

Advisory on Measures to be taken for Increasing Availability of Fodder to Mitigate the Effect of Natural Calamities

(Issued on 29.05.2015)

1. Availability of adequate quantity of feed and fodder for livestock is essential for improving livestock productivity. Government of India has released funds in the last financial year under the Centrally Sponsored Scheme for various components of fodder development both for production and post harvest management, and also distributed 'Minikits' of high yielding fodder varieties 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 recently launched National Livestock Mission (NLM), which has a **“Sub-Mission on Fodder Development”**. The Sub-Mission on Fodder Development comprehensively addresses the feed and fodder issues. The Department had issued the guidelines of the NLM, which is also available on the Department’s web-site (www.dahd.nic.in / www.dadf.gov.in) for ready reference. Department of Animal Husbandry is having 8 Regional Fodder Stations (**List of RFS with their jurisdictions is enclosed as Annexure-I**) located in different agro-climatic zones of the country are producing foundation seeds. These foundation seeds would be made available to the State Governments to multiply and produce certified seeds to be made available to animal rearers and dairy farmers for fodder production for which funds are available under NLM. Coarse cereals have been included under National Food Security Mission (NFSM) from 2014-15, which provides additional funds to all States except Goa, for production of coarse grain. The States also have sufficient funds and autonomy to undertake development of feed and fodder besides other agricultural and allied activities under the Rashtriya Krishi Vikas Yojana (RKVY). Further, as per the latest guidelines, MNREGA Scheme funds can also be utilized for improving availability of fodder.
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

3. India with above 2.3% of the land area of the world, is maintaining about 10.71% of the world's livestock. The availability, requirement and shortage of fodder as estimated by NABCONS in 2007 is as under:

(Dry matter in million tones)

S. No.	Type of fodder	Demand	Availability	Gap
1.	Dry Fodder	416	253	163 (40%)
2.	Green Fodder	222	143	79 (36%)
3.	Concentrate	53	23	30 (57%)

Source: NABCONS-2007.

4. 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.
5. 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.

Improving production by using high yielding fodder varieties

6. Use of quality fodder seeds including dual purpose grains like bajra, maize and jowar, etc., is essential for improving productivity. Some of the cultivated fodder species for different regions are indicated below (*list is illustrative*):

Type of Land	Rainfed	Irrigated
(a) Arid Tracts	Jowar, Bajra, Moth, Guar, Lobia	Lucerne, Berseem, Oats, Maize, Jowar, Bajra
(b) Semi-dry	Bajra, Jowar, Lobia, Moth, Guar, Velvet Bean, Field Bean, Moong	Jowar, Maize, Lobia, Teosinte, Lucerne, Berseem, Sarson, Turnips, Hybrid Napier, Oats, Sudan grass, Guinea grass, Setaria sphacelata, Rhodes
(c) Semi-wet	Dinanath Grass, Jowar, Lobia, Rice Bean, Velvet Bean, Teosinte, Sunnhemp	Berseem, Oats, Sudan grass, Hybrid Napier, Guar, Jowar, Maize, Para grass, Rhodes, Setaria
(d) Wet regions	Jowar, Dinanath, Rice Bean	Berseem, Oats, Hybrid Napier, Guinea, Lucerne, Berseem, Sarson, Turnips, Hybrid Napier, Oats, Setaria, Para grass, Jowar
(c) Lower hills	Jowar, Lobia, Bajra, Velvet Bean, Field Bean, Guar	Maize, Jowar, Oats, Berseem, Lucerne, Hybrid Napier, Sudan, Setaria, Rhodes

7. An illustrative list of trees, shrubs and grasses for development of pastures, suitable for different regions are enclosed in the **Annexure-II**.
8. 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 Procurement and Distribution' under the National Livestock Mission (NLM). Provisions under NFSM can also be utilized for this purpose.
9. Following high yielding fodder varieties may be considered for seed production programme for improving fodder yield per hectare in respect of existing area under fodder:

S. No.	Name of the fodder crop	Name of varieties
1	Maize	African tall, J-1006, Vijay composite.
2	Sorghum	SSG 59-3, PC-23, PC-9, PC-6, HC-136, MP Chari, CO-FS-29,
3	Hybrid Napier	CO-4, C-23, NB-21, PNB-84
4	Bajra	Giant, L-74, GFB-1, Bajra rajco, HC 20, AVKB-19.
5	Cowpea	EC-4216, NP-3,
6	Guar	BG-1, BG-2, BG-3, Bundel-2, HG 365, HG563, RG- 1003
7	Berseem	BL-I, BL-10
8	Oats	Kent, OS-6,
9	Chinese cabbage	

10. Emphasis be 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. States may ensure availability of such dual purpose quality seeds in consultation with respective Agricultural Universities.

