

## OPPORTUNITIES AND CHALLENGES OF FORAGE CULTIVATION IN ASSAM - A REVIEW

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### SUMMARY

Assam is basically an agricultural state and about 80 per cent of the people lives in villages. Agriculture and animal husbandry are the twin occupations upon which most of the rural people of Assam are dependent for their livelihood. Though, Assam as well as India has a substantial livestock population yet the production of milk and other livestock product is about the lowest in the world. In absence of sufficient grazing ground for maintaining cattle, sheep, goat on pasture, the importance of cultivation of forage crops to provide feed economically for production of milk, for draught animals need special emphasis. Improved package of practices based forage cultivation is still in its infancy stage in Assam and people generally depend on locally available forage. However, the grazing grounds are shrinking mainly due to population explosion which resulted in low availability of green forage making grazing animals malnourished both for maintenance and production. Nutrition is an integral part of livestock development. In dairy industry green grasses constitute the major ingredient of animal diet. Moreover, green grasses provide most of the essential vitamins and minerals required by the herbivorous animals. The effort made by the Animal Husbandry & Veterinary Department since 1960s to promote cultivation of high yielding fodder grasses in Assam met with negligible progress, although it is of paramount importance for the all-round development of livestock industry in the region. Scarcity of green grasses can greatly be reduced and cost of maintaining such animals in a commercial farm can be greatly reduced when cultivation of high yielding grasses *viz.* napier, hybrid napier, guinea, para grass, cowpea, maize, oats, teosinte, sorghum, subabul etc. are practiced within the farm premises. However, for selection of the type of grass to be cultivated in a particular farm yard for optimum performance, one should have a clear knowledge about the soil type. Animals are dependent on plants and plants on soil. Soil supplies all the essential micro and macro minerals required by the plant. Soil also supplies trapped atmospheric nitrogen to the plants. Thus soil makes the main natural media for cultivation of various plants including the fodder grasses. However, different fodder grasses needs different kinds of soil for their optimum growth. Efforts have been made to analyse the forage production, availability scenario and to suggest measures for ensuring maximum availability of fodder for sustaining livestock production in Assam.

**Key Words :** Assam, agriculture, livestock, forage production, grazing

In Assam, more than half of the population lives in villages and their main occupation is agriculture and livestock. Rice is the main crop in this region as out of 35 lakh ha, 23 lakh ha is under Ahu rice, Sali rice, etc. Sali rice alone occupies about 17 lakh ha. Most of the farmers go for sole cropping of rice, which remains unutilized during off-season. Livestock sector plays a crucial role in the overall growth of agriculture sector and gross domestic product of the country. The projected target for agriculture growth in five years plan cannot be met

without substantial growth in this sector. Deficit of the feed and fodder availability of the desired quality is major bottleneck restricting growth at desired level. It has been established that the cost of milk production can be significantly lowered by improving feeding system based on green fodder and replacing ingredients of concentrate with leaf meal and enriched complete feed block. But, cultivated fodder is limited in Assam as they are considered as no man's property and hence generally remains neglected (BIRTHAL *et al.*, 2006). Moreover, subsidies are also not provided by

the government for their cultivation. Most farmers remain unaware about the advantages of cultivation of forage crops and so they don't take any initiative for its cultivation.

Due to increased competition between various land uses for the cultivable land, further increase in the acreage of the fodder crops is not possible. Only way to meet the fodder needs of livestock is to look for increased productivity per unit land area and also through integration of fodder crops in the cropping system. This needed breakthrough in increasing productivity and sustaining availability of green forages is possible through tailor-made technological intervention in specific niches. Such prospect offers opportunity for the integration of the fodder based production technology based on SWOT analysis of its resource base (Capstaff *et al.*, 2018). The production of livestock particularly that of ruminants depends on the availability of quality feeds and fodder. Good quality grass/fodder helps in increased production on milk and meat at a cheaper rate. The cultivation of quality grass/fodder is rare and the quantity is inadequate. Because, the smaller land holdings are devoted to cultivation of food crops on first priority and the cultivation of fodder gets lower priority (North-East Veterinarian, 2006).

