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From the Pen of Chief Editor

Methane Emission from Livestock

Dairy cows emit a lot of methane (CH4), which is a major source of greenhouse gases and harms the environment. Ruminant CH4 emissions are linked not only to environmental issues, but also to energy losses. Methane emissions from cattle are influenced by a variety of factors, including feed intake, carbohydrate type in the diet, feed processing, the addition of lipids or ionophores to the diet, and changes in ruminal microflora. Manipulation of these factors has the potential to reduce cattle methane emissions.

The amount of methane emitted by livestock is primarily determined by the number of animals, the type of digestive system they have, and the type and amount of feed consumed. A single cow will belch approximately 220 pounds of methane per year.

Methane is produced in the natural world when organic matter decomposes in an area with little or no oxygen, such as an undersea environment or a marsh.

Methane emissions from individual or groups of animals can be measured using a variety of techniques. Better livestock rearing techniques, such as using the right feed types and increasing livestock productivity, can help to reduce methane emissions. The increase in livestock population has the greatest impact on methane levels in the atmosphere. Lowering methane levels, on the other hand, may be possible through improved livestock productivity, population stabilisation, better feed, and manure use.

Methane emissions in India are concerning because two major sources, livestock and paddy fields, are rapidly expanding. Both sources are linked to India's food and economic security.

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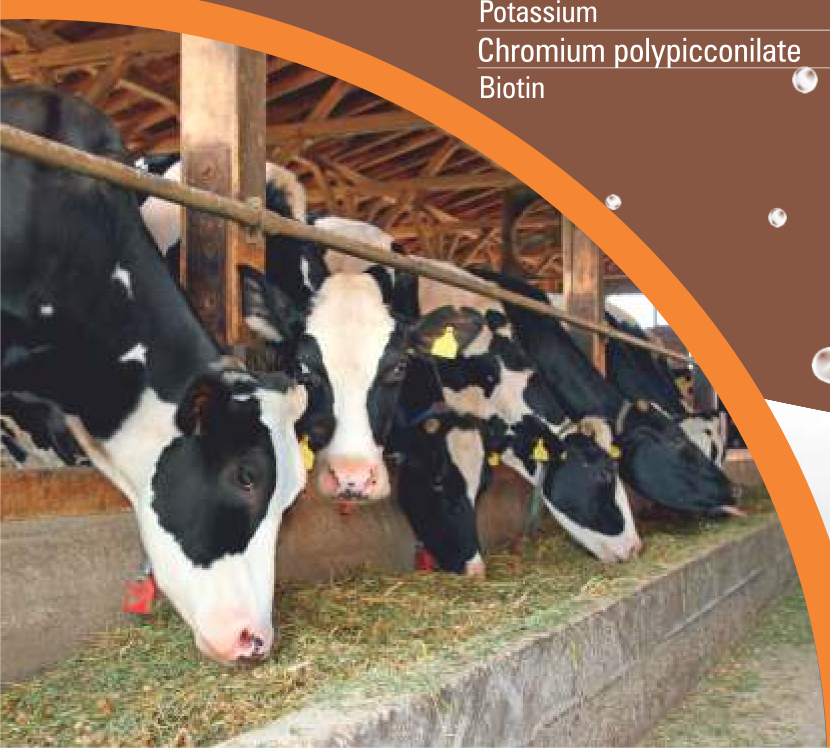

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Article

Impact of Nitrate/ Nitrite Toxicity in Cattle

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Abstract

Nitrate poisoning/ toxicosis is a condition seen in animals which consume large amount of nitrate from feed or water. It is a common case especially in regions that use more of nitrogenous fertilizer as well as plants that contain large amount of nitrate. Cattle, being ruminant are particularly more susceptible because ruminalmicroflora reduces nitrate to ammonia, with nitrite being the intermediate toxic product. It results in hypoxia and many other complications which affects the performance of animals and economic condition of the farmers. Thus, the toxic effects and guidelines to prevent its occurrence will be mentioned.

Introduction

Nitrates/ nitrites are made up of nitrogen and oxygen and is found naturally in the environment as a part of the nitrogen cycle.Nitrate is an important composition of amino acid which form proteins to carry out various metabolicactivites of the body.For example, it helps in milk production and muscle build up, etc. But when they are consumed in large amount that is more than required by the body, it results in poisoning/toxicosis. Nitrate may not be toxic as such, but its metabolic product 'nitrite' is toxic. Accidental ingestion of larger amount by animals, especially ruminants such as cattle, could result in serious health implications that affect the performance and production of the animal. Therefore, a knowledge about nitrate toxicity in cattle is important so that it can be reduced and prevented.

Source of nitrate/nitrite poisoning

The main source of toxicosis is from consumption of plants with high nitrate content by cattle. Under normal conditions, plants do not contain high level of nitrate. But after condition of draught, the nitrogen content increases because of its high uptake from the soil. What happens during draught is that the soil nitrate increases due to lack of leaching, decrease uptake by plants, and decomposition of organic matter. In particular, during the first rain following drought, plants regrow and nitrate levels are highest in this period. High level of moisture to enhance more absorption from soil, low temperature (~13oC) which suppress conversion of nitrate to amino acids and proteins,decrease in day light as well as rapidly growing plants in dry, high temperatures also contribute to the increasing level of nitrate in plants. The use of nitrogenous fertilizers such as ammonium nitrate, potassium nitrate and urea also increase nitrogen uptake by plants and increase nitrate levels. Within the plant, nitrogen content is higher in the lower third part of the stalk.Usually, nitrates content are higher in young immature plants while mature plants under favourable environment and temperature may accumulate high amount. After harvesting, nitrate may be converted to nitrite under favourable conditions of heat, moisture and microbial activity.Microbes on the fodder (such as hay) convert nitrate to nitrite under condition of moisture.Water contaminated by fertilizers, animal

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wastes and decaying matters also acts as a source of nitrate.

The plants/ crops which act as a source of nitrate poisoning include barley, corn, flax,linseed, lucerne, maize, millet, oats, radish, rape, rye, soybeans, sorghum, subterranean clover, sudangrass, sugarbeets, sweetclover, turnips and wheat.

How does toxicity occur in cattle?

When cattle consume feeds and water contaminated with nitrate (as mentioned earlier), then the microbes in the rumen breakdown the nitrate to nitrite, and then to ammonia. High level of nitrate consumption at once leads to its toxicosis.Nitrite binds with haemoglobinand forms methaemoglobin, which is unable to carry oxygen, resulting in tissue hypoxia and anoxia. Plants containing >1% nitrate on a dry weight basis, i.e., 10,000 ppm is toxic for animals and cattle can tolerate upto 0.5%. The safe level of nitrate in forage and water is 0-6000ppm and >400ppm, respectively.In some instances, even concentration of 1,000 ppm on a dry weight basis has been lethal when hungry cattle ingest this much at once. Therefore, the total amount of nitrate ingested is the key factor.

How do you know if your cattle is suffering from nitrate/nitrite toxicity?

The most predominant sign of nitrate/nitrite toxicity is rapid respiration. Since nitrite is an irritant to the gastrointestinal lining, there will be excessive salivation, diarrhea and abdominal pain. The pulse will be rapid, i.e., 150+/min. while the heart rate drops. The animal will urinate more frequent than usual and there may be muscle tremors too.The mucous membrane will be bluish/brown in colourdue to less availability of circulating oxygen. All the signs are seen within 0.5-4 hours of ingestion of toxic amount of nitrate and indicate acute toxicity.

When your cattle has been eating nitrate containing forages for days or weeks,there will be decrease in feed consumption, loss of body weight, decrease in milk production, infertility, still birth or birth of weak and stunted calves.Abortion and stillbirths may be seen in some cattle 5– 14 days after excessive nitrate/nitrite exposure. The animal becomes susceptible to infections as the feed intake reduces and there is lowered immunity. All these are signs of chronic toxicity and death occurs if the animal's feed is not checked.Rapid breathing is also seen upon chronic exposure.

How do you find out and take precautions?

Once you notice these changes in your animal, you may check all the feeds and water for any possible contamination with nitrate. Laboratory analysis should be done at the earliest for confirmation. Specific antidote for nitrite/ nitrate poisoning is methylene blue.However, the Food and Drug Administration (FDA) does not approve the use of Methylene blue in food producing animals.Alongwith the antidote, supportive therapy may be given, so, consult your veterinarian for the same.

Animals if dead, may be examined for lesions to prevent further toxicity of remaining animals. Dark brown discoloration of blood immediately after dead is a pathognomonic lesion. There will be petechial haemorrhages on the serosal surfaces. Congestion of internal organs due to vasodilatory effect.

The simple and best way to prevent nitrate/nitrite toxicity is by checking the forages. Use optimum nitrogenous fertilizer. Nitrate containing plants should be mixed with other type of forages to dilute the amount. The time of harvesting plants should also be checked, do not harvest during rain following draught and wait for at least a week after rain. Avoid the lower third portion of stalk/ plants while harvesting.Also, cut the plants in the evening or late afternoon on a sunny day.Hay that has been wet or stored in a damp place for several days should not be fed to animals. Avoid piling of forages right after cutting as heat increases microbial activity to convert nitrate to nitrite. Cattle are more prone to poisoning when they are hungry and feed greedily. So do not let them graze in high nitrate pastures when they are hungry. It is better to feed them low nitrate forages before turning them into pastures. Gradual feeding of suspected high nitrate feed and fodders should be done to acclimatize the animals. Feeding of silages reduce toxicity as the ensiling reduces nitrate level by 50%. Include supplements such as Vitamin A, D, E and iodized salt in the feed as these will allow conversion of nitrate to amino acid/ protein. The source of water should also be checked. For example, water transported in a cleaned liquid fertilizer tanks or water collected from areas where high nitrogen fertilizers are used have high nitrogen content.

Conclusion

Nitrate as such is not so toxic, but nitrite is ~10 times more toxic than nitrate. Its toxicosis is more in cattle because of microbial conversion in the rumen. A knowledge about toxicosis is importantas it reduces the milk yield and can lead to death if not treated promptly. Therefore, the forage and water consumption should be taken care of. Good management practices is the key factor to reduce nitrate/ nitrite poisoning.

Role of Livestock in Methane Emission: An Indian Perspective

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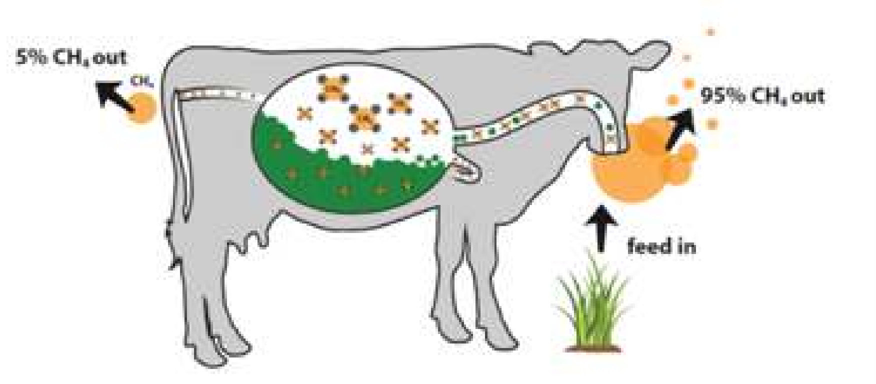
India is a country rich in geographical diversity, having all kinds of weather and surplus in huge variety of flora and fauna out of which livestock plays a vital role in India's economy. India being world's second largest populated country has to face a continuous pressure of job production so people can earn their livelihood, here agriculture and allied sector contributes the most i.e. more than 70 percent population of India earn their livelihood from agricultural and animal husbandry sector. Livestock sector comes as a boon for people who have small land holdings or even no land therefore marginal and small farmers as well as landless labourers hold 70 per cent of the total livestock population as the absorption capacity of other economic sectors is are low in rural areas.Livestock forms the livelihood of two thirds of the rural population. It also provides employment for about 18.8% of the Indian population. India has huge livestock. The livestock sector contributes 4.11% of GDP and 25.6% of total agricultural GDP.But along with all the advantages livestock rearing creates a great amount of threat to environment, livestock rearing produces methane and nitrous oxide are the two main gases which are a major threat form the environment and comes under greenhouse gases.The livestock sector contributes directly / indirectly to GHG emissions, inclusive ofvia animal physiology, manure storage, manure treatment, soil application, chemical fertilizers and more. The main greenhouse gas emissions from livestock are CO_2, CH_4 and N_2O. $CH_4$is the largest contributor to anthropogenic greenhouse gas emissions at 44%, followed by N_2O (29%) and CO_2 (27%) has a global warming effect 28 times greater than carbon dioxide. Nitrous oxide, which is produced during manure storage and the use of organic/inorganic fertilizers, is a molecule with a global warming potential 265 times greater than carbon dioxide.Apart from greenhouse gases produced directly from livestock, crop production for livestock rearing also intensify the production of greenhouse gases on a larger extent.45% of greenhouse gases produced in livestock rearing comes from feed production and its processing, enteric fermentation 39% of GHG which stands as the second largest source of emissions. Manure storage accounts about 10% of the total GHG from livestock rearing and remaining 6%is contributed by the processing and transportation of animal products. Apart from this livestock contribute also 80% of all agricultural non-CO_2 emissions which makes them responsible for about 12% of all anthropogenic greenhouse gas (GHG) emissions.

