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Fodder Production Scenario and Strategies for Revitalizing Fodder Production Technologies

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Introduction

Livestock production is the backbone of Indian agriculture and also plays a key role in providing employment especially in rural areas. This sector has been the primary source of energy for agriculture operation and major source of animal protein for masses. Therefore, India has been the home of major draught, milch and dual-purpose breeds of cattle. Indian dairy production system is complex and generally based on traditional and socioeconomic considerations. However, there has been a rapid change in way of agriculture (i.e. cropping system, water resources, diversification of crops, intensification of agriculture), increasing use of mechanical power, transformation from sustenance farming to market oriented farming, changing food habits etc., All these factors have their impact on animal husbandry practices. India has 15 % of world cattle population and due to ever increasing population pressure of human, arable land is mainly used for food and cash crops, thus there is little chance of having good quality arable land available for fodder production, until milk production becomes remunerative to the farmers as compared to other field crops. In India, there is no practice of fodder production in rural areas and animals generally consume naturally grown grasses and shrubs which are of low quality in terms of protein and available energy, they are thus heavily dependent on seasonal variations and this results in fluctuation in fodder supply round the year affecting supply of milk round the year.

1. Significance of feed and Fodder

Livestock rearing in India is changing fast and there has been a rise in demand of milch cattle as compared to dual or draught breeds. Population of indigenous breeds like Haryana, Nagori, Khilar i.e. dual and draught purpose breeds has declined more than

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milch breeds. In this age of market economy, the agri-economy and milk production has to compete for growing fodder on good quality land, required for high productivity and reproductive efficiency of dairy animals. Hence, its significance can be understood from the following points.

(i) Economy in production: Feed and fodder cost constitute about 60-70% of cost of milk production thus cultivated fodder has an important role in meeting requirement of various nutrients and roughage in our country to produce milk most economically as compared to concentrates. Feeding not only meets nutrient requirement but also fills the rumen to satisfy the animals. Feed has to meet requirement of cattle maintenance, production and requirement of microbes to promote digestion.

(ii) Better feeding for ruminants: In view of the peculiar digestive system, provided by nature, ruminants need feeds, which not only meet their nutritional requirements but also fill the rumen and satisfy the animal. In view of microbial digestion system the feeds have to meet requirements of the animal, its production as well as the needs of microbes for promoting digestion. The fodder crops meet these requirements very effectively and hence are important for ruminant production system. As evident from reports that mixed with coarse roughages, like wheat straw, its intake and digestion are improved.

(iii) Good source of critical elements: Fodder from common cereal crops like Maize, Sorghum and Oats are rich in energy and the leguminous crops like Lucerne, Berseem & Cowpea are rich in proteins. These leguminous crops are good source of major and micro minerals, which are critical for rumen microbes as well as animal system. The green fodder crops are known to be cheaper source of nutrients as compared to concentrates and hence useful in bringing down the cost of feeding and reduce the need for purchase of feeds/ concentrates from the market. In case surplus fodder is available in some season it can be stored in form of silage or hay for lean season.

2. Scenario of Feed and Fodder Availability and Future Requirement

There is tremendous pressure of livestock on available feed and fodder, as land available for fodder production has been decreasing. Scenario of feed and fodder availability till 2025 is as below.

Table: 1 Scenario of Feed and Fodder Availability and Future Requirement

(in million tones)

Year	Supply (In million tones)		Demand (In million tones)		Deficit as % of demand (actual demand)	
	Green	Dry	Green	Dry	Green	Dry
1995	379.3	421	947	526	59.95 (568)	19.95 (105)
2000	384.5	428	988	549	61.10 (604)	21.93 (121)
2005	389.9	443	1025	569	61.96 (635)	22.08 (126)
2010	395.2	451	1061	589	62.76 (666)	23.46 (138)
2015	400.6	466	1097	609	63.50 (696)	23.56 (143)
2020	405.9	473	1134	630	64.21 (728)	24.81 (157)
2025	411.3	488	1170	650	64.87 (759)	24.92 (162)
Source: Draft Report of Working Group on Animal Husbandry and Dairying for Five-Year Plan (2002-2007, Govt. of India, Planning Commission, August-2001).						

Table: 2. Feed Production (in million tones)

Particulars	2002-03	2003-04	2004-05	2005-06	2006-07
Concentrates available	41.96	43.14	44.35	45.63	48.27
Concentrates required	117.44	120.52	123.59	127.09	130.55
Concentrate Deficit	64.27	64.21	64.12	64.10	63.03
Source: Draft Report of Working Group on Animal Husbandry and Dairying for Five-Year Plan (2002-2007, Govt. of India, Planning Commission, August-2001).					