### **Measures to be taken for Increasing Availability of Fodder**

1. Availability of adequate quantity of feed and fodder for livestock is essential for improving the livestock productivity. Government of India has released funds in the last financial year under the Centrally Sponsored Scheme-National Livestock Mission for various components of fodder development both for production and post-harvest management, to assist the States in their endeavor to augment the availability of quality feed and fodder. The State Governments are requested to firm up their fodder requirement to avail the benefit of the National Livestock Mission (NLM). This Mission comprehensively addresses the feed and fodder issues. Further, as per the latest guidelines, MNREGA Scheme funds can also be utilized for improving availability of fodder (NLM-2018).

2. Though the availability of feed and fodder has improved in the last decade, still there exists a substantial gap between the demand and availability of fodder in the country, particularly during the lean periods and at the time of natural calamities including

droughts/floods. Following measures may be taken for ensuring maximum availability of fodder for sustaining livestock production:

### **Optimum utilization of land resources**

(a). The number of livestock is growing rapidly, but the grazing lands are gradually diminishing due to pressure on land for agricultural and non-agricultural uses. Most of the grazing lands have either been degraded or encroached upon restricting its availability for grazing. The area under fodder cultivation is limited to about 4% of the cropping area, and it has remained static for the last four decades. Owing to the importance of food crops and other cash crops, it is very unlikely that the area under fodder cultivation would increase substantially (Sarker *et al.*, 2017).

(b). Therefore, the need of the time is to adopt the practice of land use with multiple crops in a sustainable manner. Adopting Silvi-pastoral and Horti-pastoral models suitable to the area can help in substantially enhancing the availability of forage for the livestock. About 29 million ha area in the country falls under the category of open forests with less than 0.4 canopy density which can be developed with fodder trees. This huge land resource can be utilized for growing fodder, not only as an under-storey on the partially shaded ground without affecting standing trees. Similar development is also possible in the area under horticulture orchards. While the forest department can undertake silvi-pastoral plantations through the Joint Forest Management Committees, the horti-pastoral activities can be initiated by incentivizing the farmers who are owners of the orchards (Deka *et al.*, 2010).

(c). Emphasis should also be laid on the non-cropped areas in the agricultural land which are not cultivated viz. bunds, pond embankments, slopes of nala course, basins of plantation and horticultural crops, hedges with fodder crops etc (Goswami, 2003).

### **Improving production by using high yielding fodder varieties**

(a). Use of quality fodder seeds including dual purpose grains like bajra, maize and jowar etc., is essential for improving productivity.

(b). Inadequate availability of quality fodder seeds is a major constraint. Fodder seed production is not remunerative in many of the fodder crops. State

Governments may take initiatives to encourage farmers for taking up the production of high yielding varieties by providing sufficient incentives to farmers for production of fodder seeds of high yielding varieties by way of assured procurement with a remunerative price and assistance of inputs. State Governments can avail the benefit of the component of 'Fodder Seed Production, Procurement and Distribution' under the National Livestock Mission (NLM). Provisions under NFSM can also be utilized for this purpose (NLM-2018).

(c). Forage crops and their varieties suitable for waterlogged soil (Table 2)

d. Emphasis is also laid on availability of seeds of short duration and dual purpose crops, which can be used in emergency of drought / floods, for getting fodder in short period.

#### Adopting suitable crop combinations

(a). Productivity potential of most lands can be best utilized through not only crop rotation, but also adopting suitable crop combinations. An indicative list of possible production under different combinations of fodder crops.

(b). There is a need to disseminate the benefits of using high yielding quality fodder seeds and combination of crops among the farmers through front line demonstrations (FLD) and mini kits. For this purpose, funds available under RKVY, NFSM for coarse grain and National Livestock Mission (NLM) can be utilized (NLM-2018).

