

Smart Feeding for a Sustainable Future: New Technologies for Better Livestock Profits

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Key Points

- **Scientific Feeding:** Balanced and precision feeding can improve animal health, productivity, feed efficiency, and farm profitability.
- **Sustainable Feed Resources:** TMR, hydroponic fodder, silage, and locally available alternative feed resources can reduce feed wastage and ensure a consistent feed supply.
- **Climate Resilience:** Climate-smart feeding practices can help livestock cope with heat stress, drought, and other climate challenges while reducing environmental impact.

Abstract

Climate-smart feeding is an important approach for improving livestock productivity while reducing feed wastage, production costs, and environmental impacts. In India, where feed accounts for a major share of livestock production costs, scientific and efficient feeding practices can significantly improve animal health and farm profitability. Climate-smart feeding focuses on balanced ration formulation, efficient use of locally available feed resources, improved fodder production, reduced feed wastage, and sustainable use of water and land resources. Technologies such as precision feeding, total mixed ration (TMR), hydroponic fodder production, and silage preparation can help ensure a consistent supply of quality nutrients throughout the year. Alternative feed resources, including azolla, moringa leaves, tree fodders, crop residues, sugarcane tops, brewery by-products, and fruit and vegetable processing wastes, can further support sustainable feeding. Feed additives such as probiotics, prebiotics, yeast cultures, organic acids, minerals, and herbal additives may improve digestion, immunity, and productivity. With increasing climate-related challenges such as heat stress, drought, and irregular rainfall, integrating scientific feeding practices with digital technologies and sustainable resource management can contribute to a more productive, resilient, and environmentally sustainable Indian livestock sector.

Introduction

The livestock sector is really important in India because it gives a lot of people in areas a way to make money. India is actually the country in the world when it comes to producing milk and that is because we have so many cows. However farmers are dealing with a lot of

issues, such as the cost of food for the animals going up not having land for the animals to graze and not having enough food for them to eat. The weather is also. Farmers are under a lot of pressure to make sure they are producing enough.

The food for the animals is a part of the cost of taking care of them it is about 60 - 70 percent of the total cost. So making sure the animals are eating well and not wasting food is a way to save money on the farm. There is an idea called climate smart feeding that people have been talking about a lot lately. The idea of climate feeding is to help the animals grow and be healthy while also making sure we are not hurting the environment. If we use climate feeding with the technology we already have it can help farmers make more money and it can also help the animals be healthier which is good for the livestock sector in India, the livestock sector and, for the farmers who take care of the animals in the livestock sector.

What is Climate-Smart Feeding?

Climate-smart feeding is about using food for animals in a way. This means animals get the nutrition they need. We want to make sure animals produce milk, meat and eggs from the food they eat. At the time climate-smart feeding helps to reduce waste and saves our natural resources like water and air. The main idea of climate- feeding is to get more food from animals without using more resources. This way climate-smart feeding helps to reduce things, like greenhouse gas emissions that harm our environment.

A climate-smart feeding system focuses on:

- Balanced and scientific ration formulation
- Efficient use of locally available feed resources
- Improved fodder production practices
- Reduced feed waste
- Better animal health and productivity
- Sustainable use of water and land resources

By adopting climate-smart feeding strategies, farmers can increase their profits while getting their farms ready for future climate challenges.

Importance in Indian Livestock Farming

Every farmer in India still relies on crop residues and unbalanced feeding methods. Even though these feed sources are available in amounts they often do not meet the nutritional requirements of high-producing animals. Not enough feed also leads to milk production, slower growth, problems, with reproduction and more cases of illness..

Benefits of Scientific Feeding Practices

- Increased milk production and weight gain

- Better reproductive performance
- Improved disease resistance
- Decreased feed cost/unit of production
- Lower environmental footprint
- Increased farm profitability

Ingredients	As fed (%)
Maize grains	33.4
Soybean meal	4.0
Maize oil cake	7.0
Maize gluten (60%)	7.0
Canola meal	15.0
Molasses	10.0
Wheat straw	20.0
Mineral mixture	2.0
Vitamin pre-mix	0.1
Sodium bicarbonate	0.5
Calcium oxide	1.0
CP	19.5
Total digestible nutrients	70

Feeding represents an important production cost for livestock enterprises, the optimization of the traditional feeding with smart feeding technologies can significantly improve their efficiency.