It is obvious from **table 1** that deficit in green and dry fodder is increasing every year, while for concentrates, the gap is almost static. However, this gap is critical and is going to determine the type of animals and husbandry practices to be followed. Scarcity of feed and fodder resources (both quantity and quality), low production potential of animals, non-availability of critical inputs or services in time along with access to capital and markets, are primary reasons for low productivity of dairy animals (Mishra *et al.,* 2009).

3. Constraints in Achieving Higher Fodder Productivity

India is presently under heavy stress on account of a large-scale exploitation for fuel wood, timber and fodder, mismanagement of forest resources and frequent fires. There is acute shortage of fodder especially green nutritious fodder, which is major cause of low productivity of livestock, especially in hilly area (Deb Roy *et al.,* 1989). The main reasons for low productivity is insufficient and low quality fodder and feed including grazing facilities (Deb Roy, 1993). The main constraints can be described as;

1. **Reduced area under fodder crops:** The division of the families has fragmented the land. At present land holdings are very small and farmers are always biased in choice of the crops. Due to these reasons agricultural land ratio does not permit diversion of land from food production to cultivated fodder. Thus, area under fodder crops is meagre.
2. **Uncontrolled grazing of dairy animals:** Uncontrolled grazing has led to a decline in biomass availability. The grazing pattern has created manifold problems in these pastures. Obnoxious weeds have invaded the pastures. Excessive and continuous grazing has severely damaged these lands.
3. **Poor Management Practices:** Management practices play an important role in determining productivity of grasslands. Presence of inferior and unproductive grass species, lack of fertilizer application, and absence of legume component, improper cutting and indiscriminate grazing are some of the important factors responsible for poor productivity of grasslands. There exists a wealth of indigenous knowledge for its proper utilization and management of natural resource base but farmers because of increasing population pressure and declining land productivity are not using it.
4. **Intense livestock population:** Livestock is the integral component of Indian agriculture since time immemorial. Its contribution to national economy through milk, meat, wool as well as farmyard manure is enormous. We have approximately 20 % of world's cattle, 50 % of buffaloes, more than 120 million goats and 60 million sheep (Deb Roy, 1993). Due to religious beliefs, population of unproductive cattle is increasing. This huge population and poor fodder availability has widened the gap between demand and supply of forage crops. It is a fact that considerable fodder resources are wasted on maintenance of an excessive number of poorly fed and low yielding animals, which contributed to process of pasture destruction.

5. Fodder tree use: Indian sub-continent is one of the richest in biodiversities on the globe. For instance, Himalaya supports about 84 trees and 40 shrubs of fodder value, yet not more than 20 trees are extensively used by farmers (Misri, 1997). Tree leaf fodder is the major feed resource during lean periods. Over exploitation and unscientific management of fodder trees has depleted this resource at huge environmental cost.

4. Future Guidelines for Revitalizing Fodder Production Technology:

Changing agriculture production practices, globalization of economy, market oriented production system, decentralized form of governance etc, have its impact on livestock production system in India. The production may be milk, dung, urine etc., has to compete in economic terms for allocation of resources of production with other competing options of crops. In India, for many families especially landless, small and marginal farmers, agriculture and livestock have been a livelihood issues and economic issues. Therefore, our policies must ensure both these aspects. Following policies may be focused in future.

(i) Look for good indigenous milch breeds of cattle particularly for semi-arid / arid climate; upgrade these breeds through modern techniques as animal husbandry is main activity in such areas. There is need to adopt intensive and well-defined mile stones to achieve growth in productivity of indigenous breeds in such areas.

(ii) Adopt breeds / cross breeds in areas commensurate with productivity of land i.e. in case of high agriculture production area, cross breeds with high milk potential will be able to compete with agriculture crops.

(iii) In upcoming days, when need for fat is going to drop and cheaper fats are likely to come from different countries it is certain that cow milk production will be preferable to buffalo milk.

(iv)There should be focused programme on regeneration, promotion of Silvi-pasture, revenues and wastelands, which will not only meet shortage of feed and fodders but will give equal access to poor and improve environment also.

(v) There is need to promote scientific fodder crop production through improved agronomic practices and improved seed. Extension in this sector is totally neglected because it is part of animal husbandry department for which it has never been a

priority. Thus we should look into the possibility of attaching it to agriculture department.

(vi) Promotion of techniques of treatment of straws and feed supplements as entrepreneurial activity than treatment at farmer level.

(vii) Though a number of fodder varieties have been developed but seeds are not available because it is trapped in vicious cycle of lack of demand due to lack of extension, which inhibits production of seed etc. Thus this cycle need to be broken through proper extension.