(c). Cultivation of Azolla may be taken up on large scale as it is highly nutritious, rich in protein

and ready within a week's period and available every day thereafter. For establishment of Azolla Production Units, States can avail the benefit for the same, besides utilizing funds under National Livestock Mission (NLM) and RKVY for the purpose (NLM-2018).

#### Improvement of grasslands / wastelands and other community lands

(a). The grassland development in non forest waste land, range land, grass land, non-arable land and forest land under NLM with 60% Central grant. States can avail benefit under the scheme. Besides, other marginal lands like roadside land, canal side land, land along the railway tracks, etc., may also be utilized for forage cultivation. The forest department can also undertake silvi-pastoral plantations in degraded forest areas through the Joint Forest Management Committees for use of the communities as explained earlier (Goswami, 2003).

(b). Wasteland like waterlogged areas, saline soils, sodic soils, etc., can also be utilized for cultivation of fodder varieties suitable for such areas (Karnik *et al.*, 1961).

#### Conservation and Utilization of Crop Residues / Bye-products

(a). Diversion of crop residues for industrial use, etc., may be restricted / banned.

(b). The States may prevent burning of agricultural residues in the fields, wastage or diversion of dry fodder

(c). The State Governments should make it a

TABLE 1  
Some of the cultivated fodder species for different regions of Assam

Type of Land	Rainfed	Irrigated
(a) Arid Tracts	Sorghum, Bajra, Moth bean, Guar, Lobia, Stylo spp., Clitoria ternatea.	Lucerne, Berseem, Oats, Maize, Sorghum, Bajra, Barley, Fodder cowpea
(b) Semi-dry	Bajra, Sorghum, Lobia, Moth, Guar, Velvet Bean, Field Bean, Guinea grass, Rhodes grass, <i>Setaria sphacelata</i> ,	Sorghum, Maize, Lobia, Teosinte, Lucerne, Berseem, Sarson, Turnips, Hybrid Napier, Oats, Sudan grass, Guinea grass
(c) Semi-wet	Dinanath Grass, Sorghum, Lobia, Rice Bean, Velvet Bean, Teosinte, Sunnhemp	Berseem, Oats, Sudan grass, Hybrid Napier grass, Cluster bean, Sorghum, Maize, Para grass, Rhodes, <i>Setaria</i> , Guinea grass
(d) Wet regions	Sorghum, Dinanath, Rice Bean, Coix	Berseem, Oats, Hybrid Napier, Guinea grass, Lucerne, Berseem, Sarson, Turnips, Hybrid Napier grass, Oats, <i>Setaria</i> , Para grass, Sorghum
(c) Lower hills	Sorghum, Lobia, Bajra, Velvet Bean, Field Bean, Guar, Perennial Sorghum, Fodder Maize	Maize, Sorghum, Oats, Berseem, Lucerne, Hybrid Napier grass, Sudan grass, <i>Setaria</i> , Rhodes

(Source : Annual Report 2016-17 of AICRP on Forage crops of ICAR).

priority programme to install chaff cutters and construction of manger in each and every household keeping cattle, in order to economize the use of available fodder. This measure can result in saving of upto about 30 per cent fodder (Kumar *et al.*, 2007).

(d). Though, in general, there is scarcity of green fodder in the country, but still in most places surplus green fodder is available during the monsoon. A major part of this surplus green fodder goes waste or is improperly stored, reducing its nutritional value. The farmers may be trained in the techniques like making silage, and be provided assistance under the Central or State schemes to facilitate silage making at household level (Kumar *et al.*, 2007).

(e). The availability of dry fodder can be enhanced by installation of low capacity Fodder block making units at each Primary Milk Cooperative / Panchayat level. Tractor mounted fodder block making units are now available, which can be operated in the fields to store surplus fodder / dry fodder. Agricultural residues can be densified with or without mixing it with easily available material like urea, molasses, butter milk, etc., for easy storage and use during the lean period (North-East Veterinarian, 2006).