Adopting suitable crop combinations

11. Productivity potential of most lands can be best utilised through not only crop rotation, but also adopting suitable crop combinations. An indicative list of possible production under different combinations of fodder crops is at **Annexure-III** which shows higher productivity for different crops.
12. 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 minikits. For this purpose, funds available under RKVY, NFSM for coarse grain and National Livestock Mission (NLM) can be utilized.
13. 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.

Improvement of grasslands / wastelands, and other community lands

14. This Department is implementing the component of grassland development in non-forest waste land, range land, grass land, non-arable land and forest land under NLM with 75% 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.
15. Wasteland like waterlogged areas, saline soils, sodic soils, etc., can also be utilized for cultivation of fodder varieties suitable for such areas.

Conservation and Utilization of Crop Residues / Bye-products

16. Diversion of crop residues for industrial use, etc., may be restricted / banned.
17. The Government of Haryana has imposed a ban on burning of agricultural refuse in the fields. Other States may also adopt similar controls to prevent wastage or diversion of dry fodder.
18. The State Governments should make it a 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% fodder.
19. 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.
20. 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 refuse 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.

21. State Governments may promote use of crop residues and agricultural wastes / by-products 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.

Development of Fodder Banks

22. 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.

Strengthening of Extension activities

23. 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.
24. 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.

Convergence of fodder schemes with MGNREGA Scheme

25. State Governments have been requested earlier to dovetail the fodder and feed development programmes with the MNREGA. The guidelines of MNREGA scheme provide for location-specific grassland development for ensuring adequate fodder supply. The guidelines for the new / additional works permitted under MNREGA scheme also prescribe various livestock related works, including construction of fodder trough (manger) and Azolla units. It is suggested that all the beneficiaries who receive or have received the chaff cutters under any of the Govt. schemes must be provided assistance under MNREGA for construction of fodder trough and Azolla.
26. 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 till where the fodder can be transported are 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. This will reduce scarcity in some areas and earn revenue for others.

Annexure-I

The list of Regional Fodder Station, covering different States is as under:-

S.N	Name of Regional Fodder Station with address	States covered	Telephone No.	Mobile No.	Email address
1	Sh. T. K. Vaid Director I/c Regional Fodder Station, Camp Office, 618/A, Gandhinagar, Jammu 180 004 (J&K)	Jammu& Kashmir, Uttrakhand, Himachal Pradesh and Hill Regions	01662-259184	09868092427	terindervaid@gmail.com
2	Dr. Mahesh Gobade Director I/c Regional Fodder Station, Dhamrod, Campus CCBF, Ankaleshwar, Gujarat.	Gujarat, Maharashtra and Daman & Diu	02629-290760	09586530661	rsfpdgujarat@yahoo.in
3	Sh. B. Singh, Director Regional Fodder Station, P.O. Pahari Sharif, Via Keshavgiri, Hyderabad 500005 (A.P).	Andhra Pradesh, Odissa and Chhattisgarh	08415-201034	08099801610	rsfphyd@rediffmail.com directorrsfphyd@gmail.com
4	Dr. P. Mahesh Director I/c Regional Fodder Station, Hesserghatta, Bangalore North 560088	Kerala, Karnataka , Goa and Lakshadweep	080-28466279	09845616268 09449926784	directorcfspf@yahoo.in directorcfspf@gmail.com
5	Sh. A. K. Yadav, Director I/c Regional Fodder Station, P.O. Dairy Farm, Via Red Hills, Chennai-52	Tamil Nadu, Andaman & Nicobar and Pudducherry	044-26310884	09445210582	rsfpdchennai@gmail.com
6	Sh. Yogendra kumar Director I/c Regional Fodder Station, P.O. Netaji Subhash Sanitorium, Distt. Nadia -741251(WB)	West Bengal, Bihar, Jharkhand, Sikkim, Tripura, Manipur, Meghalaya, Mizoram, Nagaland, Assam, Arunachal Pradesh	033-25898425	09674929141	rsfpd.kalyani@gmail.com
7	Sh. T. K. Vaid Director I/c Regional Fodder Station, P.O Textile Mills, Hissar-125002	Haryana, Punjab, Delhi, Chandigarh and Uttar Pradesh	01662-259184	09868092427	n.jagat23@gmail.com terindervaid@gmail.com
8	Dr.Santosh Director I/c Regional Fodder Station Suratgarh, Rajasthan-335804	Rajasthan, and Madhya Pradesh	01509-268047	09413553781	dir.rsfpdstg@gmail.com dirrsfpdstg@gmail.com