Causes of increase in GHG through livestock rearing:

1. **Enteric fermentation by livestock:** Enteric fermentation is a natural part of the digestive process of ruminants where bacteria, protozoa, and fungi contain in the fore-stomach of the animal (rumen), ferment and break down the plant biomass eaten by the animal. Livestock farming contribute to 44% of the global anthropogenic CH_4 emissions via their normal digestive processes (enteric fermentation) and manure management and in animal production sector, as much as 95–97 % of CH_4 comes from



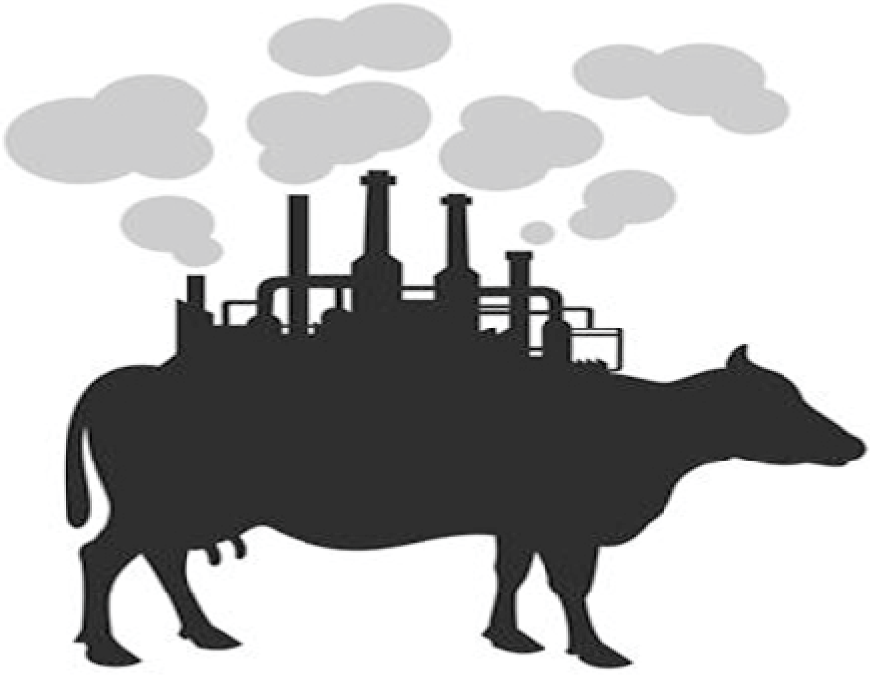
ruminants.During the digestion process of animals, enteric fermentation transforms eaten food into digestible feed. A methane by-product through exhalation is released by enteric. Feed composition and feed consumption can vary enteric fermentation and therefore methane emissions. Feeding high concentrate diet to animals can lead to less methane production compared to the dry feed or roughage. Unfortunately, India is the leading methane producing country in livestock rearing system along with China, Brazil, and the United States. India's leading position in methane emission could be due the its vast livestock population. Small ruminants, buffaloes, pig and poultry contribute about 7 to 10%. If the GHG emissions are estimated on the basis of commodities, beef cattle are the main sources of emissions in the sector with 41%, followed by dairy cattle (20%), pigs (9%), buffalo (8%), poultry (8%) and small ruminants (6%).

2. **Manure storage:** Livestock manure releases $CH_4$and N_2O gas. The decomposition of the organic materials found in manure under anaerobic conditions releases. Pig manure comprises almost half of global manure-related methane emissions. Nationally, China has the highest global manure methane emissions, primarily due to pig manure.Manure produces less CH_4 when handled as a solid (e.g., in stacks or pits) or when deposited on pasture or rangelands than liquid. As methane production increases with the temperature of stored manure, a reduction of storage temperature has been reported to drop these emissions by 30–50%. On the other hand, nitrous oxide emissions need a combination of aerobic and anaerobic conditions to be produced. Nitrous oxide (N_2O) is the third most abundant greenhouse gas in the atmosphere after CO_2 and CH_4. Nitrous oxide is generated through both the nitrification and denitrification processes of the nitrogen contained in manure, which is mainly present in organic form (e.g., proteins) and in inorganic form as ammonium and ammonia. It is estimated that 1.7 million tonnes of manure soil N_2O are released per year. N_2O emissions from applied manure are 40% higher in mixed crop-livestock systems than the N_2O emissions from excreted manure deposited on pasture systems. Industrial production systems have 90% less N_2O emissions than mixed crop-livestock systems. Indirect N_2O emissions from livestock production include emissions from fertilizer use for feed production, emissions from leguminous feed crops, and emissions from aquatic sources following fertilizer application. Due to primarily anaerobic conditions of rice production globally, CH_4 production indirectly associated with animal manure application to irrigated rice fields is considered a significant source of emissions.

3. **Feed production for livestock consumption:** Almost 60% of the global biomass harvested worldwide enters the livestock subsystem as feed or bedding material. Livestock sector contributes markedly to greenhouse gas emissions through the production of nitrogen fertilizers used to grow crops as fodder for livestock.Greenhouse gas emissions from feed production represent 60–80% of the emission coming from eggs, chicken and pork, and 35–45% of the milk and beef sector. Livestock feed consumes nearly 43 % of the food energy (kilocalories) produced by the world's total harvest of edible crops after postharvest losses.Considering the number of fertilizers used, packaging, transport and application in the animal husbandry sector, the manufacturing process of fertilizers contributes more than 40 million tonnes of CO_2 annually. As growth in fertilizer and manure use continues, a 35–60% increase of N_2O emissions (0.9 to 1.1 million tonnes per year of total N_2O-N emissions) is expected by 2030. Even the meat industry is a big contributor in this feed production associated GHG pollution, to produce 1 kg of edible meat by typical industrial methods requires 20 kg of feed for beef, 7.3 kg of feed for pig meat, and 4.5 kg of feed for chicken meat. Apart from the above-mentioned livestock related causes of environmental pollution there are other causes which also create load on the environment, like processing and transportation of animals and their products, land use change for livestock raring which causes deforestation and even soil erosion, on-farm fossil fuel usage, release of CO_2 due to cultivation of soil etc.

Mitigation strategies to reduce greenhouse gases created due to livestock production:

There is no single magic process for reducing the livestock associated pollution, multiple preventive measures need to be applied in single flow to reduce the cause. Mitigation may occur directly by reducing the amount of greenhouse gases emitted, or indirectly through the improvement of production efficiency. Decreasing methane emissions from ruminants is one pressing challenge facing the ruminant production sector, Forage quality and digestibility affect enteric methane production. Lignin content increases during plant growth, consequently reducing plant digestibility. Therefore, harvesting forage (especially grass) for ensiling at an earlier stage of maturity increases its soluble carbohydrate content and reduces lignification. Improving feed digestibility by increasing concentrate is another effective mitigation strategy, reducing methane emissions by 15% per unit of milk adjusted to fat and protein. A one percent increase of dietary fat can decrease enteric methane emissions between 4 to 5%, therefore addition of fats or fatty acids to the diets of ruminants can decrease enteric methane emissions by both decreasing percentage of energy supplied by fermentable carbohydrates; and changes in rumen microbial population. Feed additives (electron receptors, ionophore antibiotics, chemical inhibitors, etc.) have also been tested for their ability to decrease methane emission, increase weight gain and reduce feed intake per metric ton of meat produced by using feed additives can reduce enteric fermentation GHG production from manure of livestock is associated with its storage in aerobic environment for long time, therefore if we reduce the time of manure storage and instead of using aerobic method of storage and shift to anaerobic storage technique like lagoons and tanks the produced methane can be converted into methane. Removing bedding from manure by using a solids separator is a way to reduce the quantity of waste. By removing the solids from manure streams methane emissions are reduced, the time between storage systems cleaning is increased, and crust formation is prevented. Even change in diet of animals can reduce the amount of nitrogen in the faeces, if protein intake is reduced, the nitrogen excreted by animals can also be reduced. Supplements such as tannins are also known to have the potential to reduce emission.To avoid greenhouse gases emission in feed production timing, quantity, and method of fertilizer application is very important factor that influence the soil nitrous oxide emissions. The nitrogen fertilizer applied is susceptible to loss by leaching and de-nitrification before crop uptake. Therefore, ensuring that appropriate amounts of nitrogen get to the growing crop and avoiding application in wet seasons or before major rainfall events. Using organic fertilizers, regular soil testing, using technologically advanced fertilizers, and combining legumes with grasses in pasture areas may decrease GHG emissions in feed production. Intensive rotational grazing systems are being promoted as a good way to increase forage production and reduce nitrous oxide emissions.



Conclusion

Methane emission contribution from Indian livestock is the largest as compared to several other subsectors from agriculture, viz. rice cultivation and open burning of crop leftovers. The biggest biogenic sources of CH4 are enteric fermentation from ruminant animals and rice production. Animal production-related greenhouse gas emissions from the agricultural sector include CH4 emissions from domestic animals, CH4 and N2O emissions from manure and grazed areas, and N2O emissions from soils. In India, there is an urgent need to lower livestock-related GHG emissions. Methane emissions are influenced by animal feed composition and the ratio of various feeds, including soluble residue, hemicellulose, and cellulose content.Reduced feed input per unit of output strategies are the most efficient means of reducing methane emissions from livestock. Application of fermented manures like biogas slurry in the place of unfermented farmyard manure can help in reducing GHG emissions. Balanced agricultural methods are necessary to be adopted for limiting greenhouse gas emissions at acceptable level.

Article

Mitigating Strategies for Winter Stress in Dairy Animals

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Introduction

Productivity of dairy animals gets compromised with adversity in thermo-neutral zone. Maintaining animals between lower and upper critical temperature of thermo-neutral zone optimizes production. Optimum health and production of dairy animal mandates adequate management. Acclimatization to cold stress thrusts on increase in voluntary food intake, rise in resting metabolic rate, augments metabolic capacity, increase in hair coat thickness, hair length and density, shivering and non-shivering thermogenesis accompanied with adrenal hormonal rush as cold exposure advances.Mitigation of cold stress can be achieved through increasing barn temperature, reducing humidity, ensuring better ventilation, bedding to protect from cold floor, lukewarm water for drinking purpose, hay and concentrate provision for more heat generation and energy balance, dry teats to protect from frostbite, heat lamps, calf jackets and warm blankets. Cows being homo-thermic animals need to maintain a constant temperature of 38 °C. Animals kept within the thermos-neutral zone; need not to expend extra energy to suffice their body temperature. Temperatures below the lower end of this range, the lower critical temperature, result in cold stress in cows. Cold stressed cows increase their metabolic rate and energy expenditure. Scarcity of fodder due to snow covered pasture lands and ill quality fodder also potentiates to cold related stress.

Cold Index

Coldness is denoted by wind chill index and is depicted as:

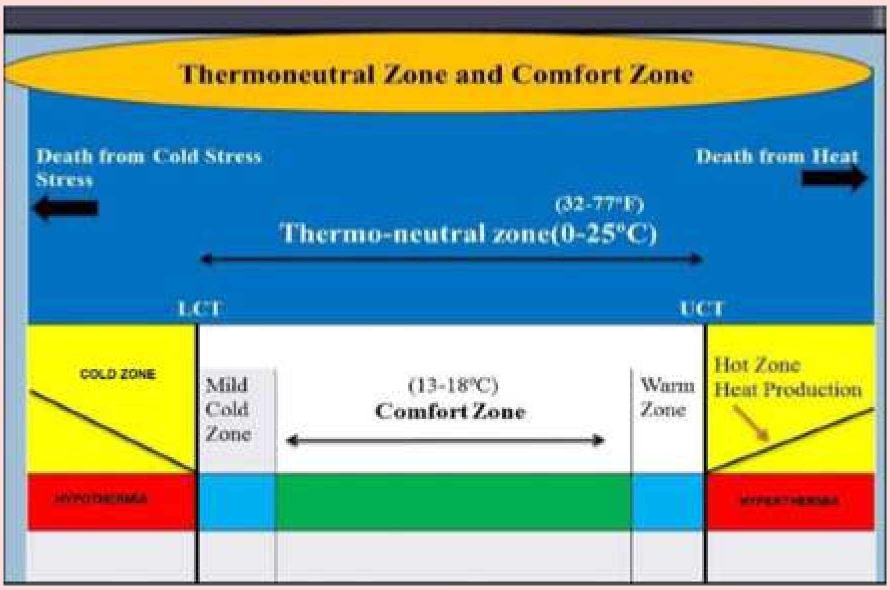
Wind Chill Temperature index= 13.12 + 0.6215 Tair – 13.17V0.16 + 0.3965 TairV0.16

Where, Tair = Temperature of the air; V=Velocity of the air.

