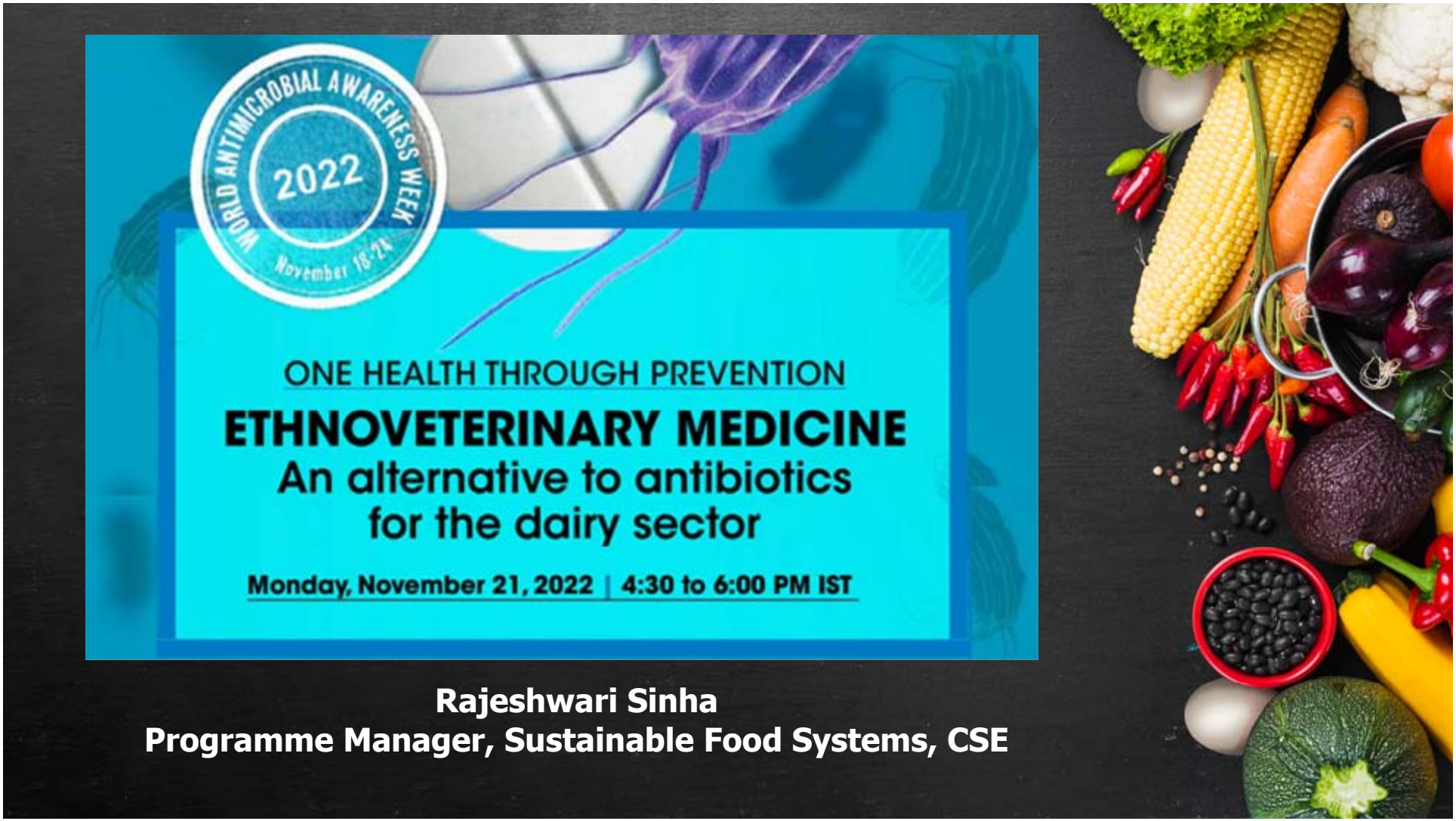

Rajeshwari Sinha
Programme Manager, Sustainable Food Systems, CSE

Critically important antibiotics used in the Indian dairy sector

- **India is the largest milk producer in the world**
  - **209.9 million tonnes of milk** produced in 2020-2021, **23 per cent** of the global production
  - **46 per cent of milk** produced is consumed at producer level or sold to non-producers in rural area, **54 per cent available** for sale to organized (milk cooperatives, producer companies, private players) and unorganised players (local milkman, dudhias, contractors)
  - Dairy cooperatives are a three-tiered: district co-operative society (DCS) at village level; milk union (MU) at district level; milk federation at state level.
- **Our previous assessments have shown the use of high end antibiotics in dairy sector; including those critically important to human**
  - These were used for disease treatment, prevention and control
  - About 21 different critically important antimicrobials belonging to six classes were found to be used (these included, for example, 3rd and 4th generation cephalosporins, fluoroquinolones, penicillins, aminoglycosides)
- **Presence of drug residues in milk reported by various studies; implications on antimicrobial resistance (AMR)**

The big gap of alternatives (to antibiotics)

- Efforts to reduce antibiotic overuse and misuse have not had much success so far
- This is largely because **alternatives to antibiotics** have not gained momentum
- **Ethnoveterinary medicines (EVM)**, which are **traditional/herbal preparations**, over the last few years have garnered some attention in the Indian dairy sector
- CSE therefore decided to understand the **effectiveness and challenges and possibilities in scaling up the EVM**

CSE assessment of the National Dairy Development Board's EVM project implemented with with technical support from Trans-Disciplinary University, Karnataka

EASY TO SWITCH

Ethnoveterinary medicine is a low-cost alternative to reduce antibiotic use in Indian dairy sector

DEEPAK BHATI, RAJESHWARI SINHA, AMIT KHURANA
NEW DELHI

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Mastitis Control Popularization Programme (MCPP)

- **2014: NDDB lunched pilot of MCPP at Sabar Dairy covering 50 district co-operative societies**
