Proven Fodder Technologies of ICAR-Indian Grassland and Fodder Research Institute

Jhansi (UP)-284003
**Technology- I: Round the year fodder production system (Irrigated situation)**

**Dimension:** The system comprises of raising seasonal legume fodder crops, inter-planted with perennial grasses (hybrid napier / guinea grass). Hybrid Napier based cropping system (Hybrid Napier + (Cowpea - Berseem + Mustard) has green fodder production potential of 273 t/ha and dry fodder potential of 44.3 t/ha per year under assured water supply (water requirement 1090 mm).

**Target area:** The system is suitable for large scale dairy farmers in Peri-urban and Milkshed areas of whole India except tropical region.

**Impact:** Technology can supply round the year good quality fodder (Cereal: legume, 67:33) which can sustain 8-10 ACU per ha (1 ACU= 350 kg bodyweight). The technology is being demonstrated in farmer’s field in Bundelkhand.

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**Technology- II : Round the year fodder production system (Rainfed situation)**

**Dimension:** The Institute has developed Subabul + Trispecific hybrid - Fodder sorghum + Pigeonpea based fodder production system for rainfed conditions. In this system, the *Pennisetum* Trispecific Hybrid (TSH) is planted in paired rows at 0.75 m x 0.5 m spacing. Subabul is planted at 50 cm plant to plant spacing in between pairs of TSH. The 3 m space between such two alleys is utilized for fodder sorghum + pigeonpea cropping system in 2:1 ratio at 30 cm.

**Target area:** Rainfed farmers of semi arid region (up to 500 mm rainfall)

**Impact:** This system has green fodder production potential of 53.3 t/ha and 13.28 t dry fodder besides producing 0.4 t/ha pigeon pea grain and 0.8 t/ha dry sticks having fuel value. Technology can sustain 2-3 ACUs with quality fodder. It also provides nutrient rich pulse for human consumption and fuel wood. It is also capable of prolonging the fodder availability up
States suitable for adoption of this technology: Maharashtra, Karnataka, Punjab, Haryana, AP, Telangana, UP, MP, Gujrat, Bihar, Jhankhand, Odisa CG, West Bengal

Technology-III : Fodder on Field boundary/Bunds/Channels: Non competitive land use

**Dimension:** Among different perennial cultivated grasses, Napier - bajra hybrid is most suitable for bunds of irrigated areas and Tri-specific hybrid (TSH), guinea grass, anjan grass and nandi grass are suitable under rainfed conditions.

**Target area:** All categories of farmers specially marginal and small farmers in different agro climatic regions of India

**Impact:** Fodder yield recorded from different farm demonstrations indicated 1.75 to 2.50 kg green fodder per meter per cut and on an average in 4 cuttings 7.0- 11.0 q green fodder per 100 metre bund length is possible in a year. Besides additional farm productivity, it also works as a guard crop for main crop, reduces runoff loss of water and controls soil erosion. Now this technology has been disseminated in 600 farmers field in different rural parts of country through Adarsh Chara Gaon (100), Mera Gaon Mera Gaurav (200) and NGOs (50), Gaushalas (10), NIFTD programme ( National Initiative on fodder technology demonstration) and KVKs (240) etc.
**Technology-IV: Silage for sustenance of livestock production**

**Dimension:** Silage is the fodder which is conserved by reducing pH through natural anaerobic fermentation and is used for feeding during scarcity period, drought or floods and for Utilizing surplus forage. The suitable crops are sorghum, maize and oat etc. During lean period feeding of silage acts as a green fodder and maintains livestock productivity.

**Target area:** All areas where farmers face problem in providing round the year fodder to the animals.

**Impact:** Sustain/Increase the livestock production by 10-15% during the scarcity of green fodder.

**Operational cost of silage:**
- Kaccha pit-Rs. 60-80/q
- Pakka pit- Rs. 40-50/q
- Polythene bag- Rs. 300-400/q

**Technology- V: Silvo-pasture model for highly degraded/ waste lands**

**Dimension:** Rainfed/ arid regions of the country have degraded land and constraints in arable farming. Animal husbandry is the main occupation of farmers after rainfed crops cultivation in these areas. Livestock is dependent on forage produced in rangeland areas. In such areas large scale grazing of animals results in quite low pasture production restricting availability during monsoon only. To solve the above said problem Silvipasture models (MPTS + Pasture) have been developed that produce higher forage per unit area per unit time as well as round the year than open pasture.

**Target area:** Forest area, degraded lands under rain-fed situation in semi-arid region of India (Rainfall 400-700 mm).

