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Addressing fodder deficits in India: A multi-level approach for sustainable dairy farming

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Abstract

India is primarily an agricultural country and agriculture and livestock are intertwined with each other in Indian context. Livestock plays a significant role in Indian economy by providing employment to about 8.8 percentage of the population in India. Livestock sector contributes 4.11 percentage to GDP and 25.6 percentage of total Agriculture GDP. Unfortunately, livestock production system in India is primarily characterized by low input as well as low output. For the production and productivity of the livestock in order to be improved and maintained, proper feed should be given. Without addressing the fodder and feed resource development, it is not possible to sustain the animal husbandry in the country. India's milk production during 2020-21 was recorded 209.96 million tons. Though India tops in the milk production globally, the average annual milk yield of cattle in India is 50% lower than the global average. Among various factors, livestock feed and fodder deficit is a critical factor contributing to the milk yields of the country. It is estimated that the most important constraint in the dairy industry is feed scarcity which accounts for nearly half of all losses in Indian dairy production. Although extension strategies do not directly help in augmenting the fodder supply in the country, helps in bringing the desirable changes in the behaviour of livestock farmers which will ultimately lead to overcoming the fodder deficit. Because of the widespread regional imbalances in the fodder availability in the country and the varying underlying reasons, it is not possible to apply one single strategy to all the regions. The strategies that can be adopted are purely location specific and can be customised based on the need. Different extension strategies which can help in addressing the fodder deficit in the country are discussed here.

Keywords: Fodder deficit, extension strategies, regional imbalances, location specific

Introduction

Food is one of those important forces that drives us to live in this world and lead this life. After air and water, it is the third most important thing that gives us sustenance for life. All living things need food though what and how much they eat varies significantly. Unfortunately, livestock production system in India is primarily characterized by low input which include feed as well as low output which include milk. In order to ensure that the dairying in the country is economically attractive, enhancing the milk production and productivity has to be focussed upon which is possible mainly by concentrating on the feed and fodder requirements of the cattle.

Why livestock matters?

In developing countries, livestock production is now growing rapidly and will happen to occur in coming decades too, which opens major pathways to bring out of poverty, nearly 700 million small scale producers living on less than \$1.90 per day. (ILRI, 2022). India is primarily an agricultural country and agriculture and livestock are intertwined with each other in Indian context. India is rich in livestock population with a total livestock population of 536.9 million which accounts for 15 percentage of the global livestock population. Livestock plays a significant role in Indian economy. It provides employment to about 8.8 percentage of the population in India and to 1.3 billion people around the world depend upon the livestock for their livelihood. It contributes 40 percentage to the global GDP and 4.11 percentage to Indian GDP and 25.6 percentage of total Agriculture GDP of India. For the production and productivity of the livestock in order to be improved and maintained, proper feed should be given. Without addressing the fodder and feed resource development, it is not possible to sustain the animal husbandry in the country.

Need to study about fodder deficit

India’s milk production is steadily increasing over the years and during 2020-21 it was recorded to be 209.96 million tons. Though India tops in the milk production globally, the average annual milk yield of cattle in India is 50 percent lower than the global average (IGFRI Vision, 2050). There are several factors that affect the milk yield of the cattle

among which fodder scarcity is an important factor to be discussed and Lack of feed and fodder are one of the major constraints to dairy production in India especially in resource-poor, rural areas. It is estimated that the most important constraint in the dairy industry is feed scarcity which accounts for nearly half of all losses in Indian dairy production.



Fig 1: Milk production of India from 2015-16 to 2020-21 with corresponding growth rate

Scenario of fodder availability in India

It is estimated that currently, there is a net deficiency of 30.65 percentage of green fodder, 11.85 percentage of dry fodder in India (IGFRI Vision, 2050) and the demand for green fodder and dry feed would become 1012 and 631 million tonnes respectively by 2050. With the current rate of expansion in forage supplies, by the year 2050, there will still be a deficit of 18.4 percentage in green fodder and shortfall of 13.2 percentage in dry fodder. For this green forage supply must rise to a rate of 1.69 percentage per year to overcome the

deficit. Contrarily, the area under cultivated fodder out of the total cultivated land accounts for only 4 percentage and has remained unchanged over last few decades. (Dagar, 2017 [3]; Halli *et al.*, 2018 [5]; Meena *et al.*, 2018 [12]). Also, the area under permanent pastures and other grazing land in the country accounts for 10.34 M ha (Directorate of Economics & Statistics, DAC&FW, 2020) which is observed to decrease over time with the tendency likely to continue. Overgrazing by the animals has resulted in falling of the productivity of pastures (Pathak & Dagar, 2015) [14].