For every degree fall in temperature below the LCT, energy requirements increase by 1% and 2% in dry and wet coat animals, respectively.

Effects of winter stress on Dairy Animals

Direct effects: It affects production,



Thermoneutral and comfort zone of dairy animals

Table 1. Upper and lower critical temperatures for dairy animals			
Animal	**Lower Critical Temperature**	**Upper Critical Temperature**	**Comfort Zone**
Cow	-5- -10 °C	25-28 °C	13-18 °C
Buffalo	-10- -15 °C	25 °C	10-17 °C
Calf	0- -4 °C	25 °C	15-22 °C

reproduction, body condition score, feed utilization and health of animal.

(a) Milk production: Cold exposure may directly limit the synthetic capacity of the mammary gland by reducing mammary gland temperature, may act indirectly affecting the udder's blood supply. Temperature of -11.2 ºC resulted in loss of 2 Kg/day/cow.

(b) Reproduction: Increasing age at first calving (AFC), failure of proper follicular development, follicular atresia, loss of sexual desire, decreased pregnancy rates increases calving intervals and decreases fertility of bulls due to underfeeding.

(c) Body Condition Score: Higher body condition score augments cows to insulate against winter stress and cows position themselves to minimize surface area exposed to harsh weather. Body reserves get depleted due to winter stress causing loss of live weights thus reversing weight gains made in summer. Cows losing more body weight (16%) are unlikely to re-conceive during the next breeding season. Winter stress increases cardiac output and body oxygen consumption, increases adrenalin, cortisol and growth hormone levels, increase lipolysis, glyconeogenesis, glycogenolysis, increase hepatic glucose output anddecreases insulin response to aglucose infusion. Starvation and pregnancy toxaemia of animals can also occur due to nutritional deficiency.

(d) Health: Increases incidence of respiratory infections & hypoxia, decreases immune response in ill ventilated barn, increases basal metabolic rate, frost bite, asthma, sore throats, coccidiosis, increases postnatal mortality, also causes hurdling, shivering and lack of coordination.

(e) Effect of winter conditions on feed utilization: Adversely effects feed efficiency-

- Reduces DM digestibility (1.8% for each 10 °C below 20 °C and increases passage rate).
- Increases fecal + Urinary energy.
- Diverting nutrient to heat generation.

Indirect effects: It affects forage production, water quality and quantity, causes shelter over-burden and mud accumulation.

(a) Shelter and Mud accumulation: Need is - Procurement of effective shelter

- Inadequate shelter results in respiratory problems and compromises animal's efficiency
- Excessive shelter is costly

Mud is most commonly found where animals are forced to congregate may result in foot rot and thrush (b) Forage deficiency both in quantity & quality due to:

- Depletion in quality of forage
- Frost, bleaching by the sun, level of CP falls from 8- 11%during summer to 1-3%in winter, TDN falls fromabout 80% to< 60% in succulent forage.
- Depletion in quantity of forage resource due to non-availability of land for forage production and vagaries of climate.

(c) Water Shortage: Depletion of water supplies, less water to drink, water quality goes down, frequency of watering goes down.

Effect of cold stress on animals and animal's response to cold

(a) Innate defense mechanism against cold: Adaptive process resulting in numerous physiological and morphological changes enabling the organism to live in an extreme thermal environment with less thermal discomfort.

(b) Tissue insulation and subcutaneous fat: Vasoconstriction of the superficial tissues of the body reduces the temperature gradient between the skin surface and environment, thereby the heat loss

(c) Hair coat insulation: Entrapped air, which occupies 95% of the volume of the hair coat is responsible for insulation. With increasing coat thickness and hair density insulation of the hair coat increases. Piloerection causes rapid increases in hair coat insulation.

(d) Air insulation: Thin film of still air adhering to the body surface causes air insulation.

(e) Increase in heat production: The rise in heat production below the Lower Critical temperature occurs approximately linearly with depression in temperature. Summit metabolism gets arrived where no further rise in heat production occurs. Increased feed intake, increased muscular activity, increased heat increment and shivering thermogenesis can cause extra heat generation.

(f) Non shivering thermogenesis: Brown fat in the neck and between the shoulders causes heat generate in animals or neonates that do not shiver. Hormones (Conversion of T4 to T3 inside brown fat cells; T3 increases cellular metabolic rate triggering mitochondria to speed up their metabolic process and generates heat instead of ATP.

Body heat is maintained by signaling the mitochondria to allow protons to run back along the gradient without producing ATP by an uncoupling protein 1 (thermogenin).

Strategies to manage winter stress

1. Nutrition Management

- Increase the energy content (77% vs. 70 -72% TDN) and protein (17.5% vs. 14.5% CP).
- Rations containing about 20% vs. 17% fiber in the animal feed are helpful to increase fat percentage in milk & reduce the effects of cold temperatures.
- Animals outdoors will require about 15 to 20% more feed for the season than animals kept in confinement housing.

2. Winter Provisions

- Concentrates: Feed Blocks, UMMB Licks, Cubes, Meals and cakes.
- Conserved Forage: Hay, Silage, Haylage, Leaf meal, etc.
- Crop residues: Stover, Straw etc.
- Cultivated fodders: Paddy, Oat, Maize, Berseem, Leucerne, Turnip, etc.
- Fodder tree leaves: Willow, Robinia, Alanthus, Callyandra, Sesbania, Salix Populus, Ulmus and Acacia, Moras and Malus.
- Aquatic vegetation: Typhaangustata, Phragmiteselephantoides, Nympheatetragona.
- Establishment of fodder banks: Surplus forages during summer is harvested and conserved or transported from nearby states to meet the periodic unavailability.
- Reduction of wastages by chaffing: 15-20% of the straw can be conserved from wastage by chaffing.
- Apple pomace: The dried apple pomace contains 7.7% crude protein (CP) &1.86 Mcal (ME)/kg DM. The ensiled apple pomace shows best feed conversion ratios at 15%incorporation in the diet.
- Maize grain, molasses and chicken littercan be used for supplementary feeding of cows or growing stock.
- Urea treatment of straws: Fertilizer grade urea @ 4-5% increases the digestibility by about five units, whereas, if it is ensiled for 10 days, the increases digestibility is twice this. Cows fed urea treated wheat straw-based diet got higher live weight gain than cows fed hay-based diet.

3. Shelter Management:

3. Shelter Management: Proper sheds should be provided to prevent from the prevailing chilly winds.

- Provision of heating facilities like room heaters, provision of curtains.
- Bedding (4-6 inches in large animals and 2 inches for smaller animals) should be clean and dry on concrete floor to reduce body heat loss.
- Shed should be cleaned at least twice in a day for proper disposal of wastes and minimum piling up of ammonia gases.
- Ventilation should be appropriate & draft free; relative humidity in the range of 40 to 80% is ideal.
- Calf jackets and blankets are also helpful to keep calves warm.
- Snow creates serious feeding and bedding issues and a snow removal plan needs to be developed.
- Strategy to move calving season too late in spring/ early summer, preventing cows to spend late lactation in cold months.

4. Water Management:

Water consumption is encouraged when water temperature is 47°F or above, tank heaters should be used to prevent water sources from freezing, ensuring adequate water intake encourages optimal health and performance.

5. Mud Management:

Providing adequate resting time is an important aspect of dairy management, both for production and welfare. Dairy cows in confinement should lie down for approximately 12 hours/day, however, if facilities are not sufficiently clean or comfortable, cows will often remain standing.

Mud is most commonly found where animals are forced to congregate results in foot rot and thrush, wetness of mud can make parasite survival more likely as well.

- Suggestions may include the development of geo textiles, gravel, tile, gutters, sand or woodchips.

6. Health Management

- Vaccinations, nutritional supplementation and deworming protocols should be followed.
- Encourage exercise by varying the location of feeding and watering sites.
- Exercise will help prevent obesity and overgrown hooves.
- Prevent wet, muddy conditions and contamination of feed by manure as it will increase the threat of coccidiosis.
- A teat dip powder will reduce risk of frost-bitten teats during cold winter.
- Check bruises on soles, trim overgrown hooves and prevent laminitis and lameness.

Conclusion

Animals show optimum performance in their production and reproductive traits with in the thermoneutral zone. The condition above upper critical temperature and below lower critical temperature, animal's performance gets compromised. To mitigate this ill effect the management in terms of nutrition, shelter, watering, mud accumulation, health, etc. are emphasized, to prevent the cold stress related abnormalities; also calving season is deferred to late spring /early summer.

Methane Emission From Livestock and its Mitigation Strategies

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India is the third-largest greenhouse gases emitter in the worldwith a total share of 6.76%,As per to 20th Livestock Census, India had the most livestock population in the world, numbering 535.78 million and this releases a significant amount of methane, a gas with a warming potential 20 times greater than that of carbon dioxide. India is thought to have the world's largest livestock population, which produces methane, which can considerably increase global temperatures. India's emissions of methane from livestock currently stands at about 13% of global emissions from livestock. According to reports livestock accounts for 78% of India's total 24 million tonnes of methane emissions. With an annual global contribution of 14.5%, the livestock sector is a significant source of anthropogenic (caused by humans) methane emission. According to estimates, over a 20-year period, the Indian livestock industry could increase surface temperatures by up to 0.69 millikelvin, or about 14% of the total increase brought on by the livestock industry worldwide. The impact on climate change is global in result, so the negative impact due to livestock emission is not restricted to India. Methane emissions can be reduced by using better livestock rearing techniques, such as using the right feed types and increasing livestock productivity.Methane levels in the atmosphere are mostly influenced by the growth of the livestock population. However, lowering methane levels may be possible through improved livestock productivity, population stabilization, better feed, and manure use.

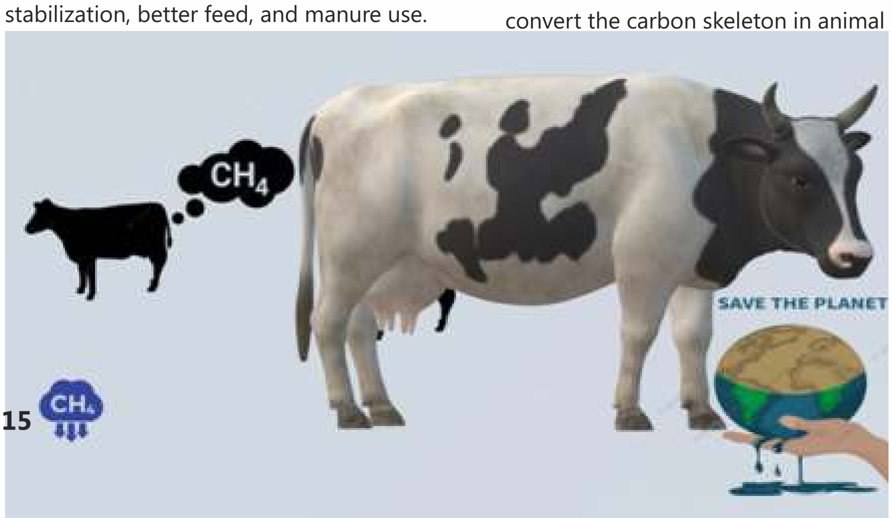
Methane emissions in the context of India are concerning because two major sources, livestock and paddy fields, are expanding quickly. Both sources have ties to the food and economic security of India.

Sources of Methane Emission

Comparing other agricultural subsectors, such as rice cultivation and open burning of crop residue, Indian livestock contributes the most methane emissions. The production of rice and enteric fermentation in ruminant animals are the two main biogenic sources of CH4. Animal production-related greenhouse gas emissions from the agricultural sector include CH4 emissions from domestic animals directly, CH4 and N2O emissions from manure and grazed lands, and N2O emissions from soils. In India, there is an urgent need to lower livestock-related GHG emissions. Methane emissions are influenced by animal diet composition and the ratio of various feeds, including soluble residue, hemicellulose, and cellulose content.GHG emissions from animals come from two sources:

(a) During digestion: In herbivores, methane is created as a by-product of "enteric fermentation," an enzymatic digestion process developed by symbiotic microorganisms living in the rumen media and used to break down carbohydrates into simple molecules for bloodstream absorption.