(f). State Governments may promote use of crop residues and agricultural wastes / byproducts as animal feed by enriching it through available technologies like treatment of straw with urea and molasses along with silage. Green topping of sugarcane and other crops should be saved for use as fodder (Karnik *et al.*, 1961).

### Development of Fodder Banks

The Milk Cooperatives and Panchayat may be assisted for keeping surplus fodder for use during crisis periods. Gaushalas may be encouraged and trained to popularize high-yielding fodder and forage crops and supported for creating fodder banks through silage or fodder blocks and enrichment of crop

residues, etc. States with surplus dry fodder may indicate the quantity and type of fodder available with them, so that necessary arrangements for supply to scarcity area can be made (North-East Veterinarian, 2006).

### Strengthening of Extension activities

It has been seen that very less emphasis is given on extension activities for feed and fodder development. States may strengthen extension activities by associating KVKs, which must play a lead role in educating the farmers in maximizing fodder output with limited land and ensuring quality of feed. Progressive livestock farmers may be identified for training through KVKs / SAUs for growing improved varieties of fodder. The progressive farmers can in turn train other farmers. Use of leguminous crops with forage varieties may be popularized through frontline demonstrations through the KVKs. The Regional Fodder Stations of the Government of India have the latest varieties and recommended crop mixtures for the region (AFDP-2017).

### Convergence of fodder schemes

There is a need of low cost transportation of fodder from fodder Surplus States/ Regions to fodder Deficit States/ Regions. In case of natural calamity i.e. drought or flood, department immediately identifies fodder surplus States and deficit States. Fodder deficit States will enter into an agreement with fodder surplus States for buying the fodder. In the surplus States nearest Rail Heads are identified where fodder can be stacked for transportation. Similarly Rail Heads of deficit States where the fodder can be transported are also identified. Railway Authorities are roped in to transport the fodder for mitigating the effects of the calamity. This system can even be continued for normal times if the States so desired.

TABLE 2  
Suitable fodder variety for water logged soil condition

Soil condition	Suitable crop
Standing water	Almon grass ( <i>Echinochloa polypytachya</i> ), Para grass, Coix sps., <i>Iseilema laxum</i> , <i>Chloris gayana</i> , Signal grass, Karnal grass, Congosignal grass
Shallow water table	Teosinte ( <i>Zea mexicana</i> ), Shevary ( <i>Sesbania sesban</i> )
Temporary water logged soil drained in <i>Rabi</i> (winter) season	Sasuna ( <i>Medicago denticulata</i> ), Teera ( <i>Lathyrus sativus</i> ), Chatarimatri ( <i>Vicia sativa</i> ), Oats and Berseem
Riverine flood waterlogging	Sorghum (PC-6), Teosinte (TL-6)

(Source : Annual report-2015-16, AICRP on Forage Crops of ICAR).

This will reduce scarcity in some areas and earn revenue for others (Kumar *et al.*, 2010).

### Opportunities of forage cultivation

- Encouraging the establishment of grass-legume mixtures for maintaining permanent pastures for maximum utilization by livestock.
- Greater use of improved pasture forage crops and varieties, which are multi-cut type and highly productive.
- During lean period, tree tops i.e. browse plants can be utilized. In Assam, during the time of flood, they can be used.
- Crop residues are very much relished as feed by livestock. These include sorghum, maize, rice and millet stovers and straws. Others are groundnut, cowpea and cotton haulms. The legume residues, which are particularly high in crude protein content (about 12 to 20 %, with digestibility of about 69 to 80 %) are more readily available during the dry season, when the nutritive value of the other forage crops decline (Megersa *et al.*, 2017).
- Agro-industrial by-products, resulting from the agricultural processing industries, are often utilised as supplementary feeds to enhance the performance of animals.
- Periphery of ponds, risers, etc. can be utilized for growing perennial fodder crops.
- Below the canopy of trees such as Coconut, areca nut, etc., some perennial fodder crops can be grown. Partially shade loving fodder crops such as Guinea grass, Congo signal, etc. are suitable for growing.
- Inclusion of forage crops in the existing cropping system without disturbing it. Some of the examples of fodder crop utilization in the cropping system are :

(i). In Ahu rice-Sali rice cropping system, if a gap is there in between them, then short duration leguminous forage can be grown.

