CONTENTS

EXECUTIVE SUMMARY

The present report encompasses the results of the coordinated trials conducted on Crop Improvement, Crop Production, Crop Protection as well as the Breeder seed production of different forage crops during kharif 2018 at different locations/centers in the country placed in five zones *viz*., Hill, North West, North East, Central and South zone. Weather data are also reported to correlate the growth and yield of forage crops with weather parameters at different sites during crop period. Results of other activities carried out by staff of AICRP units, in house breeding, tribal sub plan activities, forage technology demonstrations, research guidance, teaching, extension activities etc. were also provided.

A. FORAGE CROP IMPROVEMENT

In kharif 2018, Forage crop improvement trials were conducted across the country to identify the suitable entries for different zones and at national level. Various parameters considered included green forage yield, dry matter yield, crude protein yield, crude protein content, ADF, NDF, IVDMD, per day productivity, plant height, leafiness etc. A total of 15 multilocation trials comprising of 98 test entries along with their respective checks were conducted at 38 locations in the country. It included 9 trials under annual and 6 perennial trials. The annual crops include Fodder maize (IVT & CAVT 1&2), Fodder Pearlmillet (IVT, AVT-2 and AVT-2 seed), Cowpea (IVT & AVT-1), Rice bena (IVT& AVT-2 combined and seed) whereas under the perennial system, *Cenchrus ciliaris, Cencrhus setigerus,* Bajra xNapier hybrid, *Setaria, Pennisetum* hybrids, *Desmanthus* were evaluated. The forage trials on annuals were classified into three groups *viz*., Initial Varietal Trial (IVT), Advanced Varietal Trial Stage –1 (AVT-1) and Advanced Varietal Trial Stage-2 (AVT-2) whereas in perennials, same trial is being evaluated for three consecutive years. A total of 194 trials were allocated out of which data were received from 179 trials making a success rate of 92.26%. A total of 102 entries including 77 annual and 25 perennial along with national and zonal checks were evaluated.

A perusal of the results reported on different cultivated forage species revealed that some entries have recorded their superiority with respect to zonal/national check. These entries have been identified as promising entries and will be placed accordingly for further testing.

Forage Maize

IVT Maize: An initial varietal trial comprising of nineteen entries with three national checks *viz*., African Tall, J-1006 and CO-HM-8 (NC hybrid) was conducted at 23 locations- 4 each in hill, north-west and south zones, 5 in NE zone and 6 in central zone. For GFY, at all India level, entries TNFM-131-9, PFM-10 and at zonal level, entries TNFM-131-9, PFM-9, PFM-10, HPFM-9, ADV-6781, TSFM-16-10 in hill zone; PFM-9, AH-8070 in NW zone; TNFM-131-9; PFM-10 in NE zone; TNFM-131-9, ADV-6781, TSFM-16-10, AH-8070, CMVLBC-2 in south zone showed superiority over the best check. For DMY, entries TNFM-131-9, PFM-9, PFM-10, HPFM-9, ADV 6781, IMHBG-18KF-1, TSFM-16-10, IMHBG-18KF-2 in hill zone; PFM-9, PFM-10, ADV-6781, AH-8071R, SCH-201, AH-8070 in NW zone; TNFM-131-9, PFM-10 in NE zone; AH-8071R in central zone; ADV-6781 in south zone were superior to the best check. At all India level, entries TNFM-131-9, PFM-9, PFM-10, ADV-6781, AH-8071R, TSFM-16-10 and AH-8070 were superior over the best check. For green and dry fodder per day productivity, entry AH-8070 was best. For leafiness, IMHBG-18KF-1 and IMHBG-18KF-2 ranked joint first. For CPY, entry AH-8070 ranked first. For CP%, entries KDFM-3 and TSFM-16-10 ranked joint first (8.1%). IMHBG-18KF-2 for ADF, NDF and IVDMD was best performer.

COMBINED AVT-1 Maize & AVT-2 Maize: An advanced varietal trial **Combined first and Second Advanced Varietal Trial** comprising five entries [**03 for AVT-1: DMRH-1410, IMH-1527, TSFM-16-3**; and **02 for AVT-2: TSFM-15-5, ADV-6737**] and three national checks was conducted at 9 locations viz., 5 in NE and 4 in south zone. **For AVT-1,** three entries DMRH-1410, IMH 1527 and TSFM-16-3 were evaluated. For all the yield, growth and quality parameters, none of the entries could beat checks. **For AVT-2,** two entries TSFM-15-5 and ADV-6737 were evaluated. For GFY, in south zone ADV 6737 and TSFM-15-5 showed superiority of 4.3% and 4.0% respectively. For CPY and CP %, entry TSFM-15-5 ranked first.

Forage Pearl millet

IVT Pearl Millet: In initial varietal trial in forage Pearl millet, eleven entries along with one national check and respective zonal checks were evaluated at 18 centres which included 4 locations each in NW and NE and 7 in central and 3 in south zone. For GFY and DMY, entries ADV-160061, TSFB-17-7, K-25 and JKFBH-1521 in south zone showed superiority over best check. For dry forage production potential, entry ADV-160061 was best. For CPY and CP content, entry TSFB-17-7 ranked first. Entry JKFBH-1521 for NDF and IVDMD was best.