(b) From animal waste: Organic substances like proteins and carbohydrates can be found in animal excrement. Anaerobic bacteria convert the carbon skeleton in animal



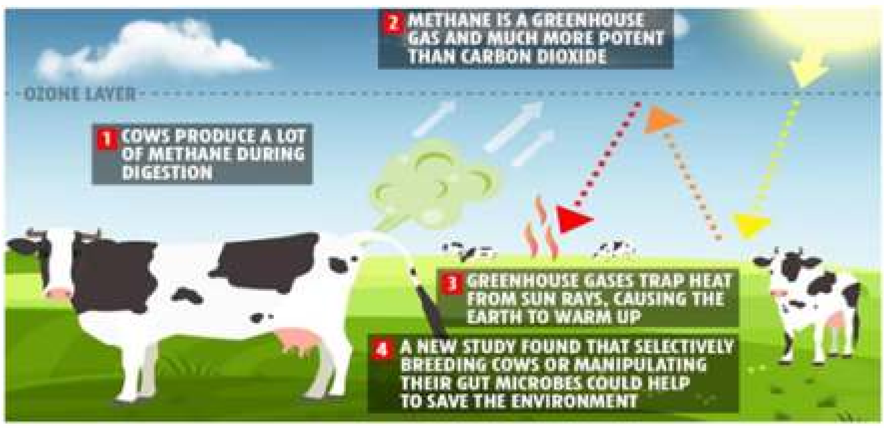
manure to methane during the process of decomposition in damp, oxygen-free settings. Nitrogen can also be found in animal excrement in the form of a number of complicated molecules. Animal waste is subjected to microbial nitrification and denitrification processes, which produce nitrous oxide that is released into the atmosphere.Due to the large population of livestock in India, even though the emission rate per animal is much lower than in developed nations, the total annual CH4 emission from enteric fermentation and animal wastes is approximately 9–10 Tg.

Mitigation Strategies for Methane Emission

- The management of India's cattle population may become challenging under the current governmental framework. The sacred cow policy in India prohibits the slaughter of cows. "The government may consider this issue from an economic and ecological perspective in addition to an ideological one.
- By increasing the productivity of its livestock, which would lead to a decrease in the number of animals raised, India could partially reduce its methane emissions from animal husbandry. India should address this issue without using techniques that have proven problematic in Western nations, such as the excessive use of antibiotics and hormones. "Even without such interventions, there is ample scope to improve milk yields through selective breeding and balanced feed," says the World Health Organization. India's milk yields continue to be about five times lower than the best-performing nations, like the USA.
- The National Livestock Mission, which includes, among other things, Breed Improvement and Balanced Rationing, is being carried out by the Department of Animal Husbandry and Dairy. Methane emissions from livestock can be decreased by feeding them premium-quality balanced rations.
- Reduced feed intake per unit of output methods are the most efficient means of reducing methane emissions from cattle. GHG emissions can be decreased by using fermented manures like biogas slurry in place of unfermented farmyard manure. To keep greenhouse gas emissions at the desired level, balanced farming methods must be implemented.
- Methane emissions could be decreased via ruminant cattle population reduction, breeding controls, and waste management. The most efficient method for reducing methane emissions is to decrease the number of ruminant animals. Increased cattle production might make it possible to use fewer animals to produce an equivalent amount of output while producing enteric methane at a lower rate. Some breeding management techniques that could be utilised to limit methanogenesis include genetic selection and breeding of low methane emitters. Additionally, manure management practises like shortening the duration of manure storage and assisting anaerobic digesters may greatly reduce CH4 emissions.
- The most promising method for reducing methane emissions from cattle is to increase the productivity and efficiency of livestock production through enhanced nutrition. enhancing pastures, processing feed, adding more concentrates to the ration, etc. By increasing concentrates in ruminant feeds, the roughage concentrate ratio can be changed, lowering methane emissions. However, increasing concentrates increases the formation of lactic acid, which may result in ruminal acidosis. Increasing the quality of the pasture is another efficient method for lowering enteric methane emissions. Leguminous forages increase digestibility, so mixed pastures like alfalfa-grass pastures have been shown to reduce emissions by 25% compared to grass-only pastures. The same goes for feed processing methods like ensilaging, chaffing, and grinding, which have been shown to reduce emissions by 10%.

Conclusion

Climate change poses a serious danger to the viability of the livestock production system, where mitigation and adaptation measures are crucial for lowering livestock-related GHG emissions. In addition to helping to meet international obligations, reducing enteric methane emissions in ruminants will also improve animal performance and the effectiveness of energy use. If we want to maintain livestock production in the face of changing climatic conditions, both these mitigation and adaptation strategies must work together. Any attempt to lessen the effects of climate change must adopt a multidisciplinary strategy, bringing in fields like housing, health, and animal nutrition. The uncertainties surrounding the nature and scope of the impact on the output level should likely be addressed soon away so that government officials and policymakers can develop the necessary measures. Significant research and development are required to boost the accessibility and affordability of efficient mitigation methods. Therefore, to adapt to the scenario of a changing climate, further study on appropriate breeding programs, utilisation of the genetic potential of native breeds, genetic conflict between adaptation and production traits, and simulation models are warranted. India today unquestionably leads the world in milk production. It is already the biggest producer and will continue to outpace its rivals in the years to come. However, from the perspective of climate change, this growth cannot and should not avoid scrutiny. Animal husbandry is the foundation of milk production, and raising cattle, buffalos, and goats is a significant source of the extremely potent greenhouse gas methane.



Article

Role of Livestock Farming in Methane Emission and Mitigation Strategies to Abate The Livestock Driven Methane Emission

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Introduction

Methane is the second most abundant greenhouse gas after carbon dioxide and its impact is short-lived but has far greater heat trapping capacity than CO2. It's concentration in the atmosphere is currently increasing at a rate of around 1% per year. Methane is produced both naturally and through human activities. In the natural world, methane is produced when organic matter decomposes in an area with little or no oxygen, like an undersea environment or a marsh. According to studies, wetlands like the Amazon River basin are the single biggest natural source of methane emissions. Human emissions of methane have increased its concentration in the atmosphere, contributing to global warming.

Human emissions of methane, primarily from agriculture, waste, and the production and consumption of fossil fuels.Enteric fermentation in livestock, releases methane. Paddy cultivation is another key source of methane. Fossil fuel production and consumption accounts for 35% of human-caused emissions, waste 20% and agriculture 40%, per UNEP. According to Climate Watch, India is currently the world's fourth greatest methane emitter, trailing only China, the United States, and Russia. In Glasgow, 103 countries signed the pact, which aims for a 30% reduction in methane emissions from 2020 levels by 2030. However, three of the four largest methane emitters, India, China, and Russia, did not join the agreement. Since, me than effectively absorbs heat from the sun, more so than carbon dioxide, and contributes significantly to the

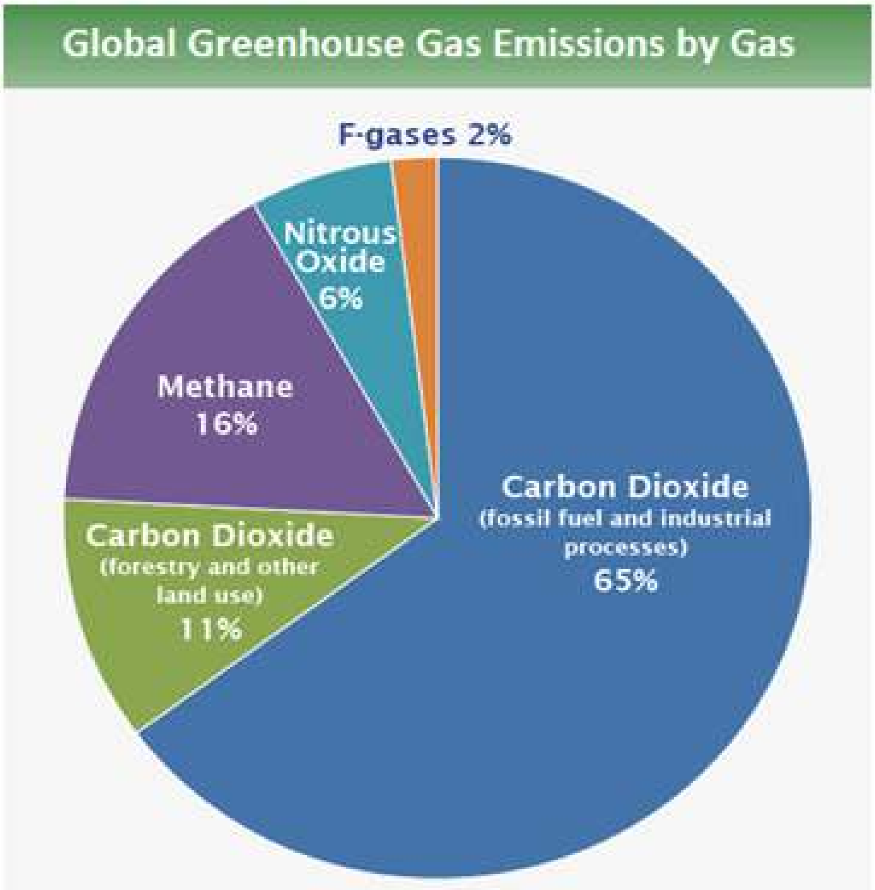

Fig. a. Percentage share of global greenhouse gases warming of the atmosphere. As a result, there is a growing demand to track and regulate methane emissions.

Role of livestock farming in methane emission in India

India's total Livestock population is 535.78 million in the country showing an increase of 4.6% over Livestock Census2012. The Female Cattle (Cows population) is 145.12 million, increased by 18.0% over the previous census (2012). Methane emissions are bound to keep rising with the growth of the livestock sector. In the past 50 years, the world's production of meat, dairy, and poultry has increased by four times.Studies show that 63% of India's agricultural methane emissions come from livestock.CH4 is primarily produced in the rumen chamber of ruminant's stomach during the microbial fermentation of the animal feeds, particularly complex carbohydrate.

The microbial fermentation is a multistep process which converts dietary polysaccharides into volatile fatty acids (VFA). These VFAs are used as a source of energy. During the process, metabolic hydrogen (H) is produced as a byproduct and converted into the molecular hydrogen (H2), which further converted into CH4 with the help of methanogens. A small amount of CH4 is also produced in the intestine. Ruminants such as cattle, buffalo, sheep, and goats have higher CH4 emissions per head, while emissions from non-ruminants (horses, poultry) are comparatively less. The mechanism of methane emission from livestock is shown in figure b.The management of India's cattle population may become challenging under the current governmental framework. The sacred cow policy in India forbids the slaughter of cows.

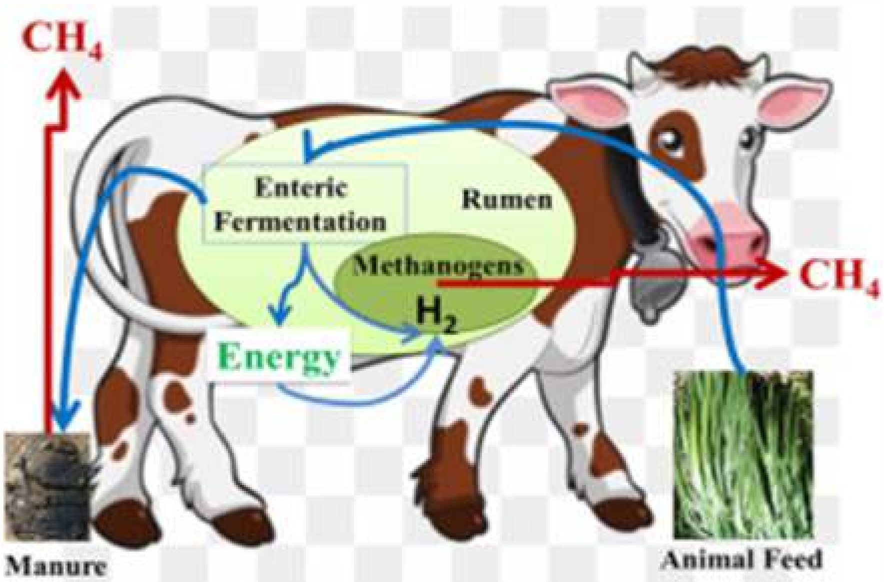

Fig.b. Livestock sector which source of 63% of India's agricultural methane emissions

Mitigation strategies for livestock driven methane emission

Reducing the methane emission from livestock farming can be accomplished by putting the following measures into exercise. Reducing CH4 emission strategies targeted on emission reduction by the following ways (i) dietary manipulation, (ii) breeding management, and (iii) livestock management.