(viii) Presently research has been mainly conducted on cultivation of green fodder in irrigated areas but it is high time to emphasize to dry land fodder or partially irrigated fodder crops.

(ix) Extension to promote balance feed, feeding chaffed feed and proper storage of fodder to avoid losses need also to be emphasized.

5. Extension Strategies for Revitalizing Fodder Production

Extension strategies can bring the desirable changes in behavior of the fodder growers. The components of extension strategy can be described below:

1. Awareness creation about fodder production technology: There is utmost need to organize method / result demonstrations and organizing field days showing the monetary gain and benefits of cultivation of high yielding varieties fodder crops.

2. Strengthening the extension and development activities: Farmers can be motivated through campaigning for growing perennial fodder crops (e.g. Napier) in pond bank, farmhouse, road side, embankment etc., Extension personnel should also help in identification of effective technologies and their transfer to fields, hence, it can be easily adopted by the stakeholders.

3. Capacity building of farmers and extension functionaries: The skilled extension staffs are heavily loaded with veterinary and artificial insemination activities alone. There is need to strengthen the manpower of animal husbandry departments across the country who should be trained in latest technologies to support the livestock owners both in terms

of animal health as well as management aspects. Trainings must also be conducted to train the fodder growers to keep them abreast with latest technical know how.

4. On-farm evaluation of fodder technologies: On farm evaluation and demonstration of existing technologies may be attempted to narrow the gap between yields realized on farmers' fields and those on research stations. Providing the basic advice to the farmers is very essential which enable them to withstand in competitive market. Adaptive research on fodder production technology must be encouraged through providing necessary feed back from the farmers' field.

5. Conservation of forages to meet the demand in crisis: Fodder scarcity is mostly observed in dry season and during floods. Conserved forages which are enriched with nutrients like energy, protein and vitamins and low cost methods of silage making are to be promoted among the farmers.

6. **Motivate farmers for Indigenous Technical Knowledge (ITKs)**: Farmers are using ITKs since immemorial and it's the part of culture. Hence, there is need for the evaluation, screening and utilization of indigenous potential of forages crops in hilly, coastal and other areas as animal feeds. Shrubs and small trees (like Gliricidia, Desmanthus, Leucaena, Sesbania spp.) are very good and cheap source of protein and minerals and can be introduced between farm plots and have multipurpose utility.

6. Scientific Interventions for Revitalising Fodder Production Technologies

There is a need to understand the existing resource utilization pattern in totality. Fodder production is a component of farming system, hence; efforts are needed for increasing forage production in a farming system approach. The holistic approach of integrated resource management will be based on maintaining the fragile balance between productivity functions and conservation practices for ecological sustainability. The strategies for improvement and conservation of forage resources will have to be dictated by actual users i.e. the farmers who are the native inhabitants of that region. Some of scientific interventions, which could help in improving productivity of forages, are described here.

(A) Agronomic management of forage crops: The herbage production from grasslands

and meadows can be enhanced with the adoption of improved technology. Important components of this technology are:

- Control of bushes and weeds
- Pasture establishment
- Introduction of legumes / grasses
- Fertilizer application
- Cutting and grazing management

(B) Scientific cultivation of fodder crops: For augmenting the fodder availability, emphasis needs to be given to cultivate fodder crops on large area. Important fodder crops of temperate region are; *Avena sativa*, *Brassica sp*., *Medicago sativa*, *Pisum sativum* etc. (Singh, 1987). Foliage of fodder trees could be fed to livestock in mixture with crop residues and hay. Mixing of tree foliage with dry roughage improves their palatability and nutritive value.

(C) Adoption of Silvi-pastoral System: Silvi-pasture implies sustained and combined management of the same land for herbaceous fodder, top feeds and fuel wood, thereby leading to optimization of production. Himalayan rangelands exhibited enormous gain in forage production over existing situation due to multi-tier silvi-pasture techniques amalgamated with an adaptable complementary plant species. Silvi-pastoral systems are most important for increasing fodder production from marginal, sub-marginal and other wastelands. It comprises about 50 % of total land area. It involves planting of multipurpose trees in existing pastures / grazing lands or planting such trees on wasteland / denuded lands followed by sowing / planting of grasses and or legumes in between the inter-spaces of trees. Atul (1996) obtained 5-7 t/ha green fodder under silvipastoral system, where as it was only 3-4 t/ha with out a tree component. Sharma and Koranne (1988) found that maximum production of 300 g/m^2/annum under existing grasslands, while under modified network of silvipastoral system of *Digitaria decumbens+Bauhinia pupurea / Quercus incana/ Grewia optiva/ Celtis australis* production varied from 1800-2450 g/m^2/annum.