  - Mastitis infected dairy cattle diagnosed by California Mastitis Test kits; treated by tri-sodium citrate
  - Project conceived to help small farmers suffering heavy losses due to mastitis
  - Aimed to highlight the significance of subclinical mastitis and reduce milk loss due to mastitis

- **2016: Roped in Trans-Disciplinary University (TDU), Karnataka to explore use of ethnoveterinary medicines**
  - TDU had already been conducting research on EVM in parallel
  - NDDB-TDU-Sabar Dairy came together to conduct a trial; success observed

- **Mastitis (infection/inflammation of mammary gland) is a common bacterial disease**
- **Multiple causative organisms, primarily bacteria such as *S. aureus*, *Streptococcus* sp.; no vaccines to prevent it**
- **Can be predisposed by unhygienic farm conditions, trauma, or milking and teat injuries**
- **Sub-clinical mastitis is another form of mastitis with no specific symptom; cannot be easily detected**

MCPP: Current coverage (8 states, 16 milk union and producer companies)

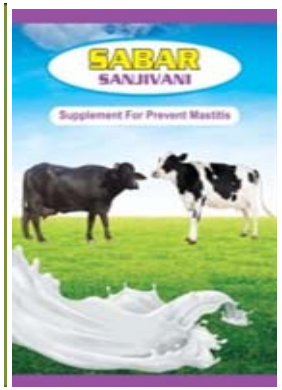
State	Milk union / producer company associated with MCPP
Andhra Pradesh	**Producer company:** Shreeja Mahila Milk Producer Company Ltd.
Assam	**Milk union:** West Assam Milk Producers' Co-operative Union Ltd.
Gujarat	**Producer company:** Maahi Milk Producer Company Ltd.
	Milk union: Sabarkantha District Co-operative Milk Producers' Union Ltd.
Karnataka	**Milk union:** Bengaluru Co-operative Milk Union Ltd.
	Milk union: Dakshina Kannada Co-operative Milk Producers' Union Ltd.
	Milk union: Kolar District Co-operative Milk Producers' Societies' Union Ltd.
	Milk union: Mysore District Co-operative Milk Producers' Societies' Union Ltd.
Kerala	**Milk union:** Malabar Regional Co-operative Milk Producers" Union Ltd.
Maharashtra	**Milk union:** Kolhapur Zilla Sahakari Dudh Utpadak Sangh Ltd.
	Milk union: Pune Zillha Sahakari Dudh Utpadak Sangh Ltd.
	Milk union: Rajarambapu Patil Sah Dudh Sangh Ltd.
Punjab	**Producer company:** Baani Milk Producer Company Ltd.
	Milk union: Ludhiana District Co-operative Milk Producers' Union Ltd.
	Milk union: Ropar District Co-operative Milk Producer’s Union Ltd.
Uttar Pradesh	**Producer company:** Saahaj Milk Producer Company Ltd.