1. Practice of balance feeding through dietary manipulation

a. Feed management is an essential strategy for the mitigation of CH4 from ruminants. Both the quantity and quality of the ingested feed regulate the extent of CH4 production and emission. The utilization of higher digestibility forages is an efficient way for CH4 mitigation. Use of highly digestible fodder like legume, silage in the ruminant diet reduces the enteric fermentation and manure production, and thereby reduce CH4 emissions.

b. The use of a starch-rich diet (corn silage) is useful for the reduction of CH4 production and thereby emission. It produces more propionate than acetate which ultimately reduces the activity of methanogens. Due to the reduction of the fermentable substrate, reduces H2 production and hence, CH4 emissions.

c. The inclusion of concentrate in ruminants (lipid-rich oils cakes and starch-rich cereal grains) diets can also reduce CH4 emission; however, the use of concentrate may cause poor economies due to higher costs. Besides this, the various chemical modifiers (plant extracts and secondary metabolite) play a vital role in methane mitigation from the livestock.

d. The residual feed intake (RFI) approach is another important measure of methane mitigation from livestock.

2. Selective breeding strategy for livestock and forage

a. The policy of selective breeding and the culling of unproductive animals will unquestionably boost animal productivity and reduce the overall bovine population, lowering methane emissions from the livestock industry as a whole.

b. Through genetic improvement CH4 emissions per kilogram of the product can be reduced by three ways (i) improving animal production and efficiency, (ii) wastage reduction in the farming system, and (iii) directly selection on emissions on the basis of heritable traits which is responsible for emissions.

c. Through selective breeding and a balanced diet, there is plenty of room to increase milk output. Researchers believe that India could partially reduce its methane emissions from animal husbandry by increasing the productivity of its livestock, which would in turn reduce the number of animals reared.

d. Selective breeding of forage provides essential improvements in environmental impacts associated with livestock productivity. Hence, improvement in type and quality in animal feed through internal changes such as forage breeding can significantly reduce animal-based GHGs emissions and also improve animal performance.

3. Livestock management practices

a. To reduce GHGs from livestock comes through livestock management practices focus on reducing and maintaining herd size and improving production efficiency. Management practices are suggested as the best mitigation measures because it is directly related to the reduction in the size of livestock. Improving the reproductive performance of cows leads to fewer replacement heifers which help in the reduction of CH4 production. Selection of high yielding variety animal help in for GHGs emissions reduction.

b. Mixed livestock farming provides opportunities to achieve sustainability using the assets of crop and livestock farming systems. The proper management of herd size plays a vital role in methane mitigation. The small numbers of high yielding animals emit less CH4 than farming a large number of low yielding animals. Therefore, farming small but high yielding group of livestock through genetic and nutritional management practices is important.

c. Poor health and less fertility of animals are also responsible for higher emissions per unit of product. Improving fertility in an animal can significantly reduce CH4 emissions. Proper management at breeding, fertility, and health level, genomic selection, selective breeding will improve productivity and reduce emissions. Increasing animal productivity can be a successful strategy for mitigating GHG emissions from ruminant in the developing countries.

d. Selection of those animals with specific genotype having high productivity also having less environmental impact. Poor fertility required a large number of animals in herd size to meet demand and hence more GHGs emission. However, pressure on increasing the productivity of animals may lead to a negative impact on animal health due to increased metabolic demand.

e. Thus, animal genetics strategies could reduce GHGs emission but it also requires proper management to reduce the animal health risk. In the case of meat producing animals, with improved efficiency, slaughter weight can be achieved at a young age and, lifetime will reduce which ultimately reduce CH4 emissions per animal.

f. The vaccination in the ruminant animal against methanogen bacteria could be another approach for CH4 emissions mitigation. Bovicin has rumen modification properties and can inhibit CH4 production by up to 53%. 3-Nitrooxypropanol (3NOP) and ethyl-3NOP have specific anti-methanogenic properties. Feeding of 3NOP could reduce CH4 emission by 60% per kg of DM intake if the NOP dose rate is 2.5 g day-1 cow-1.

g. Farmers are offered incentives for recovering cattle manure for use in the production of bioenergy through the Galvanizing Organic Bio-Agro Resources (Gobar-Dhan) plan, which was introduced in 2018, and the New National Biogas and Organic Manure Programme, which went into effect in 2017. Since 2014, the National Livestock Mission has included balanced diets for cattle feeding, which "may assist minimize methane emissions from livestock."

Conclusion and recommendations:

These are followings: -

1. Livestock farming is a significant source of livelihood and economy but also responsible for a major amount of GHGs emissions.
2. Thus, livestock farming should be practicedwith minimal GHG emissions without reducing productivity.
3. Diet management, livestock management, and breeding management are the most common approach for livestock CH4 mitigation.
4. Dietary manipulation, being one of the important strategies for CH4 mitigation, is mostly possible on the condition that the livestock is reared in an intensive system.
5. Herd size management, grassland, and pasture management, an increase in productivity, improving animal health are some of the mitigation measures under the livestock management program.
6. Mixed crop-livestock farming is also one of the important mitigation measures in livestock management to sustainable livestock farming.
7. Genomic selection of less emitting animals is also one of the approaches for mitigation purposes.
8. Among the three approaches, dietary manipulation is a short-term approach While livestock management and breeding management are long terms.

Dairy Cows In Intensive Systems - Environmental Concerns



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Introduction

As per DAHD annual report 2021,India has an estimated milk production of 198.44 million tonnesduring 2019-20 with growth of 5.69 % compared to previous year (DAHD annual report 2021).Livestock contributes to climate change through emission of methane, nitrous oxide and carbon dioxide and land use changes. Livestock contributes greenhouse gas emissions around 7.1 Gt CO2e per year (FAO, 2006) which is around 14.5% of the world's greenhouse gas emissions. Greenhouse gasemissions from dairy production systems account for 2.13 Gt of CO2e per year which is 30% of the emissions from livestock (Gerber et al., 2013). Research shows there is widegap in intensive and extensive dairy system in terms of its GHG emission due to difference in the enteric methane, and nitrous oxide emissions from the dung of animal.

Dairy farming systems

With respect to dairy farming there are three different farming systems:

- **Intensive-** In intensive farming system, farmers bring and provide water and chopped or cut grass to their cattle in a paddock.
- **Semi-intensive-** Cattle of semi-intensive farming get their feed by themselves from pastureland in morning and are stallfed during rest of the day.
- **Extensive-** Cattle of this farming graze freely on pasture land, and they do not need extra feed in general condition. Animals are tied only in harsh condition.

In free-range systems, livestock may over graze land, resulting in decertification, and pollution of water sources. Intensive farming systems can cause problems due to manure management, including: pollution, insect, dust, and odour. Overgrazing, with eventual soil erosion, habitat degradation and decertification, is cited frequently as an ecological problem throughout the world.

Environmental impact of dairy farm intensification

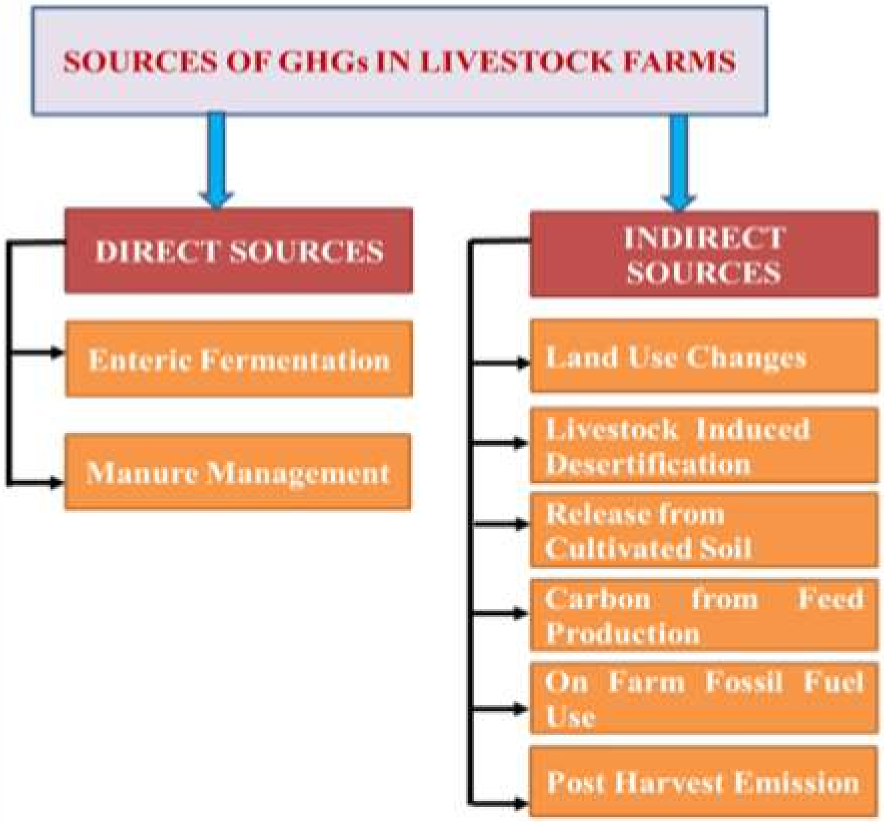
To meet growing demands of milk and milk based products for human consumption, there have been efforts of intensification of dairy farming systems. However, with large scale intensification of dairy cattle production system, environmental side-effects became visible.

Animal manure is an environmental hazard due to its high concentration of nitrate, phosphate, potassium and ammonia. NH3 contributes to eutrophication and acidification when redeposited. This eventually results in

Scientific studies on different dairy farming condition and their impact on the environment

Farm	Observation	Reference
Organic, free range and conventional	Climate change, acidification and eutrophication have lower values in free-range and organic systems, compared to conventional system	Haas et al.,2001
Organic and conventional	Organic-lower energy use and eutrophication potential. Acidification potential and global warming potential were similar for both systems	Thomassenet al., 2008
Intensive dairy farm (New Zealand)	Intensification reduced dairy farm eco-efficiency	Basset-Menset al., 2009
Alpine dairy farms	Best environmental performances by farms having low	Penatiet al., 2011

Greenhouse gas emissions from the livestock source		
Emissions	**Estimates**	**Reference**
Enteric CH4emission estimate	14.3 Tg/year for the year 2010	Patra , 2014
Enteric CH4emission prediction	15.8 Tg/year and 18.8 Tg/year by 2025 and 2050 respectively	
Total enteric CH4emission from Indian livestock	10.50Tg/year (buffaloes contribute 4.58 Tg/year)	Mohini and Singhal, 2010
Total CH4 emissions from dung	0.126 Gg /year	
Total N2O emissions from livestock dung	0.078 Gg /year	



leaching of nitrate and phosphate contribute to nutrient water enrichment; contributed to declining ecological quality of water.

The most important GHGs that are emitted from dairy supply chain are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O) and to a lesser extent hydrofluorocarbons (HFCs).

The greenhouse gas emissions from livestock are mostly on farm (72%) and off farm emissions (28 %) are less comparatively. The on-farm sources of emissions included: Cow - 25% as enteric CH_4

- Manure - 24% as CH_4 and N_2O
- Field - 19% as N_2O and CO_2
- Farm energy - 4% as CO_2

To plan for reducing harmful effect on environment, we must first know the negative impact. Environmental impact of dairy cattle production systems can be assessed by indicators derived from

- Input-Output Accounting (IOA) - process oriented on-farm method frequently used to assess nutrient surpluses of agricultural production systems
- Ecological Foot Print analysis (EFP)- the amount of resources consumed
- Life Cycle Assessment (LCA)

EFP and LCA are life cycle based methods. Life cycle based methods evaluate global emissions and impacts from the entire production chain (life cycle), in relation to types and amounts of products produced. LCA indicators appeared to be most effective, because of their high relevance, good quality and the fact that they focus on more than one environmental aspect and take into account pollutants throughout the production chain.