(ii). After Sali rice harvesting, field remains isolated. During this period from November-March, Oats and Khesari can be grown.

(iii). As intercropping, alongwith direct seeded Ahu rice, Cow pea can be grown.

(iv). Rice is generally cultivated giving bunds. In these bunds, perennial fodder crops can be grown. Those are utilized during Kharif season for feeding livestock.

- Forage and fodder conservation in the form of hay and silage, in particular, should be introduced and encouraged among livestock producers of all categories, in order to extend feed supplies for improved animal performance.
- More result-oriented research in the area of forage and fodder crops production should be intensified by the livestock research institutes and universities.
- The use of biotechnology to improve forage and fodder crop species should also be given serious consideration, with a view to providing adequate feed resources.

### Challenges of forage cultivation

There has been a sharp decline in area under permanent pastures and other grazing lands in Assam (from 240 thousand hectares in 1961-62 to 169 thousand hectares in 1998-99). There is hardly any area specifically earmarked to grow fodder for cattle, resulting in severe shortage of fodder (National Livestock Mission - 2018). Neither is there a plan to bring some areas under fodder cultivation. There are various problems regarding forage cultivation this are likely to be :

- Illegal encroachment of village grazing land for cultivation appears to have led to a decline in area under pasture and other grazing land.
- Small land holding size limiting cultivation of fodder. The entire land is put under crop production for human consumption.
- Non-availability of land due to increased competition between various land uses for the cultivable land.
- In Assam, forage is considered as no man's property and hence generally remains neglected.
- Government don't provide any kind of subsidy for forage cultivation and hence farmers cannot grow them, even if they are willing to cultivate.
- Most of the farmers remain unaware about the advantages of forage cultivation and so they don't take any initiative for its cultivation.
- As the population is increasing over the years and so to accommodate this ever-increasing population, land area for cultivation has become limited.
- Inadequate forage seed supply has been a serious drawback to pasture development. Where such seeds are available they have been of poor quality, while the good quality seeds have been difficult to obtain due to high cost.