MCPP: Moved beyond mastitis (29 diseases/conditions)

New name being considered: “Disease Control through Alternative Methods

Mastitis	Bloat	Blood in Milk	Deworming	Diarrhea	Indigestion
Teat Obstruction	Udder oedema	Wart	Wound ailments	Retention of placenta	Hygroma (swelling of joints)
Ectoparasites	Fever	Foot and Mouth disease Foot Lesion (a viral infection)	Downer (inability to get up)	Prolapse (bovine uterus protrudes after calving)	Poisoning
Leucoderma (patchy depigmentation of skin)	Anoestrus (failure of normal cycling to return after calving)	Endometritis (inflammation of endometrium)	Pyometra (accumulation of large amounts of pus in uterus)	Metritis (inflammation of the uterus)	Cheilitis (acute or chronic inflammation of the lips)
Joint ill (disease of young calves <1 week of age; occurs due to infection entering via the umbilical cord at or soon after birth.)	Milk fever (metabolic disorder caused by insufficient calcium, commonly occurring around calving)	Cystic ovary (ovarian dysfunction)	Repeat Breeder (failure to conceive from 3 or more inseminations in the absence of detectable abnormalities)	Agalactia (absence of milk production in an animal that should be producing milk)	

MCPP: From home-made preparations to packaged EVM products



- **Why this shift?**
  - To ensure uninterrupted supply
  - Not always possible for farmers to have access to raw materials
  - Farmers at times reluctant to make so much effort

READYMADE REMEDY

Ethnoveterinary medicines sold by different milk cooperative unions and private players

LICENSED PRODUCTS

Malabar, milk cooperative, Kerala

- **Masticure*:** Prevent all types of mastitis
- **Diar end:** Prevent diarrhea
- **Pyrexcure:** Reduce fever
- **Crack heal*:** Treatment of warts, pox and cracks in teats
- **Heal all*:** Wound healing
- **Rumatore:** Indigestion, bloat, anorexia in cattle
- **Milk let:** Galectogogue in cattle
- **Fly repel:** Ectoparaceticide/ticks in cattle

Ayurvet Ltd, herbal animal drugs company, Delhi

- **Diaroak:** Diarrhea of different etiology, Calf scours, Non-specific diarrhea
- **Mastidip*:** Prevention of udder infections, for teat and udder antisepsis, routine udder sanitization
- **Charmil plus*:** FMD lesions, Deep-seated wounds, Fungal infection, Yoke gall, Pyoderma, Non-specific skin problems, Scabies, Maggot wounds, surgical wounds
- **Mastilep*:** Treatment and control of clinical and sub-clinical mastitis, improving milk quality, promoting udder health

Trieto Biotech, a veterinary drugs company, Gujarat

- **Mastic lap*:** Prevent mastitis
- **Mastfree:** Prevention of subclinical and clinical mastitis, increased milk yield, milk fat and SNF content.
- **Immuno syrup:** Curing all types of pyrexia
- **Digiboost Syrup:** Curing all types of nutritional diarrhoea

FEED SUPPLEMENT

Amul Dairy, milk cooperative, Gujarat

- **Amul Masta Mix:** Prevent subclinical and clinical mastitis, helps increase in milk yield and in let-down of milk
- ***Mastitis powder:** Prevent mastitis
- **Amul Immune:** Improve immunity
- **Amul Rumen pro:** Improve digestion in animals
- **Amul Utero Plus:** Prevent metritis, helps in retention of placenta, abortion and agalactia

Sabar Dairy, milk cooperative, Gujarat

- **Sabar Sanjivani:** Prevent mastitis and sub clinical mastitis, helps to increase in milk production and fat, helps in agalactia
- **Sabar Mix*:** Prevent mastitis
- **Sabar Saral:** Improve digestion in case of diarrhea, indigestion, impaction
- **Sabar Sudarshan:** Prevent fever and improve immunity
- **Sabar Amrut:** Prevent mastitis
- **Sabar Uterine Cleanser:** Prevent uterine infection, retention of placenta
- **Aloe sabar*:** Prevent mastitis
- **Amrut:** Prevent mastitis