**Impact:** Degraded lands of India have constraints of soil and moisture making arable farming quite difficult. Different models of Silvo-pasture systems developed at IGFRI have good production potential of forage from 5-10 t DM/ha on degraded/rangelands of the country. Silvi-pasture systems can serve the purposes of forage and firewood production and ecosystem conservation.
1. **Ficus based silvipasture**  
   **Zone**: Tropical & Semi arid  
   **Rainfall**: 600-700 mm/annum  
   **Forage**: 12.3 t/ha DM/ha  
   **ACU**: 3 – 4/ha  
   Grass- *Chrysopogon fulvus*, *Cenchrus ciliaris* and *Panicum maximum*  
   Legume- *Clitoria ternatea* and *Stylosanthes seabrana*  
   **Fodder availability**  
   From grasses and legume- July to December (65-70 %)  
   Tree leaves- March to June (30-35 %)  

2. **Hardwickia based Silvi-pasture**  
   **Zone**: Semi arid  
   **Rainfall**: 600-700 mm/annum  
   **Forage**: 7-9 t DM/ha  
   **ACU**: 2 - 2.5/ha  
   Grass- *Chrysopogon fulvus*, *Cenchrus ciliaris* and *Panicum maximum*  
   Legume- *Stylosanthes seabrana*  
   **Fodder availability**  
   From grasses and legume- July to December (85-90 %)  
   Tree leaves- March to June (10-15 %)  

3. **Morus based Silvipasture**  
   **Zone**: Semi arid  
   **Rainfall**: 600-700 mm/annum  
   **Forage**: 11-13 t DM/ha  
   **ACU**: 3-4/ha  
   Grass- *Chrysopogon fulvus*, *Cenchrus ciliaris* and *Panicum maximum*  
   Legume- *Clitoria ternatea* and *Stylosanthes seabrana*  
   **Fodder availability**  
   From grasses and legume- July to December (65-70 %)  
   Tree leaves- March to June and September to November (30-35 %)  

4. **Acacia based silvipasture**  
   **Zone**: Semi arid  
   **Rainfall**: 600-700 mm/annum  
   **Forage**: 9-11 t DM/ha  
   **ACU**: 2.5-3/ha  
   Grass- *Chrysopogon fulvus*, *Cenchrus ciliaris* and *Panicum maximum*  
   Legume- *Clitoria ternatea* and *Stylosanthes seabrana*
**Fodder availability**
From grasses and legume - July to December (92-95 %)
Tree leaves- November to December (5-8 %)

![Acacia nilotica with grass and legume species](image)

**Technology- VI : Horti-pastoral model for higher income in rainfed ecosystem**

**Dimension:** Hortipasture system integrates pasture (grass and/or legumes) and fruit trees to fulfill the gap between demand and supply of fruit, fodder and fuel wood through utilizing moderately degraded land. IGFRI has developed Aonla and Guava based hortipasture systems for higher productivity. The range grasses used in the system are *Cenchrus ciliaris*, *Stylosanthes seabrana* and *Stylosanthes hamata*.

**Target area:** Well suited for poor soil with soil depth of 80-150 cm and annual rainfall of 700-800 mm.

**Impact:** During a period of 10 years it gives B:C ratio of 4-6 and supports 2-3 ACU/ha in a year. The technology is gaining acceptance among rainfed farmers in Bundelkhand, Maharashtra and Karnataka region and area is increasing in fruits particularly ber, aonla guava, sapota etc.

<table>
<thead>
<tr>
<th>Aonla with <em>Cenchrus ciliaris</em> and <em>Stylosanthes seabrana</em></th>
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<tbody>
<tr>
<td>Guava with <em>Cenchrus ciliaris</em> and <em>Stylosanthes hamata</em></td>
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Technology- VII: Fodder production in mango orchards

**Dimension:** In Karnataka, the common mango planting distance followed is 10 m by 10 m giving minimum 7-8 m inter space for introducing fodder crops. Karnataka has an estimated 90,000 ha in prime fruiting mango crop which if put under fodder crops (Bajra Napier Hybrid, Guinea, Perennial fodder sorghum) is estimated to produce 39.5 lakh tons of green fodder in a year meeting more than 7 lakh livestock’s green fodder requirement round the year.

**Target:** Mango (prime fruiting stage, above 4 years) based farming system in Karnataka, Maharashtra, Andhra-Pradesh, Uttar Pradesh, West Bengal, Bihar

**Impact:** It can provide green fodder of 146 t/ha/year with the gross value of Rs.175200=00 in irrigated condition. Besides it results in indirect economic benefits like saving cost of feed by 47%, increase in milk yield by 0.93 litres/ACU and labour saving by 0.91 mandays.

**Till now 28 ha (70.07 acre) area has been covered and 84 farmers are benefitted.** Lesson learnt from this success story is being replicated in other fruits and plantation crops like sapota, coconut, areca nut in Karnataka state from June 2016.
Technology- VIII: Community pastureland development

CPR development at SODA Rajasthan

**Dimension:** Indian subcontinent is characterized by tropical monsoon climate having degraded forests and under seasonal protection; grasses grow and produce a typical monsoonal savanna with low productivity levels. In this, the active growth of grasses in grazing land occurs only during monsoon season. The grazing intensity in such type of natural grassland is as high as 12.6 ACU/ha compared with 0.8 ACU/ha in developed countries. Productivity can be increased by developing model grass land with minimum input and management.