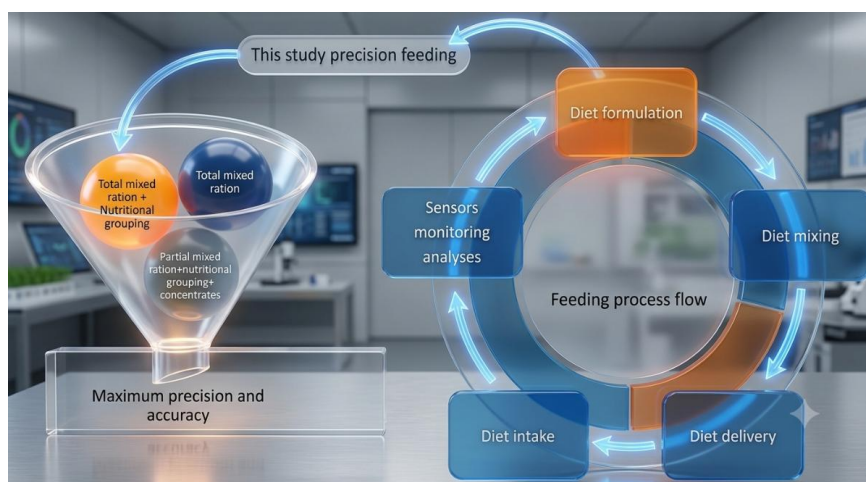
Emerging Feeding Technologies in India

1. Precision Feeding

Precision feeding is defined as provision of nutrients according to the needs of specific individuals or groups. Animals are not under-fed or over-fed instead the feed given is based on the age, body weight, production stage and physiological state, ensuring proper nutrition.

Benefits include:

- Improved feed efficiency
- Reduced feed wastage
- Lower feeding costs
- Better animal performance
- With the help of digital tools, mobile applications and automated monitoring systems, precision feeding practices have recently gained traction among modern dairy farms.



1. Total Mixed Ration

Total Mixed Ration is a system where people mix food things together before giving it to the animals. Total Mixed Ration, which is also called TMR is a way of doing things where people combine lots of food components, like hay, grains, minerals and extra nutrients all

together before serving it to the animals. This means that when the animals eat they get a balance of food every time they eat Total Mixed Ration.

The benefits of using TMR are:

- Better absorption of nutrients
- Boosted milk yield
- Less selective feeding habits in animals.
- Healthier rumen function
- Better conversion of feed into energy.

More and more organized dairy farms in India are starting to use TMR technology.

2. Hydroponic Fodder Production

You can grow healthy green food for animals using hydroponic fodder technology. This means you do not need any soil to do it. The secret is to control the environment right.

For example you can take seeds like maize, barley, wheat and oats. Turn them into green fodder in about one week. Hydroponic fodder technology makes it possible to do this quickly. You get fodder that is good, for animals to eat.



Some key benefits are:

- It doesn't need much land to grow.
- Using less water is a big plus.
- Producing fodder all year long is possible.
- You can still get feed for your animals even when there's a drought or a lack of fodder.
- Tastes quite good

For farmers dealing with limited land and water, hydroponic systems can be a really effective way to grow crops.

3. Silage Technology

Silage is basically green feed that's kept fresh by fermenting it in a way that doesn't allow air in. It acts as a dependable feed option when fodder is hard to come by.



There are several advantages to using silage:

- Storing fodder for the long haul
- A steady flow of nutrients
- Less chance of running out of feed during certain seasons.
- Boosted milk yields are a great advantage.
- More effective use of excess fodder.

Dairy farmers have really taken to maize silage because it's packed with nutrients and lasts a long time in storage.

Alternative Feed Resources for Sustainable Feeding

The gap between the feed we need and the feed that is available is getting bigger. Because of this new feed sources are very important. We can find some feed materials right near us. Add them to the feed that we normally give to animals. The feed materials can help us save money on feeding animals. New feed sources, like these can really make a difference.