**LIST OF FORAGE GRASSES, LEGUMES, SHRUBS AND TREES FOR
GRASSLAND / GRAZING LAND IMPROVEMENT ON AGRO-ECOLOGICAL
BASIS**

Agro-eco Regions	Grasses	Legumes	Shrubs / Trees
Western Himalaya, cold arid with shallow skeletal soils	Agrostis spp., Poa alpina, Trisetum spicatum	Medicago sativa / subsp sativa, M. sativa, subsp fslcuta	Hippophae rhamonides
Western plains and Kaccha Peninsula, hot arid with desert and saline soils	Cenchrus ciliaris, C. setigerus (Sandy plains), Lasiurus scindicus (Sandy interdunal plains), Panicum turgidum (Sand dunes) Chloris gayana, Sporobolus marginatus (salt affected lands)	Cassia rotundifolia	Acacia nilotica, A. tortilis, Albizia lebbeck, Ailanthes excelsa, Dichrostachys cinerea, Prosopis cineraria, Ziziphus nummularia, p. juliflora, Salvadora oleoides, S. persica (Saline soil)
Deccan Plateau, hot arid with red and black soils	Andropogon gayanus, Chrysopogon fulvus (Red soil), Dichanthium annulatum, Bothriochloa intermedia (Black soil)	Clitoria ternatea, Stylosanthes hamata, S. scabra	Acacia nilotica, Albizia amara, A.lebbeck, Desmanthus virgatus, Leucaena leucocephala, Tamarindus indica
Northern plains and central highlands including Aravallis, hot semi-arid with Alluvium	Bothriochloa intermedia, Cenchrus ciliaris, Chrysopogon fulvus, Dichanthium annulatum, Sehima neroosum	Macroptilium atropurpureum, Stylosanthes hamata, S. scabra	Acacia nilotica, A. holosericea, Albizia amara, A.lebbeck, A. procera, Azairachta indica, Dichrostachys cinerea, Hardwickia binata, Leucaena leucocephala, Sesbania grandiflora, S. sesban
Central (Malwa) highlands, Gujarat plains & Kathiawar Peninsula, hot semi-arid with red loamy soils	Bothrichloa intermedia, Chloris gayana, Cynodon dactylon, Dichanthium annulatum, Pancium maximum	Arachis hagenbackii, Clitoria ternatea, Stylosanthes hamata, S.scabra	Albizia lebbeck, Artocarpus lackoocha, Dendrocalamus strictus, Gliricidia sepium, Faidherbia albida, Holoptelia integrifolia, Pithecellobium dulce