AVT-2 Pearl Millet & AVT-2 Pearl Millet (Seed): Two entries along with one national check and respective zonal checks were evaluated in second advanced varietal trial at 7 locations, 4 in northwest and 3 in south zone. For GFY, in south zone both entries TSFB-15-4, TSFB-15-8 excelled in performance as comparison to checks. For DMY, entry TSFB-15-4 was better in NW and south zone. For CPY & CP%, TSFB-15-4 ranked first (9.7q). Entries TSFB-15-8 and TSFB-15-4 ranked first and second respectively for NDF, ADF and IVDMD. For seed yield, in south zone entry TSFB-15-4 outperformed best check by a margin of 9.4%. Combining zones, entries TSFB-15-4 and TSFB-15-8 outyielded national checks by margins of 4.8 and 3.2% respectively.

Forage Cowpea

IVT Cowpea: Eight entries along with two national checks and respective zonal checks were evaluated in initial varietal trial at 28 locations which included 3 in hill, 7 in NE, and 6 each in NW, central and south zones. Entries RFC-2 in central zone; HFC-16-3 in south zone for GFY and entry RFC-2 in NE, central zone and entry MFC-16-1 in south zone for DMY showed superiority over best check. For green and dry fodder production potential, and CPY entry RFC-2 ranked first. For CP content, entry TSFC-17-3 and check UPC-5286 ranked joint first. Entry UPC-1801 ranked first for ADF, NDF and IVDMD.

AVT-1 Cowpea: In first advanced varietal trial, six entries along with two national checks and respective zonal checks were tested at 10 locations comprising of 4 in hill and 6 in south zone. For GFY, entry MFC-16-4 showed superiority of 22.7% over best check in hill zone. For plant height, entry MFC-16-3 and for leafiness, entry HFC-16-1 ranked first. For CPY, entry TSFC-16-1 ranked first while for CP%, national check Bundel Lobia-1 ranked first. Entry C-217 ranked first for ADF, NDF.

Forage Ricebean

IVT + AVT-2 RICE BEAN + IVT + AVT-2 RICE BEAN (seed): An initial varietal trial and advanced varietal trial-2 with five entries [4 entries JOR-18-1, JOR-18-2, JRBJ-08-4, KRB-11 for IVT and 1 entry for AVT-2 - JRBJ-07-4] along with two national checks was conducted at 7 locations.

For IVT four entries were evaluated. None of the entries could show appreciable superiority over the best check for GFY, DMY. For fodder production potential, entry KRB-11 for green forage and entry JOR-18-1 for DMY ranked first. For CPY and CP% entry JOR-18-1 ranked

first. Entry JRBJ-08-4 ranked first for ADF, NDF whereas for IVDMD JOR-18-1 ranked first. **For seed yield,** entry KRB-11 was 9.0% superior to the best check Bidhan -2 (8.9q).
In AVT-2, single entry JRBJ-07-4 was evaluated. For GFY and DMY, entry JRBJ-07-4 was slightly below par to national check Bidhan Ricebean 1. For green and dry matter per day productivity, plant height, CP % JRBJ-07-4 was better than best national check. For CPY, ADF, NDF and IVDMD, JRBJ-07-4 was almost at par with best national check. **For seed yield,** single entry JRBJ-07-4 was inferior to best check.

VT *Cenchrus ciliaris*-2015 (4th YEAR) (PERENNIAL)
The trial was established in 2015 with 6 entries along with 3 checks. Data in fourth year has been received from 13 centres, five each in NW and central and 3 in south zone. For GFY, IG-67-365 ranked first in central and south zone. For DMY, entries IG-67-365, RCCB-04-3 in central zone and entries IGFRI-96-79 and IG-67-365 in south zone showed superiority. For green and dry matter per day productivity, IG-67-365 ranked first followed by IGFRI-96-79. For CPY, IGFRI-96-79 and for CP% IG-67-365 ranked first. For plant height, IG-67-365 and for leafiness IGFRI-96-79 ranked first. For NDF, ADF, IVDMD, IGFRI-67-75 ranked first.

VT *Cenchrus setigerus* -2015 (4th YEAR) (PERENNIAL)
The trial was established in 2015 with 8 entries and one national check (CAZRI 76). Data in 4th year has been reported from 10 locations in 3 zones, *viz., 3 in* NW (3), 4 in Central and 3 in south zone. For GFY, entries RCSB-02-7, IGFRI-96-706, TNCS-265, IGFRI-97-395, IGFRI-96-593 in NW zone, entries TNCS-265, IGFRI-96-706, IGFRI-96-593 in south zone were superior. Combining all 3 zones, entries TNCS-265 and IGFRI-96-706 were superior by margin of 16.3% and 8.8% respectively over national check. For DMY, entries TNCS-265, RCSB-02-7, IGFRI-96-706, IGFRI-97-395 were superior in NW zone. In south zone, entries TNCS-265, IGFRI-96-706 and IGFRI-96-593 were superior. For green fodder per day productivity, IGFRI-96-706 ranked first. For plant height, CAZRI-2397 and for leafiness IGFRI-96-593 was best performers. For CPY, entry TNCS-265 performed well. For CP%, ADF, NDF and IVDMD entry RCSB-02-60 ranked first.