Strategies to reduce the environmental burden

- Ration Balancing approach can provide promising results in reducing enteric methane emission from cows and buffaloes
- Increasing the quality of feed, especially roughage, can reduce enteric CH_4 production
- Optimizing protein feeding can result in reduction of nitrogen emission
- Elimination of non-milking animals could also reduce emissions
- Higher recycling of manures and better integration of livestock in farming systems can lead to reductions in chemical fertilisers and reductions in losses from nitrogen and phosphorus.
- Monitoring of various hotspots can help reduce the negative environment impact

Conclusion

The environmentalimpact of livestock is one of the main constraints to the development of livestock sector; vary with the system of dairy farming since intensification increases the environmental load per unit area. So, it is better to optimize the level of production and reduce the environmental impact by feeding animals on the mixture of extensive and intensive systems. High yielding animals or animals with higher growth rate cannot be sustained on the extensive system alone. GHGs emitted from the dairy production are carbon dioxide, methane, nitrous oxideand to a lesser extent hydrofluorocarbons (HFCs) ; 72% are on farm.

Goat Milk: Medicinal and Nutritional Aspects

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Abstract

No doubt bovine generates the majority of the world's milk, particularly in industrialized nations. However, caprine milk is consumed by more people globally than milk from any other species. Since cow milk is scarce, goat milk and its byproducts are crucial daily food sources of calcium, phosphorus, and protein for people in underdeveloped nations. Goat and cow milk are significantly more in protein and ash than human milk, but less in lactose. Goat milk has the special metabolic capacity to treat malabsorption in patients. In some countries, there has been a significant increase in demand for healthy foods, which has sparked curiosity in milch caprine and its products. Infants and anyone allergic to cow milk can be benefited greatly from goat milk. Such distinctive qualities of goat milk can be helpful in ensuring the future viability of the dairy goat sector.

Introduction

India is a ranker country in caprine milk production, justifying for 29% of total production, (Panchalet al., 2020).Caprine are an essential part of the livestock business due to their capacity to survive in several conditions, making them ideal for landless and marginal farmers. Goats provide a substantial contribution to the supply of milk, its products, as well as to the rural economy and health. In terms of global milk output from various species, goats are ranked third. About 2% of the world's total annual milk supply is produced by goats. Their global contribution to nutritional and economic well-being, on the other hand, is enormous. More people drink goat milk than any other single species. Goat milk has more protein and fat digestibility, alkalinity, buffering capacity, and some therapeutic qualities in medicine and human nutrition than cow or human milk. Enhanced digestion, gastrointestinal function and gut microbiological population, better absorption of minerals, desired food consumption, lesser risk of allergy are observed up on consumption of goat milk (Prosser, 2021). In underdeveloped nations, caprine milk along with their products accommodates vital daily food supply of protein, phosphate, and calcium due to a scarcity of cow milk. Increasing interest in dairy caprine and its milk commodities has stemmed from the recent growing demand of healthy foods worldwide. Caprine and bovine milk have a great extent of protein and ash, but lesser extent of lactose as compared to human milk. Goat milk has fewer fat globules and more short and medium chain fatty acids as compared to cow milk, giving it a metabolic advantage in providing energy to developing youngsters and treating malabsorption (Park et al., 2007; Li et al., 2020). The advance trend of healthy food demand in various nations includes interest in goat milk and its products. Goat milk is also essential for babies and people who are allergic to cow milk. The dairy goat industry's sustainability is aided by the special qualities of goat milk. Caprine milk and its products are said to have a high level of consumer satisfaction. Rather than this, goats have been mostly neglected in research point of view. To have this greater advantage, goats must now be completely utilized, not only for meat, milk, and milk products but also for the remedial properties.

Nutrient configuration of Goat Milk

Caprine milk has an average total solids content of 12.2 percent, with 3.8 percent fat, 3.5 percent protein, 4.1 percent lactose, and 0.8 percent ash (Table 1). It has more fat, protein, and ash than cow milk, but low in lactose. Goat milk has a lower total casein content but a larger non-protein nitrogen content than cow milk. Goat and cow milk have 3 to 4 times the protein and ash content of human milk. Goat, cow, and human

Table 1. Milk contents of Goat and Cow Milk		
Contents	**Goat**	**Cow**
Proteins (%)	3.5	3.3
Total casein (g/100 ml)	2.11	2.70
αs1 (% of total casein)	5.6	38.0
αs2 (% of total casein)	19.2	12.0
β (% of total casein)	54.8	36.0
κ (% of total casein)	20.4	14.0
Whey protein (%)	0.6	0.6
Nonprotein N (%)	0.4	0.2
Lactoferrin (μg/ml)	20-200	20-200
Transferrin (μg/ml)	20-200	20-200
Prolactin (μg/ml)	44	50
IgA (milk: μg/ml)	30-80	140
IgA (colostrum: mg/ml)	0.9-2.4	3.9
IgM (milk: μg/ml)	10-40	50
IgM (colostrum: mg/ml)	1.6-5.2	4.2
IgG (milk: μg/ml)	100-400	590
IgG (colostrum:mg/ml)	50-60	47.6

milks have equal total solids and calorie contents. Smaller fat globules permit for best lipid dispersion and homogeneity in caprine milk, which gives a higher surface area of fat for enhanced digestion by lipases. Caprine milk fat comprises 97-99 % free lipids (about 97 % of which are triglycerides) and 1-3 % bound lipids (about 47 % neutral and 53 % polar lipids).

In goat milk, there are five main proteins: s2-casein (s2-CN), -casein (-CN), -casein (-CN), -lactoglobulin (-Lg), and lactalbumin (La). In goat milk, s2-casein is the most common casein component, but in cow milk, s1-casein is the most common (Montalbano et al., 2016). The disparity in amino acid composition across goat milk casein parts are substantially higher than those between species (goat versus cow).

Goat milk has roughly 134 milligrams of Ca and 141 milligrams of P per 100 g (Table 1). Only ¼ th to 1/6 th of Ca and P are found in human milk. Caprine milk has more Ca, P, K, Mg, and Cl than cow milk and merelyNa and S. Lactose content and the molar total of sodium and potassium amounts in goat and other species' milks have a strong negative connection. Chloride has a positive relationship with potassium and a negative relationship with lactose, but sodium has no relationship with K, Cl, or lactose. Diet, breed, animal, and lactation stage all influence trace mineral concentrations. Goat milk has a higher mineral content than cow milk on average. Goat milk, on the other hand, has a lesser degree of hydration and an inverse association among micelle mineralization and hydration.

Vitamin A levels in goat milk are greater than in cow milk. As caprine have the capability to alter all -carotene in the milk into vitamin A, caprine milk is whiter than cow milk. Goat milk has enough vitamin A and niacin, as well as an abundance of thiamin, riboflavin, and pantothenate. In comparison to cow milk, goat milk is lacking in folic acid and vitamin B12. Cow milk contains five times higher vitamin B9 and vitamin B12 than goat milk, and folate is required for hemoglobin formation. Both goat and cow milk are lacking in pyridoxine (B6), as well as ascorbic acid and calciferol, which should be obtained from other sources.

Goat milk contains similar amounts of lactoferrin, transferrin, and prolactin as cow milk. Human milk has a lactoferrin content of greater than 2 mg/mL, which is 10-100 times higher as compared to goat milk (Table 1).

Medicinal Properties of goat milk

Antimicrobial Properties: Milk proteins have been shown to serve as building blocks for antimicrobial peptides. The peptides made from a globular multifunctional protein are the most well-known. Additionally, it possesses antioxidant properties, anti-carcinogenic and anti-inflammatory effects.

Treatment of Cardiovascular Diseases: Medium-chain triglycerides, such as fatty acid esters of caproic, caprylic, and capric pathogenic bacteria, are abundant in caprine milk. Goat milk reduced LDL oxidation and had an anti-atherogenic impact.

Treatment of Gastrointestinal Diseases: Intestinal inflammation seen in Intestinal Bowel disease can be compared to colitis. It has been demonstrated that the oligosaccharides (60 - 350 mg/L in mature milk and 200 - 650 mg/L in colostrum)in goat milk have an anti-inflammatory impact.

Treatment of Cancer, Allergy and Others: Due to its different protein structure, namely its casein micelle components, goat milk is believed to be a significantly less allergic alternative to cow milk by numerous studies and anecdotal evidence. In comparison to cow milk, goat milk has shown to significantly alleviate symptoms of eczema, asthma, and minor digestive issues.

Conclusion

Although caprine milk has an equal composition as like cow milk, the importance of caprine milk and its products in human nutrition and well-being should not be overlooked. This milk furnishes critical elements for human nutrition as well as revenue sources for human's existence in various ecological community across the world. Those with cow milk allergies and other nutritional problems appreciate the contribution of dairy goat products. Proteins, lipids, minerals, vitamins, carnitine, glycerol ethers, enzymes, fat globule size, and casein polymorphisms are only a few of the major ingredients and physical properties in goat milk that are crucial in human diet. It is essential to raise community knowledge about the importance of goat milk for its nutritional and therapeutic properties, to enhance goat breeds in order to boost milk production, and to undertake additional studies and research on goat milk.

Demand of "Area Specific Mineral Mixture" at Current Scenario:

Dr. Kaushlendra Narayan Dwivedi*[1], Dr. Deepak Dhiman[2], Dr. Gopal Jaiswal[3], Hilal Ahmad Bhat[4]

[1]Technical Manager, Carus Laboratories Pvt. Limited, Karnal, Haryana

Introduction

Minerals are the inorganic compounds required for normal body maintenance, growth and reproduction of dairy cattle and buffalo. There are 40 minerals required by the animal body however only 40 minerals are of dietary importance. Minerals that are required in large amounts are called macro minerals (required more than 100mg/kg dry matter) Calcium, Phosphorus, Magnesium, Sulphur etc. Those needed in small amounts are classified as micro minerals (required less than 100mg/kg dry matter) Iron, Iodine, Copper, Cobalt, Zinc, Molybdenum, Selenium etc.The productive and reproductive efficiency of animals is the most important factor in the success of dairy farms. Minerals play a very precious role in maintaining the productive and reproductive health of a dairy herd.Trace elements have critical roles in key interrelated systems of immune function, oxidative metabolism and energy metabolism in ruminants which are directly or indirectly involved in growth, production and reproduction.

India is a country of diversity, easily reflect in our culture,crops, foods& festivals which is due to huge variations in soilmineral composition. If the specific mineral is absent or deficient in a particular soil may create a mineral deficiency in the crop that deficiency transfers into the animal.So needs of hour supplementation of "Area specific mineral mixture" in proper doses to fulfil the demand of minerals requirements as per NDDB guidelines.

Functions of Minerals in animals' performance.

Zinc:

Zinc plays an essential role in the maintenance and repair of the uterine lining after calving and helps in early involution. Abnormal levels of zinc are associated with decreased conception rate, abnormal estrous and abortion. Zn is an important component of various metalloenzymes and an activator of more than 300 enzymes in the animal body (Salim et al., 2012).

Copper

Required for Hemoglobin synthesis and for tissue pigmentation and normal reproductive function.Cu is related to the synthesis and secretion of the hypophysiary hormones, modulating the capacity for the liberation of the luteinizing hormone (LH). Copper regulates the GnRH & helps in ovulation.

Cobalt

Cobalt play'san important role in the synthesis of Vitamin B12. The level of

Glycine Chelated

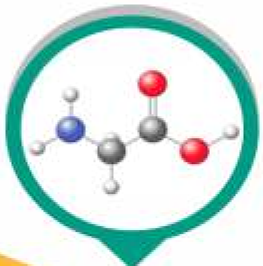
SAMRIDHI™ GOLD

Area specific mineral mixture

With the power of thermostable live yeast, chromium propionate essential amino acids and coated vitamins

Benefits :

- Improve Fertility
- Faster Weight Gain
- Early Puberty
- Higher Milk Yield
- Improve Immunity



Glycine Chelated Technology

National Dairy Development Board

As per *NDDB Guidelines

1 kg. & 5 kg.

Glycine Chelated Minerals Mass (Dalton) 57.05

Self Manufacturing Quality Guaranteed

Usage:

Cow, Buffalo & Horse : 50 gm. per day
Calf, Sheep, Goat & Pig : 25-30 gm. per day
Camel : 100 gm. per day
Or mix 1-2 kg. in 100 kg. feed or as advised by the nutritionist

CARUS
Carus Laboratories Private Limited
(An ISO & FAMI-QS Certified Company)
Plot No. 75, Sector 3, HSIIDC, Karnal-132 001, Haryana (INDIA)
Website : www.caruslab.com | E-mail : info@carus.in
Nutrition Division

Vitamin B12is high in milk and colostrum which is required for the conversion of propionate into glucose and folic acid metabolism. The need of cobalt for thymine synthesis, which is required for DNA synthesis, explains the biological role of cobalt in cell division, growth and reproduction.

Manganese

Mn is involved in energy metabolism, and cartilage formation and is also important in cholesterol synthesis which is very essential for the synthesis of steroids like estrogen and progesterone and testosterone. It is responsible for silent estrus and anestrus.A deficiency of Mn results in poor growth and impaired reproduction, which is characterized by testicular atrophy in males and impaired ovulation in females.

