

Forage garden for encouraging potential fodder crops

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Livestock farming is a vital component of the rural based economy in India and provides livelihood to two-third of the rural community. India has large diversity in livestock and also provides employment to nearly 8.8% of the total population. Increasing health awareness, urbanization and socio-economic status will lead to more demand for food from livestock. Low livestock productivity and increased product prices are mainly due to insufficient availability of nutritious green and dry fodder round the year across the country. Fodder crops offer cost-effective, eco-friendly, resource efficient and sustainable sources to maintain livestock productivity and vigour in the long term. Nevertheless, the country is facing an 11.24% shortage in green fodder and 23.4% in dry matter, therefore fodder crops with high biomass and nutritional superiority can be the best choice for the livestock keepers. All India Coordinated Research Project on Forage Crops and Utilization has established more than 50 forage gardens across the country for sensitizing fodder crops and their high yielding varieties including annuals and perennials, and more awareness among farmers and livestock keepers.

Keywords: Annuals, Fodder crops, Forage garden, Perennials

IN India, >50 plants or tree species are being used as forage for livestock across the different agro-climatic zones of the country. However, only 30 plant species have been selected by the scientists to develop new high-yielding varieties and more than 360 high yielding varieties have been developed so far in annual and perennial crops in the country. Besides, these varieties have brought significant impact on fodder production and availability under lean phases and fodder crops are being used as new entrepreneurship under agri-business incubation centres. Therefore, establishment of forage gardens across the country might be a crucial step to promote fodder crops and provide best variety to the end users.

Genesis of forage garden

On the occasion of Golden Jubilee of AICRP on Forage Crops and Utilization, Jhansi (1970–2020), it was planned during National

Group Meet 2019 to establish 'Golden Jubilee Forage Gardens' at all the SAUs/SVUs/CAUs/Deemed Universities across the country in presence of ICAR dignitaries (Dr Trilochan Mohapatra, the then DG, ICAR and Secretary, DARE and Dr T. R. Sharma, DDG Crop Science). The main objective was to enhance awareness among farmers and livestock keepers along with students/government

officials towards fodder crops, their nutritional values, production level and other details. It was conceptualized to address the significance of fodder crops in Indian agriculture through livestock productivity and increasing milk and meat production in the country. In addition, a scientifically designed and uniform layout of forage garden was conceptualized, developed and shared with all the SAUs/ SVUs/



Forage garden at ZARS-Mandya (UAS, Bengaluru)
Source: AICRP-FCU, Mandya

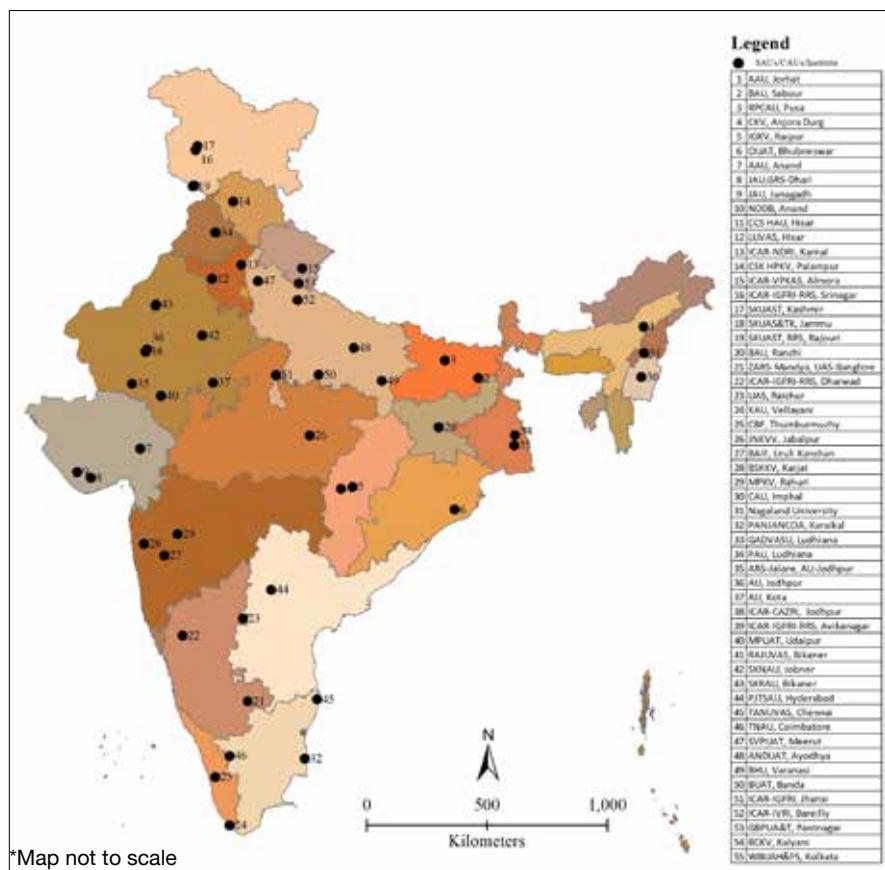
CAUs/ Deemed Universities. In this process, AICRP FCU unit located at ICAR-IGFRI, Jhansi acted as nodal agency and provided seeds of improved varieties of different fodder crops. Besides, package of practices, varietal information and their nutritive qualities were also provided to each centre. All such information was shared with common boards on each variety. In a span of 2 years, more than 50 forage gardens were established across the country and were inaugurated by Hon'ble Director General ICAR in presence of several Vice Chancellors/ DDGs/ADGs/Directors on 22nd December, 2020. Each forage garden has 50 improved varieties of forage crops including perennials with information regarding common name, botanical name, production potential, crude protein content as well as digestibility.