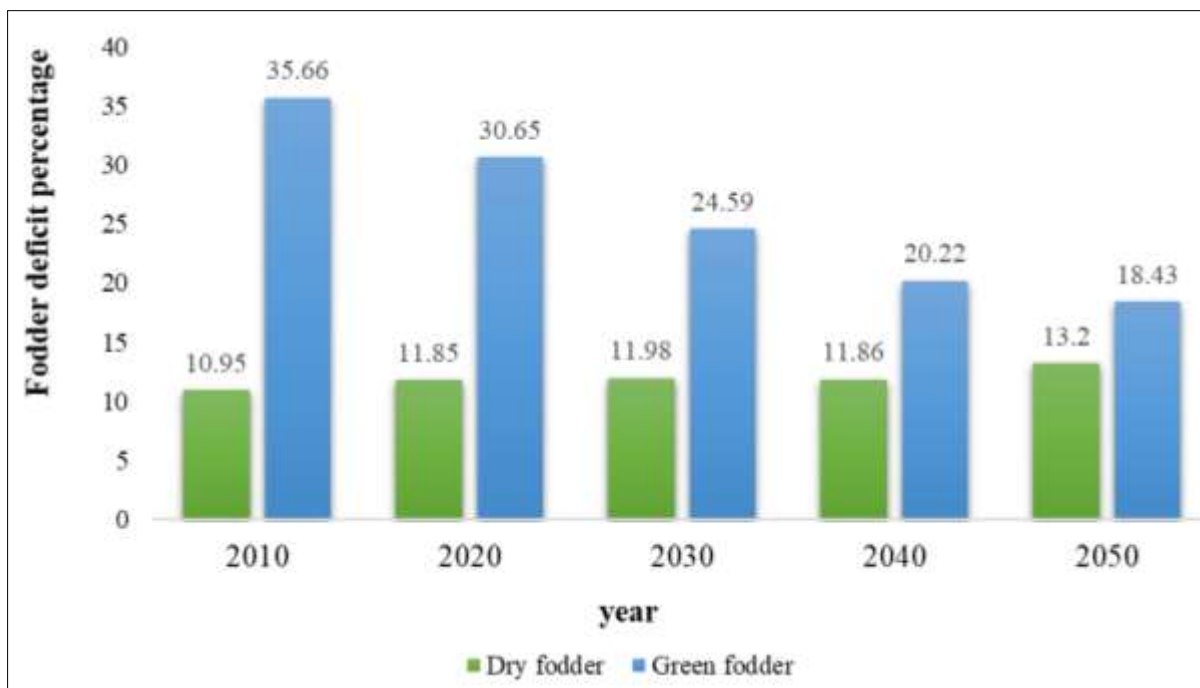


Fig 2: Dry and green fodder availability in India

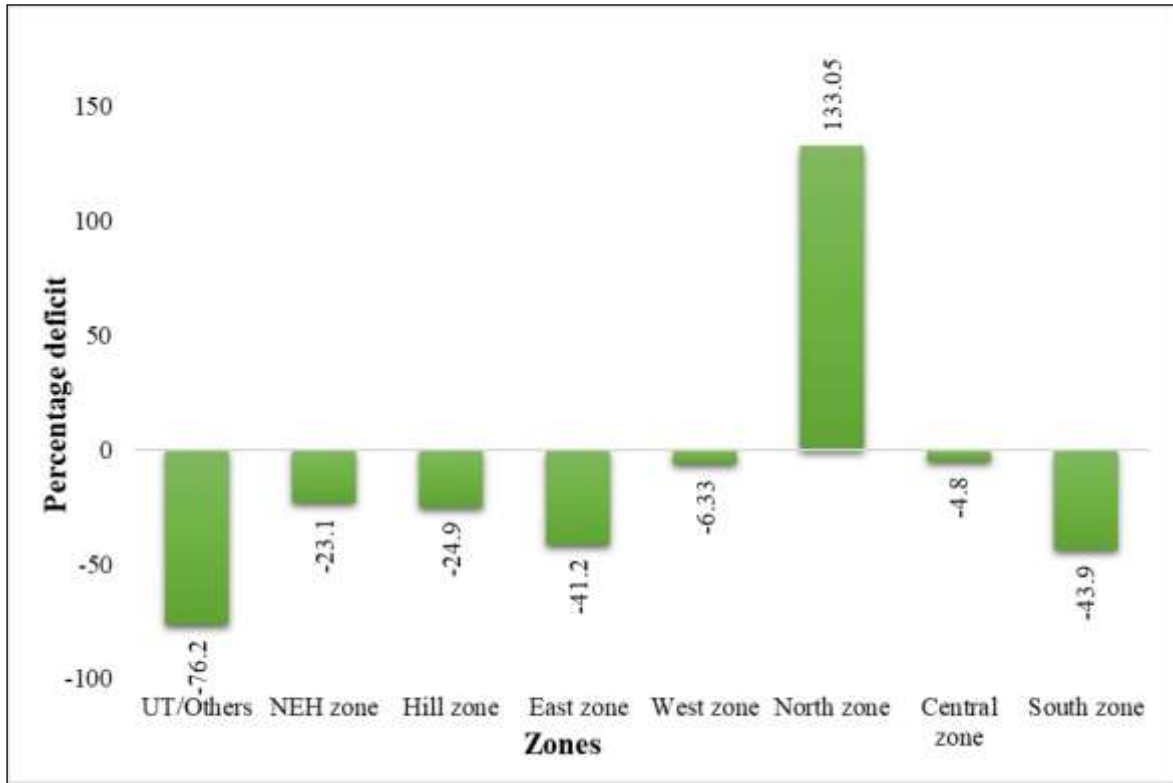


Fig 3: Zone wise distribution of green fodder availability

In terms of green fodder availability, all the zones in the country except northern zone are deficit. While the reasons for deficit in various zones are varying according to the geography and other conditions of the region, Northern zone has a surplus of 133.5 percentage of green fodder availability.

The reason for this is that Punjab state has maximum area under cultivation of forages followed by rice and wheat. There is high adoption of technology and forage crops productivity as well as cropping intensity is highest (Roy *et al.*, 2019) [16].