Chromium

Chromium has an improving effect on insulin binding and increases the number of insulin receptors on the cell surface and sensitivity of pancreatic β-cells together with an overall increase of insulin sensitivity thus increase the glucose uptake and utilized in lactose synthesis for milk production.

Selenium

Selenium is an essential trace mineral and plays an important role in various biological reactions like an antioxidant defense by the virtue of the important component of the enzyme glutathione peroxidase and selenoproteins. It is also required for optimum fertility in both males and females, conversion of thyroid hormone into active form and immunomodulation.

Iodine

Necessary for thyroid hormone synthesis that regulates BMR and energy metabolism Reproductive disorder in iodine deficiency due to thyroid gland dysfunction in the dam, embryo or fetus, which in the last two can cause embryonic death, abortion, stillbirth or weak goitrous calves (suttle, 2010).

Calcium

Required for the development and formation of bones & teeth. Helps in the clotting of blood. essential for milk production required for muscle contraction & nerve conduction. Deficiency causes various metabolic diseases like milk fever and retention of the placenta which may leadto metritis.

Magnesium: Important for the integrity of bone and teeth. Involved in protein synthesis and metabolism of carbohydrates and lipids and plays important role in muscle contraction.

Sodium, Potassium and Chloride: All required for the maintenance of osmotic pressure and acid-base equilibrium. Potassium helps in the contraction and relaxation of the heart. Potassium is necessary for protein synthesis.

Conclusion

India is a country of diversity having variable minerals composition in soil, water & fodder.

The use of a single mineral mixture for the whole country is not the right way of mineral supplementation, which may either create deficiency or toxicity to the animal. So it is very necessary to offer Glycine chelated "Area specific mineral mixture'' to overcome the problem of mineral imbalance and boost the animal's reproductive efficiency and productive potential.

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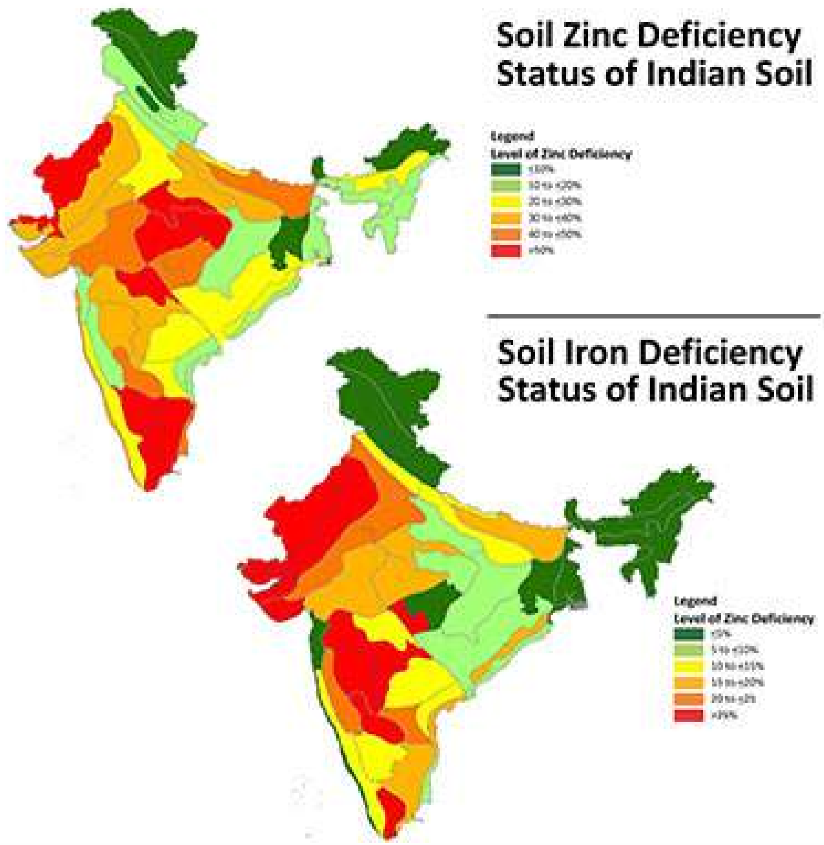

NDDB Appoints Meenesh C Shah as Managing Director

National Dairy Development Board (NDDB) has appointed Meenesh C Shah as its Managing Director with effect from November 15, the government said.

In response to a written question in Rajya Sabha, Union Fisheries, Animal Husbandry, and Dairying Minister Parshottam Rupala stated that the Gujarat-based NDDB will be without a regular chairman beginning in December 2020.

Varsha Joshi, the then-Joint Secretary in the Government of India's Department of Animal Husbandry and Dairying, held the additional charge of Chairman, NDDB, from December 1, 2020 to May 31, 2021. "From June 1, 2021 to November 14, 2022, Meenesh C Shah served as Executive Director, NDDB, and also held the additional charge of Chairman NDDB," the minister stated.

Shah has been appointed as Managing Director (MD) with effect from November 15, 2022, based on a decision made by the NDDB Board.

Shah took over as NDDB's MD on November 15, 2022, and held the additional charge of Chairman until November 30, 2022, according to Rupala. "A proposal has been sent to the nodal department for approval to further extend the additional charge of Chairman, NDDB to Meenesh C Shah for a period of six months with effect from December 1, 2022 or until the regular chairman takes charge," he added.

Meenesh Shah has been functioning as NDDB's MD with effect from November 15, 2022, and was holding the additional charge of Chairman till November 30, 2022

Sabar Dairy: CSR Initiative

Sabar Dairy is also a part of the Amul Family Unions, which conducts numerous social activities for the benefit of their valued employees, from labour to the Managing Director.

Along with that, they are caring for the health of all employees by calling many large renowned hospitals of various branches/expertise and checking all employee health with full awareness of details such as cancers, routine diseases, Covid, and so on.

To achieve this goal, they hold regular Yoga sessions on their premises as well as Bhrma Kumaris organisation sessions, which help in all for refreshment, healing, and reducing stress and negativity from life.

Also, Sabar Dairy is expanding its plant for around 200 crore for the production of cheese and sweets, so they have many labours involved in this work, and the children of their labours are now blooming by its staff members.

Sabar Dairy provides their children with adequate shelter, food, and education, all of which are basic human needs.

SUSHIMA Has Been Awarded with "UTTARAKHAND UTKRISHT UDYAMI AWARD" on 23rd Sept. 2022 by the Honorable Chief Minister of Uttarakhand Mr. Pushkar Singh Dhami

SUSHIMA
An Ethical Vision to Serve Animal World

(as received by our Managing Director M.D. - **Mr. Piyush Goel** and Director – **Mr. Deepak Goel)**

"**Mr. Piyush Goel,** Managing Director of **Sushima Pharmaceuticals**, is a Dynamic First Generation Entrepreneur. He established Sushima Pharma in **1998** in Ghaziabad, Uttar Pradesh. He started Sushima Pharmaceutical Company with only Five Veterinary sales representative and two products only but his leadership quality and dedication made it possible to grow the same to 32 plus brands, 67 SKUs and 400 plus team members till 2022. **Sushima Company also has its own Manufacturing Unit in Pantnagar, Uttarakhand** which is helpful to manufacture one of the best quality products for veterinary industry."

Sushima Pharmaceuticals majorly focuses on giving a healthy and better life to Dairy Animals by providing the **Best Quality Allopathic drug formulations and Excellent Herbal/Feed Supplements** which are quite affordable for the customers. Sushima Pharmaceuticals believes in preparing & launching innovative formulations by looking into the actual need of the Veterinary Industry.

Sushima Pharmaceuticals today is a leading Manufacturing & Marketing Company in Animal Health Industry. Sushima Pharmaceuticals holds a much respected position in Veterinary Fraternity driven by a comprehensive product range & a very dedicated Sales & Marketing team.

Sushima's Core Values

Meerut Kisan Mela

- Sushima pharmaceuticals participited in all India Farmers' Fair & Agro-industrial Exhibition Held at the Sardar Vallabhbhai Patel University of Agriculture & Technology , Meerut from 18 oct- 20 oct 2022. Sushima Company won first prize in the fair for stall activity and farmers knowledge enhancement from state agriculture minister- shri surya pratap shahi.
- At the fair, around 1300 visiters visited the stall out of which 1000 were farmers and 300 were vets & Internship students.
- We disseminated technical knowledge and Products information related to various animal diseases to all dairy farmers so that they can do profitable dairy farming.

Pantnagar Kisan Mela

- Sushima Pharmaceuticals Participited in All India Farmers' Fair & Agro-industrial Exhibition Held at the Govind Ballabh Pant University of Agriculture and Technology , Pantnagar From 17th oct - 20th oct 2022 & Sushima won second prize in the fair for stall activity and farmers knowledge enhancement from Director Extension Education and Mr. Mohan Singh Bisht, MLA, Lalkuan, Uttarakhand
- At the fair, around 1500 visiters visited the stall out of which 1200 were farmers and 300 were vets & Internship students.
- We disseminated technical knowledge and Products information related to various animal diseases to all dairy farmers so that they can do profitable dairy farming .

Jabalpur Conference

- An Important Technical conference with a gathering of 400 plus clinicians of Gynae and Reproduction department was conducted at Jabalpur veterinary college from 16th Nov – 18th Nov 2022 by ISSAR (Indian Society for study of Animal Reproduction).
- Sushima Pharmaceuticals organized its stall in the conference and provided updated information about its products to all the veterinarians present there. It was a huge success for the company.

Lucknow Event

- A huge gathering of 1500 plus field veterinarians was Organized in Gandhi Bagh, Lucknow by U.P Veterinary Association on 18 Nov 2022. In which Sushima pharmaceuticals team members had organized a beautiful stall to discuss & inform to all Vets about the company products.

Dr. Manish Kawatra, G.M. - Sales & Marketing, along with all competent team members of company led the successful participation in all these events.

Press Release

Vet Varsity Conducts Training on Innovations in Dairy Farming and Milk Processing Ludhiana

09 December, 2022

The Directorate of Extension Education along with College of Dairy Science & Technology, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana conducted two days residential training on "Innovations in Dairy Farming and Milk Processing" sponsored by National Bank for Agriculture and Rural Development (NABARD) under the guidance of Dr. Parkash Singh Brar, Director of Extension Education cum Course Director. A total of 17 trainees from five districts of Punjab attended the training at GADVASU.

The experts of the University conducted lectures in order to enhance the knowledge of the trainees with respect to entrepreneurial opportunities in dairy farming and allied sectors as well as regarding the FSSAI (Food Safety and Standard Authority of India) guidelines on milk processing. Hands-on training was provided to evaluate the quality of milk, making of Mozzarella cheese, Milk cake and

Paneer. Special visits of trainees were organized to the Experimental Milk Plant and Integrated Farming System model.

While addressing the trainees, Dr. Parkash Singh Brar motivated them to take up milk processing for maximizing the benefits from dairy farming. He stated that dairy farmers should opt for the value addition of milk so that they can obtain higher returns from the dairy industry. Dr. Y.P.S. Malik, Dean, College of Dairy Science & Technology said that the dairy farmers must look up to the opportunities in dairy processing for maximizing their profits. The training concluded with distribution of certificates and literature to the trainees. The training was coordinated by Dr. Inderpreet Kaur, Dr. Jaswinder Singh and Dr. Amandeep Singh.

DAHD integrates 12 breed improvement institutions at various locations of the country

Department of Animal Husbandry and Dairying has initiated the process for integration of various infrastructures of the department with PM Gati Shakti-National Master Plan (NMP).

As a first step Department of Animal Husbandry and Dairying has integrated its 12 breed improvement institutions (7 central Cattle Breeding Farms, 4 Central Herd Registration Scheme and Central Frozen Semen Production & Training Institute) located at various locations of the country with PM Gati Shakti National Master Plan a digital platform to bring 16 Ministries including Railways and Roadways together for integrated planning and coordinated implementation of infrastructure connectivity projects. This multi-modal connectivity will provide integrated and seamless connectivity for movement of people, goods and services from one mode of transport to another. It will facilitate the last mile connectivity of infrastructure and also reduce travel time.

The integration of other Institutions such as Regional Fodder Stations (RFS), Central Poultry Development Organizations (CPDO) etc with PM Gati Shakthi NMP is under progress. In future this Department is planning to integrate all the veterinary dispensaries, milk processing plants, chilling centres and infrastructure projects under various schemes of this department with PM Gati Shakthi NMP digital platform. This step will facilitate effective management of infrastructures available in the animal husbandry and dairy sector in the country.