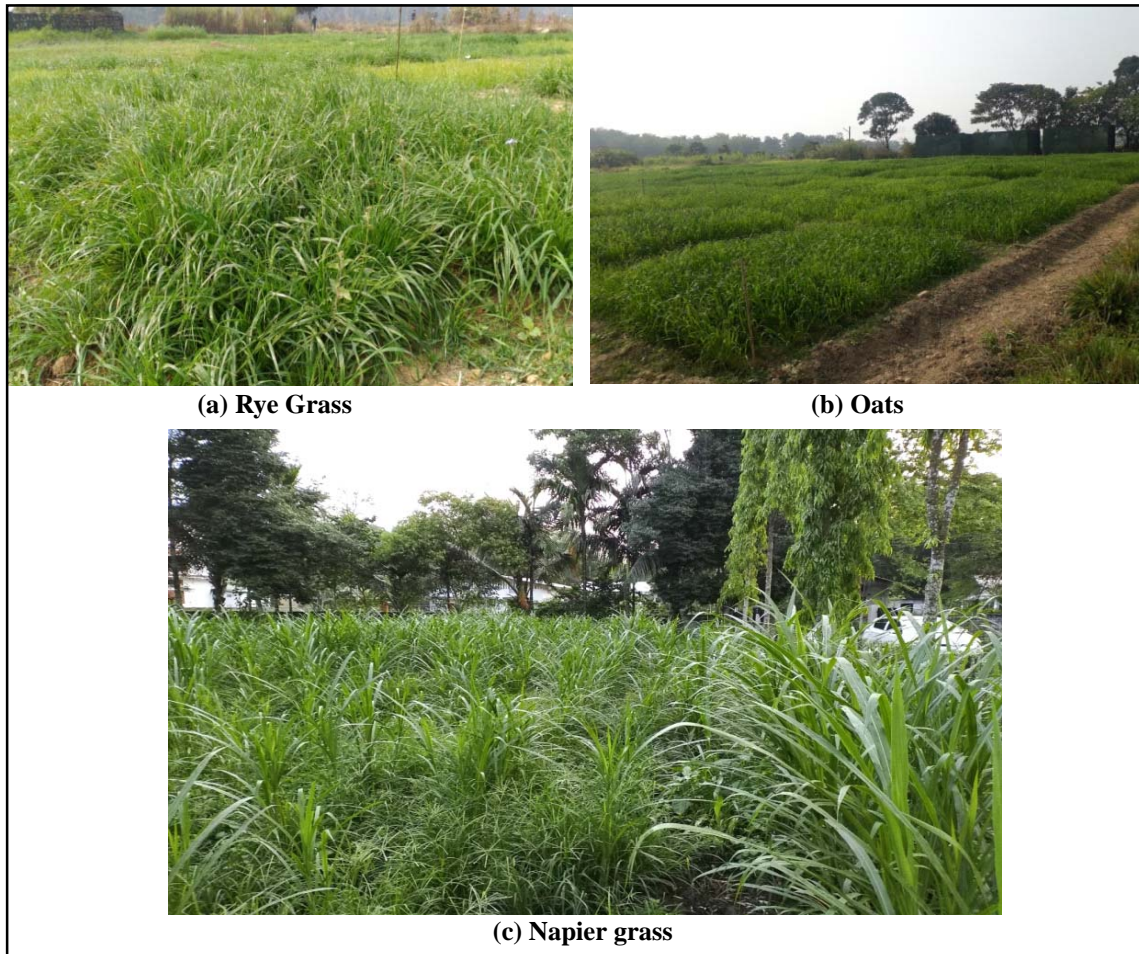


Fig. 1. Important cultivated Fodder/ Forage crops in Assam.

- Improper land clearing and seedbed preparation have been a limiting factor in good forage growth and establishment, as this tends to suffer from weed invasion in particular.
- Majority of the farmers are dependent on sole cropping and don't go for any kind of integration of other crops in the cropping system.
- Most of the farmers are small and marginal farmers in Assam and hence they don't have enough land area for forage cultivation.
- Non-utilization of unused area such as waste land, unproductive area, periphery of the pond and drainage area, bunds of rice-fields, etc.
- Lack of perception of farmers' to real need and poor research focus and planning.
- Inadequate monitoring of field works, feedback on failure, rate of adoption of the scientific knowhow imported through various trainings.

There is no compound feed manufacturer in the whole of the N.E. India. As a result the utilization

of non-conventional feed resources could not be maximized.

**Steps should be taken to increase the supply of feed and fodder.**

(a). Farmers can be encouraged to take up cultivation of green fodder crops on a commercial basis and should be provided with quality seed and other inputs.

(b). Since there is large seasonal and regional variation in the supply of fodder, arrangements should be made for collection, storage and transport of properly prepared fodder.

(c). The existing pastures and grazing lands have to be effectively preserved and developed to yield their full biological potential through control of free grazing, cultivation of more nutritious and high yielding grasses, supply of good quality grass seed etc.

(d). To overcome the problem of overgrazing, particularly in the forest areas, farmers should be

encouraged and educated to take up stall-feeding.

(e). Developing the culturable wasteland of the state to grow fodder for livestock is also very important.

(f). Suitable plan and strategy for cultivation of green fodder in the fallow land.

### CONCLUSION

Forage and fodder crops production is a very important component of farming systems, not only from the perspective of cereal and pulses production for human consumption, but also from the perspective of providing adequate feed for the livestock sub-sector of the economy. However, improvement is also needed in the production of fodder crops in order to meet the increasing demands of a growing livestock population. These demands can hardly be met without developing or adopting technologies that will enhance the yield and quality of the various forage and fodder crop species existing in the major agro-ecological zones of the country.

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