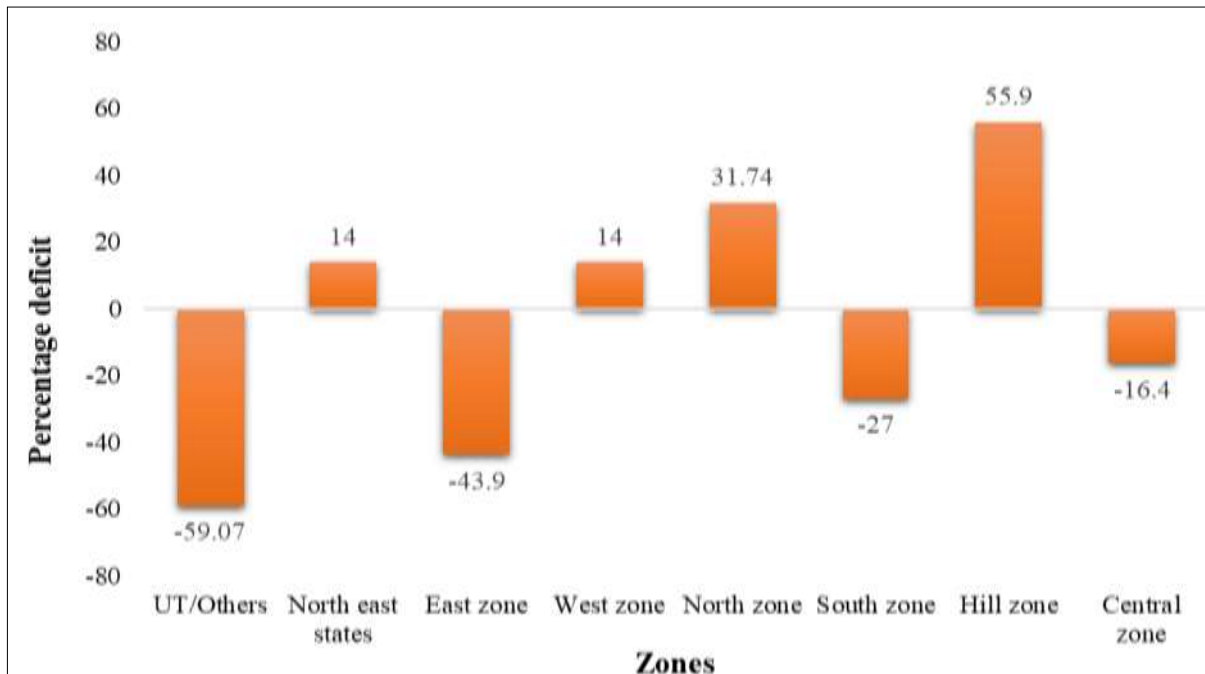


Fig 4: Zone wise distribution of dry fodder availability

Dry fodder sources majorly considered in India are food grains followed by forests and other sources which include sugarcane and groundnut. Considering the dry fodder availability in different zones, half of the zones are having surplus of dry fodder and other half zones are deficit in the dry fodder availability for animals (Roy *et al.*, 2019) [16].

Constraints hindering adequate fodder availability in India

Raising human and livestock population

India with a land area of 2.29 percentage of the global land area is bearing nearly 17.5 percentage of world human population and 15 percentage of livestock. And these human and livestock population are increasing at the pace of 1.6

percentage and 0.66 percentage per annum respectively leading to a huge pressure on Earth's natural resources for their growth and survival. As a result, both of them are fighting tooth and nail with each other for food and fodder production which resulted in the cultivated fodders occupying only 4percentage of total cultivable land area in the country. Also, maintenance of such large herd of animals is a major challenge with their optimum productivity.

Biasedness of Green revolution

No doubt green revolution played a phenomenal role in improving food production of the country and in contributed to the poverty reduction. While there are many positive contributions of green revolution to the agriculture and mankind, there are also complaints that it was biased in many aspects like concentrating on resource rich farmers leaving behind the resource poor ones, focussing on irrigated areas leaving behind rainfed areas, considering male farmers leaving behind female farmers etc., Similar was the case with fodder crops. The whole concept of green revolution revolved around eradicating the ship to mouth concept of food in India and reduction of poverty. It rarely took livestock and its feed availability into account. Thus, major attention was given to grain crops and fodder crops were neglected which further widened the gap between area and production of the both.

Resource constraints

The main natural resources required for fodder cultivation are land and water. And India has only 2.4percentage and 4percentage of the world's land and fresh water resources. Fodder crops need cultivable fertile lands, year-round irrigation supply, good dosage of fertilizers and proper maintenance. Fodder crops usually involves regular harvesting, mostly on daily basis for which large work force is required that makes it expensive for farmers. The chances of fodder wastage are more likely in the absence of efficient preservation and storage techniques which makes farmers hesitant to make heavy investments in the production of fodder (Dagar, 2017) ^[3].

Livestock farmers are small (21.75 percentage) and marginal (69.4 percentage) not paying much attention on feeding of poor yielder animals

Majority of the farmers in the country are small and marginal farmers who will be often trying for getting returns from the food crop and meeting the family requirements, completely neglecting the fodder crop as an income source. And then there are landless farmers also who work as labourers in others field but maintain one or two livestock at home. These farmers cannot afford for cultivating fodder crops in that limited piece of land which they have. As a result of all these factors, they do not pay adequate attention to the differential feed requirements of good and poor yielders.

Regional imbalances of fodder availability

Availability of fodder is also not uniform across the country. The pattern of fodder deficit is different in different parts of the country. Western Himalayas, Upper Gangetic plains and eastern plateau and hill zones have more than 60 percentage availability than actual requirement of green fodder. While in Trans Gangetic plains, it is between 40 to 60 percentage and in remaining regions it is below 40percentage. This might be due to varied geographical conditions, amount of water availability, fertility of the soil, weather conditions and many other related factors.