Banas Dairy, milk cooperative, Gujarat

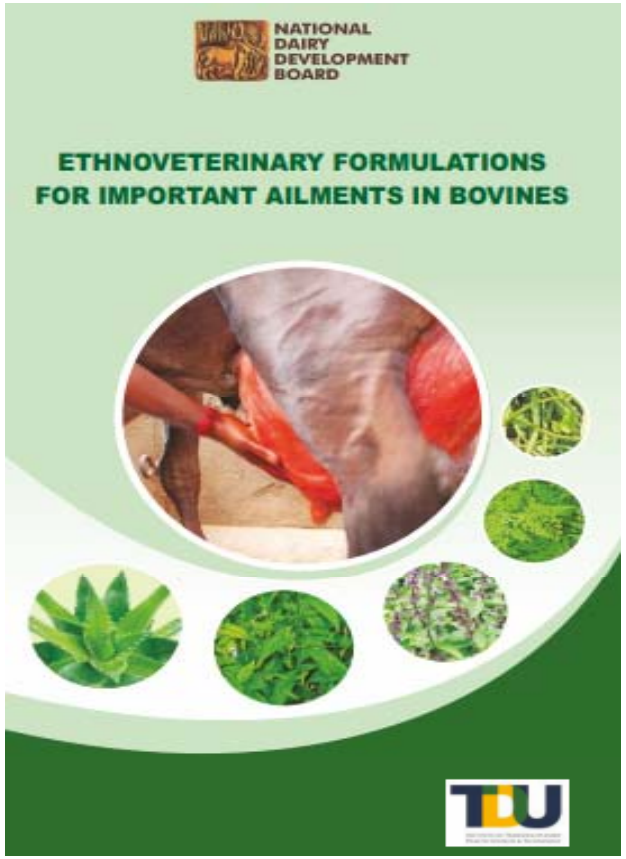
- **Banas Shital:** Prevent pyrexia
- **Banas Amrut:** Prevent mastitis
- **Banas Pachak:** Prevent Indigestion, Diarrhoea, Enteritis

Source: Centre for Science and Environment

- Milk unions manufacturing packaged EVM products on a no-profit and loss basis
- Readymade formulations sold as feed supplements by unions
- **Ethnovet MILMA**, start up launched by Malabar Milk Union in Kerala; selling 8 licensed EVM products
- Private players also involved in selling licensed products

MCPP: Awareness

- **Information brochure on ethnoveterinary formulations for >20 bovine ailments**
  - Jointly developed by NDDB-TDU
  - Available in 12 major languages (Assamese, Bengali, English, Gujarati, Hindi, Kannada, Malayalam, Marathi, Odia, Punjabi, Tamil, and Telugu)
  - Provides ingredients and quantity needed for one days formulation, method of preparation, method of application and duration of treatment
  - Barcode on each disease page linking to short YouTube videos



WHAT MAKES IT SPECIAL

Simple ingredients of ethnoveterinary medicines that can work against several bovine ailments