Forage garden design

Forage gardens located across the country have uniformity in plot size and number of genotypes. Each forage garden has 50 plots of uniform size. Among them, twenty plots are covered by perennial forage crops and their high yielding varieties with spacing of 40 × 30 cm. Other plots are grown by annual forage crops and their varieties with the spacing of 30 × 10 cm. However, each center has flexibility to increase the plot size, crop spacing and total forage garden area to make the garden more eye-catching, lucrative and technically sound based on their agro-ecological conditions.

Recent status

In the last two years, 50 plus forage gardens were established and maintained during both *rabi* and *kharif* seasons across the country ranging from high elevation of Jammu and Kashmir to seaside areas of Kerala and dry areas of western Rajasthan to high rainfall areas of Assam. The AICRP (FCU) coordinating unit, Jhansi continuously supplies the seeds of annual and rooted slips/stem cuttings of perennial crops to the centers during both *rabi* and *kharif* seasons. The SAUs/SVUs/CAUs/



Footprint of forage gardens across the Pan India (Source: AICRP-FCU, Jhansi)

NGOs/ICAR institutes where forage gardens are maintained are depicted on the map.

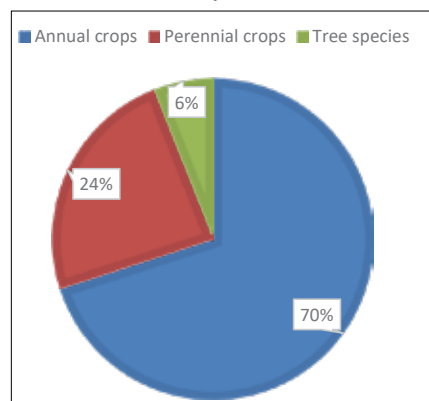
Major forage crops and varieties

Forage garden covers both annual and perennial crops being used as fodder and have high biomass and nutritional values. Under perennials, >15 plant species including tree/shrub species having high regeneration capability are established to provide high green biomass throughout the year under different agro-climatic conditions. Under annuals, mainly berseem, oat, lucerne, lathyrus in *rabi* season

whereas fodder maize, fodder sorghum, fodder pearl millet, fodder cowpea etc. were grown in *kharif* season. The perennial components of the garden are maintained throughout the year; however, annual crops are replaced season after season.

Table 1. Major fodder crops being used in forage garden establishment across the country

Crop type	Crops being used as fodder
Annual	Kharif crops: Fodder maize, sorghum, pearl millet, cowpea, rice bean, dinanath grass, guar; Rabi crops: Berseem, lucerne, fodder oats, rye grass, lathyrus
Perennial	Bajra Napier Hybrid, Anjan grass, Dhaman grass, Guinea grass, red clover, white clover, Subterranean clover, Nandi grass, Hedge lucerne, Dinanath grass, Dhawal grass, Sewan grass, Tall fescue, Sainfoin, Orchard grass, Timothy
Tree species	<i>Sesbania grandiflora</i> , <i>Erythrina indica</i> , <i>Leucaena</i> spp., <i>Moringa oleifera</i> , <i>Acacia nilotica</i> , <i>Acacia senegal</i> , <i>Albizia lebbek</i> , <i>Prosopis cineraria</i> , <i>Sesbania sesban</i>



Varietal contribution of forage crops

Forage garden footprints

In a span of two and half years, forage gardens located across the country have a significant impact on dissemination of forage crop varieties, promotion of perennial crops specially bajra-napier hybrids, lab-to-land demonstrations, and scientific knowledge towards a package of practices and relevant training programs to the farmers. More than 60,000 visitors' viz., livestock keepers, farmers, students, government officials, research associates etc. have visited the forage gardens located at 50 plus centers and were provided with the relevant information related to cultivation of forage crops and their nutritional qualities. Former Director General, ICAR and Secretary, DARE, Dr Trilochan Mohapatra and DDG (Crop Science), Dr T. R. Sharma and other dignitaries have appreciated the efforts to promote forage crops through gardens in the country.