Deccan Plateau, hot semi-arid with shallow and medium black soils	Bothriochloa intermedia, Brachiaria decumbens, Cenchrus setigerus, Dichanthium annulatum, Pennisetum pedicellatum, Panicum maximum	Arachis hagenbackii, Stylosanthes hamata, S. scabra	Acacia nilotica, Albizia procera, Anogeissus pendula, Bauhinia variegata, B. purpurea, Leucaena leucocephala, Moringa oleifera, Pterocarpus marsupium, Sesbania sesban, Terminalia arjuna
Deccan (Telangan) Plateau and Eastern Ghats, hot semi-arid with red and black	Andropogon gayanus, Bothriochloa intermedia, Chrysopogon fulvus, Pennisetum pedicellatum, Dichanthium annulatum	Atylosia scarabaeoides, Macrotyloma axillare, Macroptilium atropurpureum, Stylosanthes scabra	Albizia lebbeck, Gliricida sepium, Faidherbia albida, Holopteaila integrofolia, Leucaena leucocephala
Eastern Ghats, TN uplands and Deccan (Karnataka) Plateau, hot semi-arid with red and black soils	Brachiaria decumbens, B. ruziziensis, Cynodon dactylon, Dichanthium annulatum, Bothriochloa intermedia	Arachis hagenbackii, A. glabrata, Stylosanthes guinensis, S. hamata	Ailanthus malabarica, albizia falcata, Erythrina variegata, E. poppygyana
Northern plains, hot sub-humid (dry with Alluvium derived soils	Bothriochloa intermedia, Cynodon dactylon, Chloris gayana, Dichanthium annulatum, Pennisetum pedicellatum	Clitoria ternatea, Macroptilium atropurpureum, Stylosanthes hamata	Albizia stipulata, Desmathus virgatus, Azadirachata indica, Ficus racemosa, Leucaena leucocephala, Robinia, pseudoacacia
Central Highlands (Malwa, Bundelkhand & Satpura) noth sub-humid with black and red soils	Andropogon gayanus, Pennisetum pedicellatum (red soil), Bothriochloa intermedia, Chrysopogon fulvus, Sehima nervosum, Dichanthium annulatum (black soil)	Atylosia scarabaeoides, Macroptilium atropurpureum, Stylosanthes hamata, S. scabra	Albizia amara, A. lebbeck, Anogeissus latifolia, A. pendula, Dichrostachys cinera, Hardwickia binata, Leucaena leucocephala
Eastern Palteau (Chhatisgarh), hot sub-humid with red	Bothriochloa intermedia, Cynodon dactylon dichanthium annulatum, Panicum maximum, Pennisetum pedicellatum, Setaria sphacelata	Arachis hagenbackii, Stylosanthes hamata	Bauhinia variegata, Dalbergia sissoo, Leucaena leucocephala, Moringa oleifera

Eastern (Chhotangapur) Plateau and Eastern Ghats hot sub-humid with red and laterite soils	Andropogon gayanus, Bothriochloa intermeida, chrysopogon fulvus, Pennisetum, pedicellatum, Urochloa mosambicensis	Atylosia scarabaeoides, Macroptilium atropurpureum, Macrotyloma axillare, Stylosanthes hamata	Artocarpus heterophyllus, A. lakoocha, Leucaena leucocephala, Moringa oleifera
Eastern plain, hot sub-humid (moist) with Alluvium derived soils	Brachiaria brizantha, B. decumbens, B. mutica, Cynodon dactylon, Paspalum notatum	Arachis glabrata, A. hagenbackii	Bauhinia variegata, Dalbergia latifolia, D. sissoo, Desmanthus virgatus, Pterocarpus marsupium
Western Him alayas, warm sub-humid with brown forest and Podzolic soils	Dactylis glomerata, Festuca rubra, Lolium perenne, Poa spp.	Trifolium pratense, T. repens, Lotus comiculatus	Quercus incana, Robinia pseudoacacia, Grewia optiva, Celtis australis, Fagus sylvatica, Celtis australis, Morus alba
Bengal and Assam plains, hot sub-humid (moist) to humid with Alluvium derived soils	Brachiaria decumbens, B. mutica, Paspalum notatum	Desmodium uncinatum, D. heterophyllum	Artocarpus heterophyllus, A. lakoocha, Ficus hookeri, F. nermoralis, Parkia roxburghii, Morus alba
Eastern Himalayas, warm per-humid with brown and red soils	Coix lacryma-jobi, Pennisetum clandestinum, Tripsacum dactyloides	Desmodium spp., Pueraria phaseoloides	Celtis australis, Ficus hookeri, F. nemoralis, F. semicordata
North-eastern Hills (Purvanchal), warm per-humid with red and laterite soils	Brachiaria decumbens, Pennisetum clandestinum, Tripsacum dactyloides	Arachis spp. Desmodium uncinatum	Dendrocalamus hamiltonii, Parkia roxburghii, Morus alba., Robinia pseudoacacia
Eastern Coastal plain, hot sub-humid to semi-arid with coastal Alluvium derived soils	Chloris gayana, Cynodon dactylon, Dichanthium annulatum, Pennisetum pedicellaum, Stenotaphrum dimidiatum, Urochloa mosambicensis	Stylosanthes guinensis	Ailanthes malabarica, Erythrina variegata, E. poeppigiana, Ficus retusa
Western Ghats and Coastal Plain, hot humid per humid laterite and Alluvium derived soils	Cynodon dactylon, Dichanthium annulatum, Panicum maximum, Pennisetum clandestinum, P. polystachyon, Setaria sphacelata	Clitoria ternatea, Desmodium heterophyllum, Pueraria thunbergiana, Stylosanthes hamata, S. guinensis	Ailanthes malabarica, Erythrina variegata