Livestock sector is crucial to the Indian economy today, comprising one third of the agriculture and allied sector GVA and having over 8% CAGR. At the same time, Animal Husbandry, Dairying and Fisheries activities play a significant role in generating farmer income, particularly among the landless, small and marginal farmers and women, besides providing cheap and nutritious food to millions of people

Arunachal Releases A Service For Delivery Of Live Vaccines Using Drone Technology

Using drones to deliver livestock vaccines from Kangkong to Paglam in the Lower Dibang Valley district for the first time ever, Arunachal Pradesh on Monday set something of a record for the use of drone technology.

Today in Lower Dibang, the world's first experimental use of drone technology for the distribution of livestock vaccine from Kangkong to Paglam in the Lower Dibang Valley district was completed.

The drone flight covered a 28 km aerial distance in 23 minutes, compared to a 125 km road distance that takes 4 hours to travel.

Amul and the NDDB to provide support to increase milk production in Sri Lanka

India announced on Monday that it will provide assistance to improve the country's dairy industry and milk output in order to reduce Sri Lanka's reliance on imported milk products.

In a statement, Sri Lanka's President Media Division stated that officials from the National Dairy Development Board (NDDB) and the Gujarat Cooperative Milk Marketing Federation (GCMMF), which markets milk under the Amul brand, have taken steps to provide technical assistance for milk production in Sri Lanka.

Sri Lanka's President, Ranil Wickremesinghe, has appointed a panel of public and private players to work with the NDDB's multidisciplinary team to develop long and short-term plans to increase milk production and reduce reliance on milk imports.

"Additional Secretary to the Ministry of Agriculture, Dr. Nimal Samaranayake, Chairman of the National Dairy Development Board, Professor H.W. Cyril and other committee members and officials of the Ministry of Agriculture and line agencies, Indian National Dairy Development Board Senior General Manager Rajesh Onkarnath Gupta, General Manager Sunil Shivprasad Sinha, Senior Manager Rajesh Kumar Sharma and other representatives participated in the discussions," the statement added.

Department of Animal Husbandry implements dairy development schemes to improve milk availability

The Department of Animal Husbandry and Dairying is implementing the following animal husbandry and dairy development schemes to create dairy infrastructure to help improve availability of milk in the country:

i. National Programme for Dairy Development (NPDD)

ii. Dairy Processing and Infrastructure Development Fund (DIDF)

iii. Supporting Dairy Cooperative and Farmer Producer Organisation engaged in dairy activities (SDCFPO).

iv. Animal Husbandry and Infrastructure Development Fund (AHIDF)

v. Rashtriya Gokul Mission (RGM)

Sid's Farm enters the dairy market in Bengaluru

Sid's Farm, a Telangana-based D2C dairy brand, announced its Bengaluru launch on Monday. Their products will be available on Milk Basket, Big Basket, Zepto, SuprDaily, and Fresh to Home e-commerce platforms.

Initially the products, milk and regular use dairy products such as paneer, curd, ghee, and butter will be available only through e-commerce sites. Sid's Farm offers cow and buffalo milk and dairy products separately.

Milk and common dairy products such as paneer, curd, ghee, and butter will initially be available only through e-commerce sites. Sid's Farm sells cow and buffalo milk, as well as dairy products, separately.

Sid's Farm's Founder and MD, Dr. Kishore Indukuri, stated, "It has been a thrilling experience to launch Sid's Farm in Bengaluru and expand our product line beyond Telangana. I am confident that, like our patrons in Hyderabad, we will soon capture the hearts of residents of the garden city."

In announcing the closure of Sid's Farm in Bengaluru, Indukuri stated, "We will begin our venture by serving our superior quality milk and dairy products exclusively through e-commerce sites, and will then expand into niche store partners in Bengaluru. We eventually want to be available to our customers at their doorsteps via our app and our own distribution channel."

Bel expands its portfolio of alternative Dairy products

The Bel Group and Bel Brands USA launched two new alternative dairy options on December 8: Nurishh animal-free cream cheese spread and The Laughing Cow Plant-Based.

Bel developed its Nurishh Incredible Dairy Animal Free Cream Cheese Spread Alternative in collaboration with Berkeley, California-based Perfect Day, which developed a precision-fermented protein for use in animal-free dairy products.

Nurishh is Bel's first dairy alternative brand. Its new animal-free cream cheese is made without the use of cows and contains real dairy proteins. The lactose-free product will be available starting January 1, 2023, in three flavours: Original,

Strawberry, and Chive & Onion. Nurishh cream cheeses will be available for $4.99 at Kroger stores across the United States.

Bel Brands USA's plant-based acceleration director, Florian Decaux, said the company is leveraging new and evolving technologies to make products that meet consumers' needs.

"By expanding our portfolio and entering strategic partnerships, we are able to act on and embrace key insights, live responsibly, and provide delicious food that enables people to lead a good life," Mr. Decaux said.

Cargill India's Global Scholars Program awards scholarships to ten Indian students.

Cargill

Helping the world thrive

Cargill India, in collaboration with the Institute of International Education (IIE), announced the Cargill Global Scholars Program 2020 awardees. The programme provides financial assistance and is designed to promote students with exemplary academic achievements, leadership potential, and studies in food, agriculture, and risk management. This academic year, ten scholarships will be awarded to students from leading science and technology institutions in India, including the Indian Institute of Technology Bombay, Delhi, and Gandhinagar, the National Institute of Technology Tiruchirappalli, the Indian Institute of Science Bengaluru, and the Lady Shri Ram College for Women. Selected students will receive US$2,500 per year for up to two years as part of the two-year scholarship programme.

This year, the programme will take a step forward by welcoming three new reputable institutions: ICAR-National Dairy Research Institute, Karnal for their B.Tech. (Dairy Technology) programme, Punjab Agricultural University, Ludhiana for their B.Tech. (Food Technology) programme, and University of Agricultural Sciences, Bengaluru for their B.Tech (Ag.Engg) and B.Tech (Food Tech) programmes. Students from these institutions will be awarded scholarships next year, which will include financial support as well as opportunities for leadership development through the programme.

"We are committed to talent development by nurturing future leaders, laying the foundation for a better tomorrow," said Raj Karunakaran, HR Head, Cargill India, on the occasion. Cargill Global Scholarship Program assists Cargill in identifying top talent by providing students with the opportunity to hone their technical and business skills at a time when talent risk is one of the most significant challenges for businesses. This year, we have added three more agricultural science institutes, and we believe that our collaboration with these institutions will help us expand our vision to more young talent and lay a solid foundation for their academic and career growth."

MK Stalin, the Chief Minister of Tamil Nadu, inaugurates the Aavin ice-cream factory in Salem.

On Tuesday, Tamil Nadu Chief Minister M K Stalin inaugurated the state-owned Aavin ice-cream factory in Salem, which cost Rs 12.26 crore.

The state-of-the-art facility, which was virtually inaugurated by the Chief Minister from the secretariat here, can produce 6,000 cone and cup ice creams in various flavours measuring 50 ml, 100 ml, 500 ml, and 1 litre that will be sold through retail outlets.

Aavin, or Tamil Nadu Cooperative Milk Producers Federation Limited,

has modern facilities in Chennai and Madurai to serve the state's needs. The new factory in Salem would serve the districts of Salem, Coimbatore, and Erode. It was built on a 9,210 square foot lot.

Aavin sells milk and milk byproducts such as ghee, milk powder, paneer, butter, palkova, curd, buttermilk, lassi, yoghurt, flavoured milks, sweets, ice cream, kulfi, chocolate, and cookies to customers.

For over four decades, Aavin has been a pioneer in selling milk and milk products in the state, procuring an average of 36 lakh litres of milk per day from 4.20 lakh milk producers and selling 30 lakh litres to consumers across Tamil Nadu.

Aavin manufactures approximately 84 dairy products in 146 varieties for consumers, with a daily production capacity of 15,000 litres of ice cream.

Patterson enters agreement to acquire Dairy Tech

Patterson Companies Inc. announced the signing of an agreement to acquire a significant portion of the assets of Dairy Tech Inc., based in Colorado. The acquisition will allow Patterson Animal Health to expand its product and solution suites.

Patterson Companies, Inc. announced the signing of an agreement to acquire substantially all of the assets of Dairy Tech, Inc., a Colorado-based company that provides pasteurising equipment and single-use bags that allow dairy producers to produce, store, and feed colostrum for newborn calves, as well as product offerings for beef cattle producers, through a subsidiary. Following the acquisition, Patterson Animal Health's value-add platform will be expanded by adding these products and solutions to their suite of offerings.

Dairy Tech is a privately held company that was established in 1999. With the integration of Dairy Tech employees into the Patterson Animal Health team, the acquired business will maintain its domestic and international commercial presence, bolstered by Patterson's extensive sales force and customer relationships.

"We are excited about joining the Patterson Animal Health team and continuing to build on Dairy Tech's success as part of Patterson," said Dr. Rick Dumm, founder and CEO of Dairy Tech. Patterson Animal Health has long been regarded as a leading value-add provider to the production animal market."

PATTERSON COMPANIES, INC.

Editorial Calendar 2023

Publishing Month	Article Deadline	Advertising Deadline	Focus
January	**30th, Dec. 2022**	**3rd, Jan. 2023**	**Climate Management**
February	**30th, Jan. 2023**	**3rd, Feb. 2023**	**Nutritional Deficiency Effects**
March	**28th, Feb. 2023**	**3rd, March 2023**	**Herd / Breed Management - Fertility, Breeding & Reproduction**
April	**30th, March 2023**	**3rd, April 2023**	**Disease Prevention/ Risk Assessment**
May	**30th, April 2023**	**3rd, May 2023**	**Small Ruminants Management (Sheep, Goat etc)**
June	**30th, May 2023**	**3rd, June 2023**	**Calf & Heifer Management**
July	**30th, June 2023**	**3rd, July 2023**	**Milk Production Management/ Milking Practices**
August	**30th, July 2023**	**3rd, August 2023**	**Feed & Fodder**
September	**30th, August 2023**	**3rd, September 2023**	**Vaccination Protocols/ Cattle Herd Immunization**
October	**30th, September 2023**	**3rd, October 2023**	**Dairy By-products**
November	**30th, October 2023**	**3rd, November 2023**	**Potential of Dairy Farming**
December	**30th, November 2023**	**3rd, December 2023**	**Calf Management**

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Front Title Inside	30000 ☐	Back Title Inside	25000 ☐
Front Title Opening	25000 ☐	Back Title Opening	20000 ☐
Full Page	12000 ☐	Center Spread	35000 ☐

January 2023

1. **Dairy Forum 2023 (IDFA)**
   Dates: January 22 - 25, 2023
   City: Orlando
   Country: Florida
   Website: www..idfa.org/events

2. **DairyTech**
   Dates: January 25 - 27, 2023
   Venue: Crocus Expo International
   City: Moscow
   Country: Russia
   Website: www.dairytech-expo.ru

3. **IDEX 2023**
   Dates: January 28 - 29, 2023
   Venue: Expo Center
   City: Lahore
   Country: Pakistan
   Website: www.internationaldairyexpo.com

February 2023

1. **Agroexpo**
   Dates: February 1 - 5, 2023
   City: Izmir
   Country: Turkey
   Website: en.agroexpo.com.tr

2. **Dairy and Poultry Expo**
   Dates: February 2 - 4, 2023
   Venue: International Convention City Bashundhara
   City: Dhaka
   Country: Bangladesh
   Website: www.limraexpo.com

3. **GulFood**
   Dates: February 20 - 24, 2023
   Venue: Dubai World Trade Centre
   Country: Dubai
   Website: www.gulfood.com

April 2023

1. **Canadian Dairy EXPO 2023 Animal husbandry**
   Dates: April 5-6, 2023
   Venue: Stratford, Canada
   City: Stratford
   Website: https://ifw-expo.de/en/exhib/canadian-dairy-xpo

June 2023

1. **DLP EXPO Africa Dairy LiveStock and Poultry Expo**
   Dates: June 15-17, 2023
   Venue: KICC, Nairobi, Kenya East Africa
   City: Nairobi
   Website: www.dlpexpo.com

August 2023

1. **The Dairy Expo @ The Livestock Expo**
   Dates: August 3-5, 2023
   Venue: India Expo Center & Mart
   City: Greater Noida - Delhi
   Country: India
   Email: info@thedairyexpo.in
   Website: www.thedairyexpo.in

October 2023

1. **World Dairy Expo**
   Dates: October 1 - 6, 2023
   Venue: Madison
   City: Wisconsin
   Country: USA
   Website: www.worlddairyexpo.com