung based fertilisers
  • Climate smart dairing/ Manure Management as category in Green Credit program
Thank You