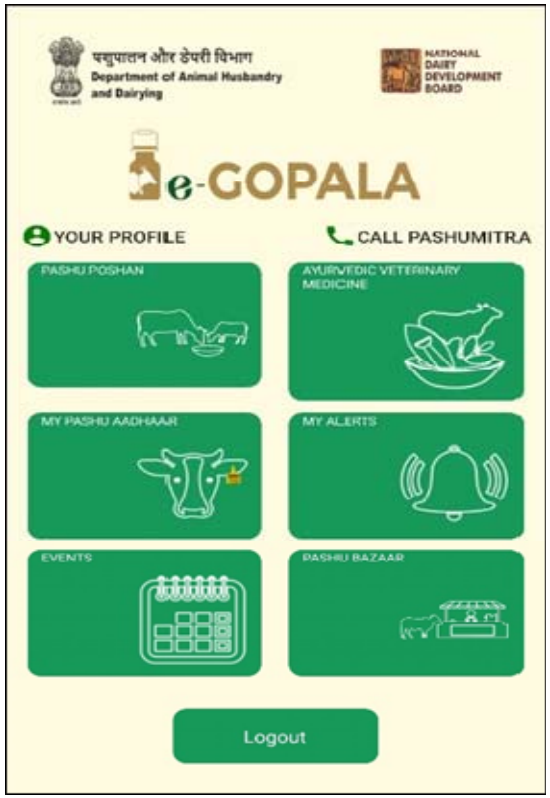
Brochure

Disease/Condition	Ingredients
Mastitis (all types)* (Water based preparation)	Aloe vera, turmeric, calcium hydroxide, lemon
Mastitis (all types)* (Oil based preparation)	Aloe vera, turmeric, calcium hydroxide, lemon, mustard or gingelly oil
Teat obstruction*	Neem leafstalk, turmeric, butter or ghee
Udder oedema*	Sesame or mustard oil, turmeric, garlic
Retention of placenta#	White radish, lady's finger, jaggery, salt
Repeat breeding#	Jaggery, salt, white radish , aloe vera, moringa, cissus stem, curry leaves, turmeric
Prolapse*	Aloe vera, turmeric, mimosa pudica (shameplant)
Foot and mouth disease-mouth lesions*	Cumin seeds, fenugreek seeds, black pepper, turmeric, garlic, coconut, jaggery
Foot and mouth disease-foot lesions/wound*	Acalypha indica (indian copperleaf), garlic, neem, coconut or sesame oil, turmeric, mehndi, tulsi (holy basil)
Fever#	Garlic, coriander, cumin, tulsi (holy basil), dry cinnamon, black pepper, betel leaves, shallots, turmeric, chirata leaf powder, sweet basil, neem, jaggery
Diarrhoea#	Fenugreek seeds, onion, garlic, cumin seeds, turmeric, curry leaves, poppy seeds, pepper, jaggery, asafetida
Bloat and Indigestion#	Onion, garlic, dry chilly, cumin seeds, turmeric, jaggery, pepper, betel leaves, ginger
Worms#	Onion, garlic, mustard seeds, neem, cumin, bitter gourd, turmeric, pepper, banana stem, common leucas, jaggery
Tick/Ectoparasites*	Garlic, neem leaves and fruit, acorus rhizome (sweet flag), turmeric, lantana leaves, tulsi (holy basil)
Pox/wart/cracks*	Garlic, turmeric, cumin, sweet basil, neem, butter or ghee
Allergy / poisoning / venomous sting/bite#	Betel leaves, black pepper, salt, jaggery
Hygroma (Swelling of joints) *	Aloe vera, lime, cissus quadrangularis (veldt grape), turmeric, garlic, gingelly oil
Cough#	Adhathoda (adusa), tulsi (holy basil), garlic, turmeric, pepper, jaggery
Downer (not able to get up)#	Desi chicken eggs, moringa, cissus quadrangularis (veldt grape), jaggery
Toxicity (Pesticide /HCN / Mycotoxin) #	Betel leaves, black pepper, salt, jaggery, tamarind, water, moringa extract
Blood in milk#	Curry leaves, moringa leaves, jaggery, lemon
Anoestrus#	Betel, pepper, moringa, tamarind, salt, jaggery

MCPP: Awareness

- **E-Gopala application**
  - android mobile application
  - developed by NDDB jointly with the Department of Animal Husbandry
  - available in 12 languages

- **Awareness through social media**
  - About 275 videos on EVM preparation and application methods on Youtube
  - Facebook page to document success stories from different milk unions across the country



MCPP: Training

- Trained nearly 260 core group of veterinarians from 34 milk unions and producer companies
- Core group veterinarians have further trained about 800 veterinarians at union level and about 8300 personnel at district cooperative society level
- About 575 demonstration plots have been established so far; 416 at DCS level, 160 at MU levels.