**Combination of range grasses and legumes:**
Cenchrus ciliaris, Cenchrus setigerus, Chrysopogon fulvus, Sehima nervosum, Heteropogon contortus, Dichanthium annulatum, Bothriochloa intermedia, Stylosanthes seabrana, Stylosanthes hamata, Clitoria ternatea, Macroptilium atropurpureum

**Target area:** Degraded land, community land and forest land available with different state governments in India

**Impact:** Productivity- 7.3 t DM/ha, carrying capacity: 2 ACU/ha, availability period of fodder from July to December. Grassland improvement was perfected by IGFRI by involving different stakeholders in 70 ha area in Soda (Rajasthan) and 50 ha forest area in Orcha, MP (Bundelkhand). Tree, grass and legume species varied based on its suitability in particular agro climatic region. These combinations increased grassland productivity and improved carrying capacity.

Pasture land site at Soda, Rajasthan with fodder trees, shrubs, grasses and legumes (70 ha)
**CPR development in U.P.**

1. **Jhansi District:**

   1. In Jhansi District: First of all, controlled grazing from stray animals (Chhutta Pashu) by developing technically designed trenches and bund around grassland.

   2. Sowing/planting of perennial grasses as Anjan (Cenchrus ciliaris and C. Setigerus) and planting of Bajra Napier Hybrid grass (cv.IGFRI 6). After 3 months of planting/sowing of grasses, the fodder was harvested by villagers for feeding to cattle and other livestock. From the single cutting from Bajra Napier Hybrid grass, 1000-1200 quintals of green fodder is harvested in normal condition, it is expected that in coming year it will provide green fodder about 1800-2000 quintals/ha/year. The fodder trees were also planted on the bund around the grassland and in between the grasslands with the purpose to provide fodder in lean period.

   3. The success achieved in development of these grasslands was widely published in news papers and received appreciation from state and central government.

2. **Lalitpur District:**

   IGFRI (Indian Grassland and fodder Research Institute, Jhansi), provided technical advice and planting material to line department of Lalitpur disytrict of U.P. Govt. Developed Grassland in Lalitpur District in 100 acre of...
land in Gaushala Kalyanpur in association of line department and Administration with U.P. Govt. during monsoon season of 2018.

**CPR development in Sheopur District (M.P.):**

Grassland Developed in 6 villages and each villages having approximate 2 ha of CPR land for the purpose.

1. Team have provided technical advice as well as demonstrated the methodology of grass sowing to rural people (already member of village group) regarding sowing of grasses and legume mixture in line. Our team also monitored performance of transplanted rooted slips of Bajra Napier Hybrid at all the sites.

2. Team performed regular rigorous monitoring for success of Model Grassland and demonstrate the methodology of grass sowing to rural people (already member of village group) and management with Self Help Group.
## Table 1: Promising drought tolerating varieties of grasses and cultivated fodder

<table>
<thead>
<tr>
<th>Crop</th>
<th>Varieties</th>
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<tbody>
<tr>
<td>Sorghum</td>
<td>Pusa Chari-1, CO-27, SSG 59-3 (Meethi Sudan), CSH-20MF (UPMCH- 1101), PAC 981, CSV–15</td>
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<tr>
<td>Bajra</td>
<td>Avika Bajra Chari (AVKB-19), Raj Bajra Chari-2, CO-8, APFB-2, PCB-164</td>
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<tr>
<td>Maize</td>
<td>Pratap Makka Chari 6</td>
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<tr>
<td>Oat</td>
<td>FOS-1/29, Bundel Jai-822, Bundel Jai 992 (JHO 99-2), JHO-2009-1</td>
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<tr>
<td>Cowpea</td>
<td>Bundel Lobia-1, Bundel Lobia-2 , S 450</td>
</tr>
<tr>
<td>Guar</td>
<td>Durgajay, Durgapura Safed, HFG-119, Bundel Guar- 1, Bundel Guar- 2, Bundel Guar- 3</td>
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<tr>
<td>Sem</td>
<td>Bundel Sem-1</td>
</tr>
<tr>
<td>NB hybrid</td>
<td>CO-1, NB-37</td>
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<tr>
<td>Dinanath grass</td>
<td>Bundel-1, Bundel-2, COD-1</td>
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<tr>
<td>Sudan grass</td>
<td>Meethi Sudan, Sweet Sudan Grass, Punjab Sudex Chari-1 (LY-250)</td>
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<tr>
<td>Guinea grass</td>
<td>Bundel Guinea-1 (JHGG-96-5), Bundel Guinea-2 (JHGG 04 –01)</td>
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<tr>
<td>Anjan grass</td>
<td>Bundel Anjan-1, CO-1 , Bundel Anjan-3</td>
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<tr>
<td>Motha dhaman grass</td>
<td>CAZRI-76, Marwar Dhaman (CAZRI-175)</td>
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<tr>
<td>Black spear grass</td>
<td>Bundel Lampa Ghas -1</td>
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</tbody>
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