Quality forage seeds and rooted slips are also being supplied to the farmers to increase green acreage in the region. For example, forage gardens located at Himalayan regions provide materials of fodder oat and rooted slips of tall fescue, *Seteria* grass, BN hybrid etc. CSK HPKV-Palampur center received a project 'Propagation of planting stock of perennial high yielding grass species, fodder trees and their further dissemination on farmers' fields as well as *Gosadan's* in the state, having a worth ₹5.54 crore from the state govt. to strengthen seedling/planting material production for improved grass, forage legume species and fodder trees and make available to the farmers. Likewise, BAU-Sabour distributed about 1.5 lakhs slips of Trishanker Grass, Guinea grass, BN hybrid, Para Grass, and >35 tonnes seeds of fodder sorghum, maize and cowpea to the farmers and dairy units under various districts of Bihar. In addition, more than 25 lakhs rooted slips of BN hybrid, and >1 lakhs slips of other perennial grasses such as Guinea grass, *Cenchrus*, Marvel grass, etc. were provided to Gothans/Goshalas, farmers, livestock keepers etc. and training programs for



Forage garden visit of Former DG, ICAR and Secretary DARE (Dr. Trilochan Mohapatra) at ICAR-IGFRI, Jhansi
(Source: AICRP-FCU, Jhansi)

farmers and extension workers were organized across the centers located in central and southern parts of the country. Forage gardens are playing key roles in replacing old varieties with the recently released high yielding varieties having nutritional superiority.

Insights for future

- Outspreading the forage gardens up to 100 locations covering all 28 states and 8 union territories.
- Awareness among end users for forage crop varieties that have high nutritional quality.
- Supplying the seed materials and delivering the package of practices to the farmers for any particular forage crops.
- Encouraging the non-conventional crops viz., spineless cactus, fodder

sugarcane, fodder sugar beet etc. and dissemination of scientific knowledge related to fodder crops.

SUMMARY

Livestock population is significantly increasing in the country and their feed and nutritional demand can be met by diverse cropping systems based on fodder crops, varietal diversification and increased fodder productivity. As India is facing acute shortage of green and dry fodder, forage gardens can act as ambassador of forage crops in different agro climatic zones of the country. These gardens are located in more than 50 centres and covering all agro climatic zones of the country. Each forage garden contains 50 crop varieties of annual, perennial, and tree species being used as fodder



Farmers and livestock keepers visit to forage garden at BAU, Ranchi
(Source: AICRP-FCU, Ranchi)

source. The seeds of the annual crops and rooted slips of perennial crops where viable seeds are not formed are supplied by AICRP (FCU) for both *rabi* and *kharif* seasons. Forage gardens are increasing awareness among farmers and livestock keepers to forage crops especially perennials. Information related to forage crops, their nutritional values, production level etc. is being

provided and seeds/ rooted slips/ stem cuttings of suitable varieties are being distributed to the farmers across the centres. Farmers are encouraged for the cultivation of perennial fodder crops to get green forage throughout the year or in lean periods. Likewise, stakeholders are promoted to grow fodder crops based on their livestock need, and cropping system. Therefore, forage

gardens are required in all the universities and national institutes to promote fodder crops amongst the stakeholder as these are the major source to meet livestock feed and nutritional demand.

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HANDBOOK OF INTEGRATED PEST MANAGEMENT

To reverse the loss of environmental resources and also to reduce biodiversity loss, the Government of India has Integrated Pest Management (IPM) as part of the National Agricultural Policy. Integrated Pest Management emphasizes the growth of a health crop with the least possible disruption to agro-ecosystems and encourages natural pest control mechanisms. IPM is not new – mechanical, cultural and biological tactics were used by farmers for hundreds of years before chemical pesticides became available. Besides, there are IPM techniques that have been developed more recently and are effective in suppressing pests without adversely affecting the environment.



The task of spreading the message of IPM across is tough due to poor awareness about the subject among people in line-departments as also among the farmers. The information on integrated pest management as a whole is scattered. This *Handbook* comprehensively deals with all the aspects of integrated pest management in field crops, horticultural crops under traditional, protected systems. Information on basic strategies and tactics of different methods of management including mass production of biocontrol agents, IPM policy and pesticide registration is provided in comprehensive form.

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TECHNICAL SPECIFICATIONS

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