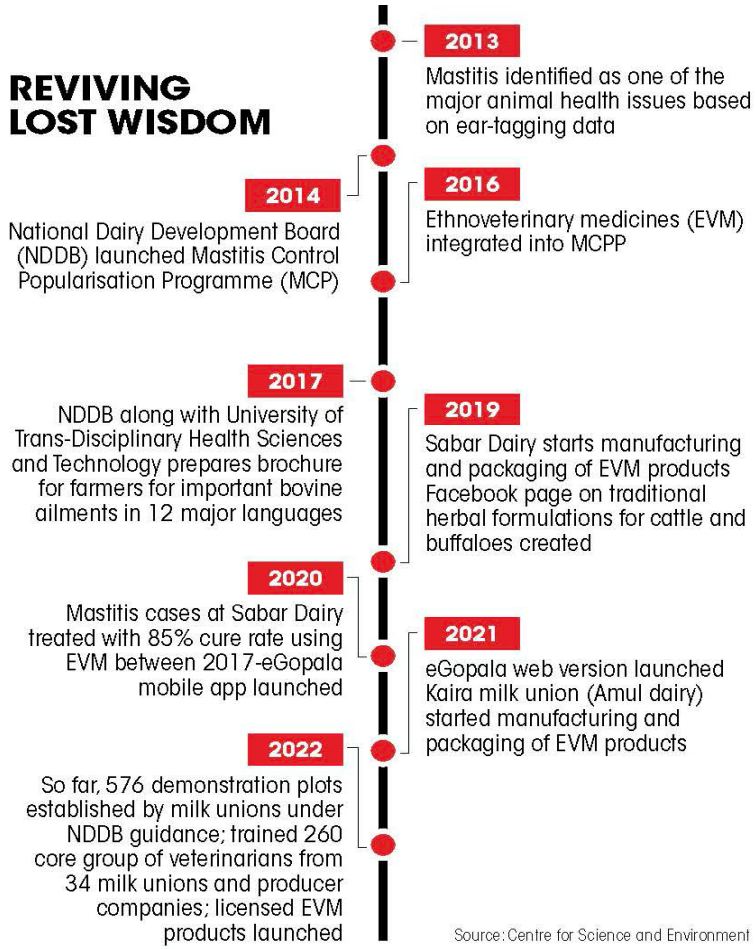
Training at Tezpur, Assam

Demonstration plot at NDDB campus

MCPP: Monitoring

- **Animal Health Management Information System**
- Unions report the programme progress over various parameters (e.g., the number of project personnel trained, number of EVM demo plots established, number of animals treated by EVM)
- Data uploaded by unions on monthly basis
- Quarterly evaluation by NDDB

MCPP: Timeline of key milestones



Results: effectiveness of EVM

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MCPP: Overall results

Disease	Number of unions/producer companies treating with EVM	Total number of cases treated across unions (in thousands)	Cure rate (%)
Mastitis	25	255	78.4
Fever	18	163	82.2
Diarrhea	20	151	84.4
Indigestion	19	32	83.4
Wound	16	9	80.5
Bloat	18	7	76.0
Retention of placenta	17	6	71.2
Lumpy skin disease	8	3	66.2
Prolapse	17	2	69.6
Sub-total		628	80.9
Other ailments		152	78.3
Total	25	780	80.4

Key four diseases covering 77% (6.01 lakhs) of total cases

Key nine diseases which are otherwise treated with antibiotics

- 2016-October 2022
- 7.8 lakh disease cases across all 25 unions
- Overall 80.4% cure rate
- Nine diseases which are treated with antibiotics, 80.9% cure rate
- 4 diseases covering 77% of total cases; 81.2% cure rate
- In general, in most disease cases, 4 out of every 5 animal were cured using EVM.

PROMISING NUMBERS

Key 4 diseases in 16 active unions/producer companies: all have cure rate >50%; Many have above 70%

Examples of readymade EVM formulations sold by different milk unions and private players and private players and sold by different milk unions and private players and private players and sold by different milk unions and private players private