(D) Adoption of Agri-silvipastoral system: Under agri-silvicultural system multipurpose trees including fodder cum fuel trees can be grown in association with crops. Trees are pruned annually, yielding fodder as well as fuel wood. In addition to

annual pruning, few trees are also cut down in order to allow light penetration and minimization of competition with the crops. Under alley cropping system multipurpose trees like *Leucaena leucocephala* and even perennial pigeon pea etc. are pruned frequently to provide leaf fodder to get better crop production.

(E) Agri-horti-silvicultural system: Under this system besides growing fruit trees and fodder crops, fast growing NFTs like Leucaena leucocephala can be lopped two to three times in a year to provide fodder (2.5-3.0 t/ha) and fuel wood (1.8-2.5 t/ha). These fodder trees also provide some protection to fruit trees during summer and cold winters.

(F) Horti-pastoral system: In this system forage are grown in wide inter-row spaces of fruit trees for economic utilization of orchard lands. Horti-pasture up to an elevation of 2000 m is catching up with the orchadist. Forage from horti-pasture is consumed fresh and is also conserved as hay for winters. Sharma and Jindal (1989) found that introduction of Fescue in apple orchard gave 83.50 % higher fodder yield over local grasses in Shimla hills of Himachal Pradesh. There is considerable area under orchards in temperate regions. Inter spaces between fruit trees could be utilized for the production of fodder by growing perennial grasses and legumes. In U.P hills (Singh, 1995) reported that Rye grass and orchard grass are the best perennial grasses for introduction in apple orchards. Soil nitrogen build up was maximum with white clover introduction.

(G) Forage production on terrace risers or bunds: A non-competitive land use systems for forage production in the hills is to grow forage on terrace bunds and risers (Singh *et al.,* 1993_a). Forage grasses / legumes / fodder trees grown on terrace risers and bunds arrest the nutrient loss in run off water under high rainfall conditions of this region. This gives an added advantage to produce forage with out any fertilizer or manure.

6. Future Opportunities and Lessons Learnt

The process of documentation, validation, dissemination and practical applications are vital in effective re-integration and revitalization of traditional knowledge systems pertaining to fodder. Community participation in their traditional knowledge and experience has great significance especially regarding the nutritive value of tree fodder.

(i) Female farmers have sound traditional knowledge regarding nutritive value of different fodders and grasses. Community-led action research coupled with scientific

validation methodologies is important in blending people's knowledge. This enabled a positive shift in the attitude towards traditional fodder varieties by the various stakeholders.

(ii) Traditional feed and fodder species are more suitable for rain fed areas compared to new fodder varieties being introduced that need irrigation facilities and other requirements. Government policies as well as top down interventions can be counter productive if not based on the needs and requirements of livestock keepers as shift towards non-food cash crops, planting timber varieties in forests etc resulted in reduction in fodder resources for the livestock.

(iii) Documentation of traditional knowledge concerning plants, feed and fodder species has to be undertaken so that this knowledge is not lost and future generations can bank upon documented resource base. This needs concerted efforts, financial and human for a considerable period of time and can lead to revitalization of traditional knowledge systems both by individuals and as a collective, which in turn, can result in positive changes in their livelihood systems.

(iv) Lopping of branches of trees undertaken in traditional ways facilitates enhanced growth of branches leading to more fodder production demonstrating that the traditional practice of lopping of trees in forest areas does not harm the forest in any way.

(v) There is great scope for forest department to plant fodder yielding traditional trees with active community participation instead of growing timber yielding species.

(vi) This experience shows that the tribal community has been empowered to take back control over their own knowledge and related genetic resources, and utilize it in ways that are making a positive impact on their livelihoods. Therefore, community based institutions are best suited to conserve and propagate traditional species of feed and fodder.

CONCLUSIONS

Importance of forage production in maintaining food security as well as nutritional security has been felt since long. The overall scene of forage production is very alarming and corrective measures have to be taken to improve this problem. A comprehensive grazing policy needs to be formulated and both grazing and forage cultivation has to be

considered complementary to each other and simultaneous efforts are required to improve both. Fodder tree improvement programmes for higher leaf fodder have to be initiated. For the improvement of grasslands, its management needs to be considered holistically promoting interaction between grassland, livestock and grazing communities. Therefore, the vast natural resource can serve human society substantially, more particularly grazing communities. A favorable policy environment in terms of access to micro-credit and assured market will have to be provided and simultaneously there is need to address the socio-economic and technical constraints.

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