Variation in seasons

Seasonal variations also affect the availability of fodder year-round in an area. Fodder availability during monsoons will be more due to abundant rainfall in the season and it gradually reduces by winter. The shortage becomes severe during summer due to absence of rainfall and high temperatures.

High transport cost

Bulkiness and perishable nature of the fodder makes it difficult for transportation to long distances adding to high transportation costs. It is for this reason; the regional imbalance of green and dry fodder could not also be easily averted.

Non-availability of quality seed

Lack of availability of high-quality seed is a major issue all over the world especially in developing countries (Biemond *et al.*, 2012) ^[2]. The major limitation towards less area and production of forage crops is good quality seed/planting material (Parihar, 2010). The seed production aspect of forage grasses and legumes is almost neglected in India owing to their perennial nature and capability for vegetative propagation (Vijay *et al.*, 2018) ^[19]. The major factors limiting the availability of quality seeds of fodder crops include indeterminate growth, uneven maturity, blank seed, seed dormancy, seed shattering, climatic factors (photoperiod, thermos-period, humidity etc.), low density of ear-bearing tillers, lodging, lack of seed production technology among physiological; weather extremes among climatic; poor harvest index; less refined package of practices among management factors and unavailability of an exclusive forage seed market.

Lack of knowledge/awareness among livestock farmers (poor TOT) about technologies in fodder production

Most of the times, farmers are not well versed with package of practices of fodder crops like other food grains and hence are not utilizing them up to their potential that would otherwise help in assuring the year-round fodder supply to the animals. Also, the extension system of the country in most places does not give enough attention to transfer of technology of fodder production technologies like how it promotes technologies regarding food and commercial crops.

Non-availability of trained and expert human resource in fodder production

Human resource in the country in agriculture is most of the times trained in food crop production. Even though it concentrates on livestock production, it only includes about animal health, nutrition and production aspects, often neglecting its feed and fodder production aspects. As a result, the extension agents as well as farmers lack the knowledge on Package of Practices related to fodder crops.

Climate change

Livestock is not just the victim of climate change but also the culprit of climate of climate change. They are both affecting the climate and are being affected by the climate. Livestock contributes to the climate change in the form of Green House Gases emitted through enteric fermentation, manure making, feed conversion and converting of forests into pastures. In turn because of the climate change, the animals are suffering from heat stress, alternation in the quality and quantity of manure and ultimately reduction in the milk yield.

Economic implications of fodder deficit

Increasing livestock population is creating a demand for increase in fodder production in the country to meet their feed requirements. On the other side, because of various factors like unavailability of land, over grazing, seasonal variations etc., the production of fodder is not enough to meet the demand. This is leading to the decreasing supply of fodder. The surging demand of fodder and its dipping supply is creating an imbalance leading to a demand supply gap in the country. This gap is ultimately leading to the increase in the fodder prices.

Strategies for ensuring year-round supply of fodder

There are several strategies that can help overcome the fodder crisis in the country if practiced. These strategies include

A. Cultivated fodder resources

This includes going for cultivation of fodder crops. Farmers can devote a piece of land which they have for cultivation of fodder crops like fodder Sorghum, Hybrid Napier Bajra etc., Continuous cultivation of the same food crops might lead to the deterioration of the soil. So, the farmers can rotate their food crops with leguminous fodder crops which will not only promote the soil health but will also provide year-round supply of green fodder. To overcome the fodder problem, cropping system with forage crops is a potential alternative as it uses the resource more efficiently and helps in providing balanced diet to the animals as well due to the inclusion of both legume and cereal crops (Kadam *et al.*, 2017) ^[11].

B. Fodder production under fruit orchards horti pasture and silvipasture

Fodder production on degraded land is difficult due to soil and moisture limitations. Alternate land use systems (ALU) can be a great option in this regard which include Silvi-pasture with tree+ pasture/+ animal, Horti-pasture with fruit trees+ pasture/+ animal, agri-horti-silvipasture with crop+ fruit trees +MPTS+ pasture etc., These multi-purpose tree species (MPTS) helps in providing leaf fodder to the animals, besides providing them shelter during sunny days and also gives wood to the growers.