UNIONS CURRENTLY ASSOCIATED WITH MCPP	Mastitis (Fig in%)	Fever (Fig in%)	Diarrhoea (Fig in%)	Indigestion (Fig in%)	Wound (Fig in%)	Bloat (Fig in%)	Retention of placenta (%)	Lumpy skin disease (%)	Prolapse (Fig in%)	Other ailments (Fig in%)	Cure rate (Fig in%)
Andhra Pradesh											
Shreeja Mahila Milk Producer Company Ltd.	73.6	100	84	66.4	33.3	88	100	57.9		52.6	68.3
Assam											
West Assam Milk Producers' Co-operative Union Ltd.	96.1	-	-	-	-	97.3	-	98	100	79	94.3
Gujarat											
Maahi Milk Producer Company Ltd.	80.8	-	85.7	100	100	66.7	92.9	-	-	88.6	85.2
Sabarkantha District Co-operative Milk Producers' Union Ltd.	80	82.4	85.5	91	-	-	-	-	-	90.3	82.9
Karnataka											
Bengaluru Co-operative Milk Union Ltd.	78.9	81.8	84.2	89	87.1	82.3	81.4	78.6	77.1	76.3	79.6
Dakshina Kannada Co-operative Milk Producers' Union Ltd.	83	86.6	88.4	88.1	-	87.3	-	-	-	82.7	84
Kolar District Co-operative Milk Producers' Societies' Union Ltd.	56.9	59.8	67.4	66.4	66.5	61.7	57.9	76.2	51.4	60.7	61.1
Mysore District Co-operative Milk Producers' Societies' Union Ltd.	73.9	50.6	82.8	-	87.5	41	75.6	72.6	53.3	83	81.1
Kerala											
Malabar Regional Co-operative Milk Producers'' Union Ltd.	76	85.2	76.2	81.6	-	-	-	-	-	99.1	80.2
Maharashtra											
Kolhapur Zilla Sahakari Dudh Utpadak Sangh Ltd.	71	74.2	78.7	84.8	89.6	82.5	67.7	-	68.4	73	73.3
Pune Zillha Sahakari Dudh Utpadak Sangh Ltd.	96.6	-	97.9	100	-	100	50	-	100	98.3	97.3
Rajarambapu Patil Sah Dudh Sangh Ltd.	74.6	67.9	69.4	70.7	79.3	76.7	-	-	62.3	70.9	73
Punjab											
Baani Milk Producer Company Ltd.	96.8	98.5	93.1	99.5	86.6	94.6	89.7	-	83.4	93.4	95.1
Ludhiana District Co-operative Milk Producers' Union Ltd.	88	-	-	-	-	-	-	-	-	88	87.9
Ropar District Co-operative Milk Producer's Union Ltd.	72.8	59.3	67.5	62.6	76.9	-	74.3	33.6	60.8	77.3	72.4
Uttar Pradesh											
Saahaj Milk Producer Company Ltd.	83.5	91.3	81.5	80	66.7	86.7	75.3	50	82.5	82.8	82.8
UNIONS CURRENTLY NOT ASSOCIATED WITH MCPP											
Andhra Pradesh											
Krishna district Milk Producers' Mutually Aided Co-operative Union Ltd.	69.1	89.4	92	96.6	97	96.6	89.9	-	89.5	87.8	87.2
Sri Vijaya Visakha Milk Producers Company Ltd.	81.8	-	-	-	-	-	-	-	-		81.8
Gujarat											
Surat District Co-operative Milk Producers' Union Ltd.	95.8	-	-	-	-	-	-	-	-		95.8
Karnataka											
Tumkur Co-operative Milk Producers' Societies' Union Ltd.	39.6	58.4	55.1	49.1	50.5	55.2	40.6	-	41.2	43	46.4
Maharashtra											
Aurangabad District Co-operative Milk Producer's Union Ltd.	90.1	-	-	100	100	-	100	-	100	77.2	86
Baramati Taluka Sahakari Doodh Utpadak Sangh Maryadit	71.5	75.8	73.3	72.2	66.4	70.2	74.3	75.5	61.2	68.3	70.3
Punjab											
Jalandhar District Co-operative Milk Producers' Union Ltd.	72	62.7	69.2	-	-	64.1	62.1	-	61.1	65	67.8
Tamil Nadu											
Erode District Co-operative Milk Producers' Union Ltd.	61.7	36.1	47.3	92.1	68.8	61.8	21.8	-	53.3	87.7	71.3
Salem District Co-operative Milk Producers' Union Ltd.	73.5	81.8	71	80.2	72.3	65.8	70.4	-	75.8	48.6	75.3

Source: Centre for Science and Environment

What do these results mean?