Examples Include

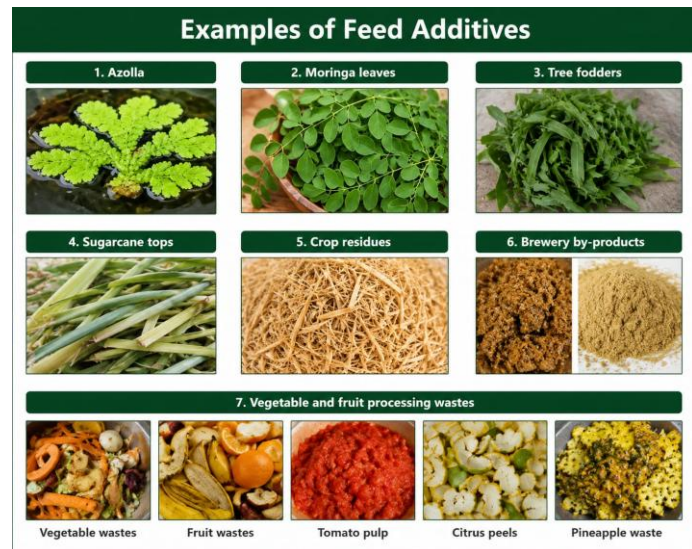
- Azolla
- Moringa leaves
- Tree fodders
- Sugarcane tops
- Crop residues
- Brewery by-products
- Vegetable and fruit processing wastes

These resources, if properly managed, can enhance feeding sustainability and alleviate reliance on costly commercial feeds.

Common feed additives include:

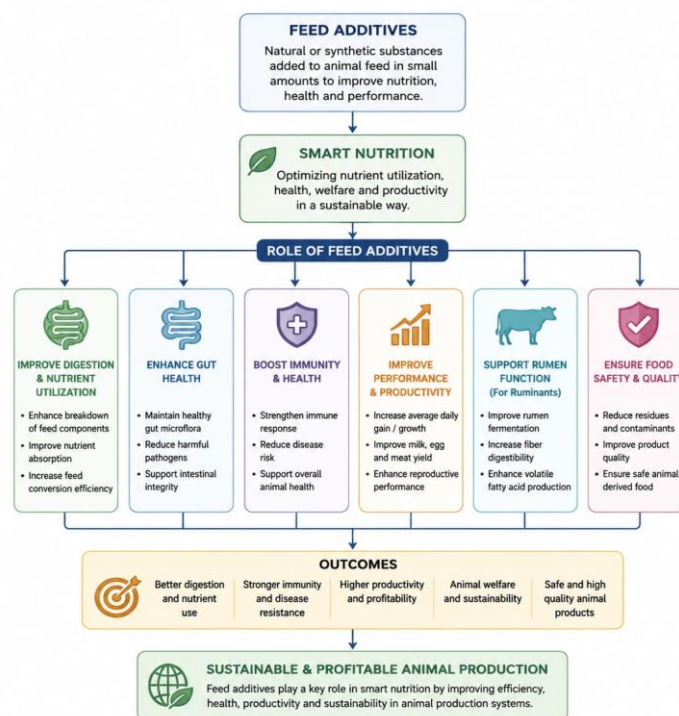
- Probiotics
- Prebiotics
- Yeast cultures
- Organic acids
- Mineral supplements
- Herbal feed additives

These helps in better digestion, enhanced immunity and boosted productivity.



Climate Change and Livestock Feeding

Role of Feed Additives in Smart Nutrition



Climate change is affecting livestock in ways. Its making life harder for livestock. The weather is getting hotter. There are more droughts. Sometimes it rains a lot. Sometimes it does not rain at all. This is very stressful for livestock. When it is very hot livestock do not eat much food. They also produce milk and have babies less often. This means that livestock production is going down. We need to find ways to feed livestock that will help them deal with these problems. Climate-smart feeding systems can help livestock to handle the stresses of climate

change. Climate change is a problem, for livestock and the climate-smart feeding systems can assist livestock to tolerate climate change..

The system focuses on:

- Nutritional balance
- Proper supplementation of mineral inputs
- Quality fodder
- Water supply
- Supplementing feeds with heat stress management additives

Feed-smart feeding practices not only assist in improving animal health, but are a cost-effective way to reduce fodder wastage, thus supporting the sustainable livestock sector.

The future of Indian livestock feeding

The feeding system of the future is one that merges technology, sustainability, and scientific management. Potential developments in feeding systems in the future include:

- AI-powered feeding systems, automatic feeding systems
- precision livestock farming, research into rumen micro-flora
- nutraceuticals and functional foods
- Digital farm management systems.

These technologies will be beneficial for both profit and the environment.

Conclusion

For long-term growth of animals in India we need to do more than just get production. We also need to make sure things are efficient and a long time. New and smart ways to feed animals can help with costs of feed not enough food for animals and problems with the environment when feeding animals. Ways like feeding exactly what is needed growing food with water of soil keeping feed fresh with special methods and using new kinds of food additives can help animals do better and help farmers make more money. These smart ways to feed animals will help farming survive, in the future.

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