C. Permanent pasture/grazing lands

These are the rangelands which are unfit for crop cultivation and usually contain natural vegetation where animals graze. Development of permanent pastures and grazing lands helps in meeting the fodder requirements of cattle. Care should be taken to prevent over grazing of cattle.

D. Non-competitive lands

Farmers often demarcate their land boundaries by raising bunds. These bunds can be made use of for growing fodder. Perennial grasses like Bajra Napier hybrid, guinea grass etc., can be grown on the bunds which will be quite useful during the peak seasons. They also act as natural fence to the crop inside. Farm pond bunds, road sides, places around farm houses can be made use of to cultivate fodder for small scale consumption. These do not compete with the crops for space and nutrients and in turn help to save the fodder cost of the animals.

E. Crop residue quality enhancement

Providing the animals with the crop residue as feed is one more alternative for fodder crops. The left-over straw after harvesting the crop can be used for cattle feeding. Since the straw obtained is not readily palatable by the animals, quality

enhancement should be done. The straw has to be made to fine pieces for easy intake and the crops like paddy, sugarcane can be treated with urea and molasses to enhance the fodder quality and increase the palatability to cattle.

F. Alternative fodder resources

Alternative fodder resources are used to supplement the supply of fodder at an affordable cost. They are a viable source of feed for animals in the times of natural calamity and scarcity. Alternative fodder resources for livestock include

- **Azolla:** Azolla is a floating water fern which can also be used as a fodder plant. It is rich in several sources and is an excellent supplement as fodder. Its fast multiplication rate and production potential makes it a viable option as alternative fodder resource. Azolla cultivation can be taken up in farm ponds, wetlands and standing rice.
- **Hydroponic fodder production:** Cultivation of fodder in water culture is called hydroponics fodder. It uses trays for sprouting the seeds in controlled conditions of temperature, moisture, humidity etc., These sprouted seedlings are fed to animals as a fresh green fodder. This method is highly preferable in semi-arid, arid and drought prone areas with high water shortage. This is a boon to landless livestock farmers for production of fodder.

G. Fodder conservation technologies

Fodder conservation is very much important in preservation of the fodder to ensure its supply year-round to the animals owing to its seasonal availability and perishable nature. Earlier only dry fodder used to be preserved in form of hay and heaping. But with the developments in fodder technology green fodder is also being preserved in the form of silage. Different fodder conservation technologies include

- **Hay making/Bales:** Storing the fodder is difficult because of its bulkiness which demands more space. The dry fodder can be pressed into cubical or circular bales to reduce the keeping space and to facilitate easy transportation. The principle of making hay is to reduce the moisture content of the forages that permit to store it without spoilage. The moisture content in the hay is less than 15percentage. Crops with thin stems and leaves are preferred for hay making.
- **Silage:** Silage making involves converting green fodder for preservation by the process of fermentation and contains moisture content between 40-60percentage. Succulent parts of the plant are usually used for making silage.
- **Feed Block:** Feed blocks are made using locally available forage material which provides balanced ration to the animals containing forage, concentrates and supplementary nutrients required by the animals. It is basically a block containing ration required by a cow/buffalo in 24 hours.

Conclusion

Though there are various ways to address the problem of this fodder deficit, the question arises about at what level this problem can be addressed. It is not the responsibility of just the individual farmers or the community or of the government. Rather it should be a combined effort of all these levels who should act individually as well as collectively to overcome this shortage of fodder in the country. Since it is very important to minimise the losses during feeding the animals, at individual level, farmers can practice feed management practices and fodder conservation methods to

make fodder available to the cattle during the lean season. At community level, collective management of grazing lands, establishment of community fodder banks and Custom Hiring Centres can be practiced. At the government level, it should be understood that extension is not just for technology dissemination rather it should consider including the feedbacks obtained from extension personnel in policy formulations. It should come up with schemes covering fodder crops under credit and insurance coverage. Finally, it is the need of the hour for a fodder revolution to make India from a fodder deficit country to a self-sufficient one in fodder availability but this time taking into consideration the sustainability which was neglected during green revolution.

Conflict of Interest

Not available

Financial Support

Not available

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