Islands of Andman Nicobar and Lakshdweep hot humid to per humid island with red loamy and sandy soils	Andropogon gayanus, Cynodon dactylon, Cenchrus ciliaris, Pennisetum pedicellatum, p. polystachyon, Brachiaria ruziziensis, Tripsacum laxum	Centrosema pubescens, Clitoria ternatea, Macroptilium atropurpureum, Stylosanthes guianensis, S. scabra	Bauhinia purpurea, Erythrina variegata, Leucaena leucocephala, Trema tomentosa, Pithecellobium dulce, Gliricidia sepium
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Stratified fodder-production potential of the best fodder crop combinations

Best 2-3 rotations at various Centres	Green fodder yield (q / ha)
(1) Jhansi	
1. Hybrid Napier + Cowpea - <i>Berseem</i> + <i>Sarson</i>	2,863
2. Maize + Cowpea - M.P. Chari - <i>Berseem</i> + <i>Sarson</i>	1,972
3. M.P. Chari - Turnips - Oats	
(2) Hyderabad	
1. Hybrid Napier + Cowpea - Hybrid Napier + Cowpea - Hybrid Napier + <i>Berseem</i>	1,334
2. Maize + Cowpea - <i>Bajra</i> + Cowpea + <i>Berseem</i>	1,267
3. <i>Madikattujonna</i> + Cowpea - Jonna (Ratoon) + Cowpea - <i>Berseem</i>	1,098
(3) Anand	
1. Hybrid Napier alone	2,877
2. Hybrid Napier + <i>Guar</i> - Lucerne	2,529
3. Maize + Cowpea - Maize - Cowpea - Oats - Maize + Cowpea	1,685
(4) Kalyani	
1. Maize + Cowpea - <i>P. Pedicellatum</i> - Oats	1,308
2. Maize + Cowpea - Rice Bean - <i>Berseem</i> + <i>Sarson</i>	1,115
3. Maize + Cowpea + <i>Jowar</i> + <i>Cowpea</i> - Oats	884
(5) Kanker	
1. Maize + Cowpea - Oats - <i>Bajra</i> + Cowpea	1,026
2. <i>Jowar</i> + Cowpea - <i>Berseem</i> + <i>Sarson</i> - Maize + Cowpea	960
3. <i>Bajra</i> + Cowpea - <i>Berseem</i> + <i>Sarson</i> - Maize + Cowpea	959
(6) Pantnagar	

1. Napier + <i>Berseem</i> intercropped and cut at the optimum time	2,141
2. Napier + <i>Berseem</i> intercropped and cut at the same time	1,998
3. Napier + Lucerne intercropped and cut at the optimum time	1,960
(7) Jorhat	
1. Hybrid Napier alone	1,442
2. Maize + Cowpea - Maize - <i>Jowar</i> - Oats	664
3. Guinea alone	607
(8) Hissar	
1. Napier - <i>Bajra</i> Hybrid intercropped with <i>Berseem</i>	2,117
2. Napier - <i>Bajra</i> Hybrid + Lucerne	1,760
3. <i>Berseem</i> + Japan Rape - <i>Jowar</i> + Cowpea - <i>Jowar</i> + Cowpea	1,705
(9) Coimbatore	
1. Sorghum + Cowpea - Maize + Cowpea - Maize + Cowpea	1,107
2. Maize + Cowpea - Maize + Cowpea - Maize + Cowpea	1,060
3. Guinea grass round the year	935
(10) Palampur	
1. Maize + Cowpea - Lucerne + Oats + <i>Sarson</i>	844
2. Maize + Cowpea - Turnip - Oats + Pea - Cowpea	833
3. M.P. Chari + Cowpea - Oats + Pea - Cowpea	782
(11) Jabalpur	
1. Hybrid Napier intercropped with Cowpea - <i>Berseem</i> and Cowpea	1,761
2. M.P. Chari - Cowpea - <i>Berseem</i> + <i>Sarson</i> - <i>Jowar</i> + Cowpea	1,686

Based on All-India Coordinated Project for Research on Forage Crops of ICAR