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MCPP: Potential impacts

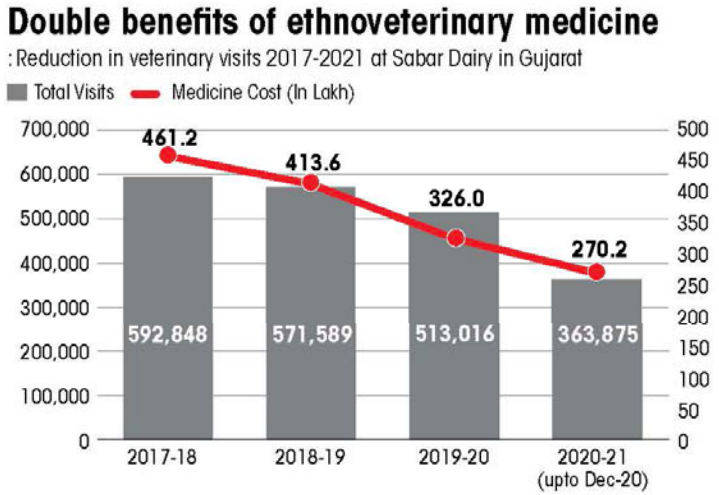
- **Safe milk and milk products for consumer**
  - antibiotic free milk
  - cattle reared without antibiotics leading to reduction in AMR drivers/pathways through food and environment (AMR safe manure useful for growing organic movement in India)
- **Reduction in overall treatment expenses**
  - reduced consumption of antibiotics, veterinary medicines
  - reduced veterinary visits; farmer dependence on vets reduced
- **Improved livelihood of farmers**
  - reduction in loss of milk productivity
  - lesser rejection of milk at the district co-operative society level

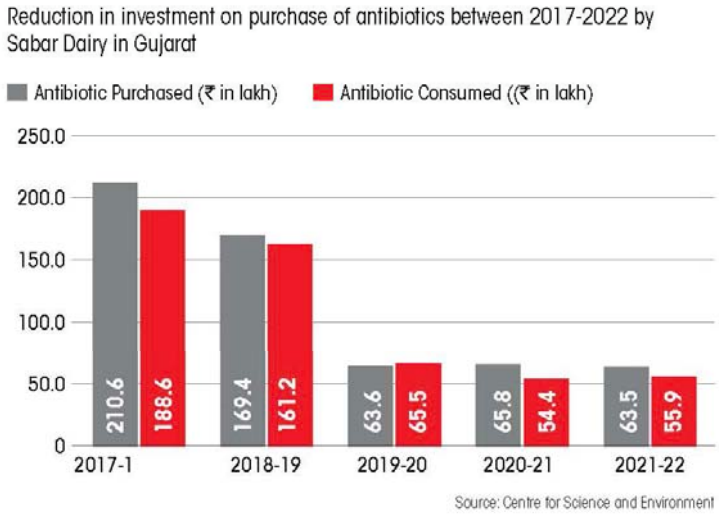
Farmer buy-ins

- "Since we began using these, the incidence of mastitis on the farm has drastically reduced"
- "Use of these preparations have reduced our treatment cost. We are spending 100-200 Rs only, where we used to earlier spend 2000-3000 Rs earlier on medicines"
- "We had once spent Rs 18,000 on one cow affected with mastitis but were still unable to save it. When compared to EVM, this is exorbitant expense"

MCPP: Evidence from Sabar Dairy

- About 2.29 lakh veterinary calls have reduced from 2017-18 till Dec 2020
- Rs 191 lakhs have been saved on medicine costs (2017-18 to Dec 20)
- Antibiotics worth Rs 210 lakhs in 2017-18 purchased in Sabar dairy came down to Rs 63 lakhs in 2021-22
- Antibiotic consumption reduced by Rs. 132.67 lakhs from 2017-18 to 2021-22





What needs to be done to up-scale EVM?

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Way forward (1/2)

- **The central government and state governments should promote up-scaling EVM at the federation level as well as big and small milk producers and procurement agencies through suitable policies and programmes. This should involve:**
  - **Creating awareness** among veterinarians, para-veterinarians, farmers, milk procurement agencies, dairy collectives through training and capacity building
  - Develop a **research agenda**, promote pilot projects across states for different diseases, formulations etc. and publish results for greater learning and trust building among stakeholders
  - **Modify curriculum** for veterinarians to include EVM
  - Make available EVM preparations/products and appropriately **regulate them for price** and quality
  - Make EVM ingredients/preparations available through supporting herbal gardens and manufacturing/mixing plants such as through self-help groups, local producers, community as well as small and medium enterprise

Way forward (2/2)

- **Monitor EVM interventions** and document their impact on cost, livelihood, health, antibiotic residues, reduction in AMR load etc.
- **Incentivize antibiotic free milk** or milk produced without use of antibiotics
- Make **consumer aware** about EVM in dairy and its role in reducing antibiotic residues in milk and AMR
- **Incentivize cattle dung not treated with antibiotics** for use in crops as organic manure

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