VTBN-2015 (4th YEAR): (PERENNIAL)
The trial was established in 2015 with six entries and three national checks (CO-BN-5, NB-21, CO-3). Data in 4th year has been reported from 17 locations which included 2 each in hill and NW zones, 3 in NE zone and 5 each in central and south zones. For GFY, BNH-14 in hill zone, TNCN-1280 in NW zone, check CO-3 in NE zone was best. In central zone, entries BNH-11, BNH-12, TNCN-1280, PBN-351were superior to best check CO-3. In south zone, BNH-14, BNH-11, BNH-22 were superior to best check CO-(BN)-5. Combining all zones, entries BNH-11 (15.4%), BNH-14 (11.3%), TNCN-1280 (8.2%), BNH-12 (5.4%), PBN-351 (5.3%) were superior over the best check. For DMY, BNH-14 was best performer in hill zone. In NW zone, BNH-12, TNCN-1280, BNH-14 performed better than check CO-BN-5. In NE zone, check CO-3 was best. In central zone, BNH-11, PBN-351, BNH-14, BHN-12 were superior. In south zone, entries BNH-14, BNH-11, BNH-22 were superior. Combining all zones, entries BNH-11 (15.9%), BNH-14 (12.2%), PBN-351 (9.7%) were superior over best check CO-3. For per day productivity, BNH-14 was best for green whereas, entry BNH-11 for dry forage. For CPY, BNH-11 followed by PBN 351 were best performers. National checks were best performers for CP%, ADF, NDF and IVDMD.

VT *SETARIA* GRASS -2015 (4th YEAR) (PERENNIAL)
The trial was established in 2015 with three entries S-4, S-6 and S-25 along with three checks PSS-1, S-92 and S-18. Entry S-25 was top performer for GFY and CPY. For DMY, check PSS-1 was best. For crude protein content, S-6 ranked first (7.5%).

VT PENNISETUM HYBRIDS-2015 (4th YEAR): *(P. glaucum x P. squamulatum)* (PERENNIAL)
The trial was established in 2015. For GFY and DMY, entry IGPISH-1 ranked first with 433.8q and 129.3q respectively. It was followed by IGPISH-5 with 342.4 q/ha and 114.1 q/ha green and dry fodder yield respectively. For CPY, entry IGPISH-1 was best followed by IGPISH-5. For CP%, entry IGPISH-7 was best. For plant height, entry IGPISH-6 ranked first. For leaf stem ratio, entry IGPISH-1 was best followed by IGPISH-7.

VT *DESMANTHUS* - 2016 (3rd YEAR) (PERENNIAL)
The trial was established in 2016. Results were reported from 11 locations in 4 zones for 5 entries and one check Desmanthus CO-1. It included 4 locations each in south and central zone and 1 in NE and 2 in NW zone. For GFY and DMY, entry TND-1308 ranked first in all zones and at all India level showing 11.4% to 23.3% superiority for GFY and 7.3% to 23.7% for DMY. Entry TND-1309 also showed superiority of 10.6% in south zone for GFY over the check. For green and dry per day productivity, crude protein yield entry TND-1308 was best. While for CP content, ADF, NDF and IVDMD, entry TND-1309 was best.

B. FORAGE CROP PRODUCTION

The programme on forage crop production was conducted at 20 locations during Kharif season. In total 15 experiments were conducted, out of which 6 in coordinated, 2 AVT trials and 7 in location specific mode with the aim to generate region specific forage production technologies for different growing condition.
Research aspect consisted of de-toping of maize before physiological maturity for additional fodder availability, performance top feeds under varying planting geometry, nutrient management in genotypes of B x Napier hybrid, INM in teosinte + rice bean intercropping system, new generation herbicides for forage maize, screening of genotypes of fodder pearl millet and resource management in rice-oat cropping system under sodic soils. Besides above, development of climate resilient production technologies for food-fodder based cropping systems, carbon sequestration studies, intensive forage production through Agase based cropping system in south zone, and standardization of seed priming technique for enhancing productivity of forage maize were also studied. Exploratory trials on possibility of silage of paddy straw and sugarcane tops with different additives and suitable cutting stage and chemical spray economic seed production of fodder cowpea were conducted. From the trials, relevant technologies have been identified and relevant database generated is presented hereunder;

<u>COORDINATED TRIALS</u>

CS-15-AST-4: Development of climate resilient production technologies on productivity and economic of food-fodder based cropping systems
The field experiment was conducted at Pantnagar, Ranchi, Kalyani, and Jabalpur to find out the suitable climate resilient production technology for higher profitability of grain-fodder based cropping systems. Maize (baby corn) – berseem – sorghum (fodder) proved superior. Minimum tillage single pass of cultivator + sowing with seed drill and Conventional tillage remained proved significantly superior to other treatments.

K15- AST- 10C:- Intensive forage production through Agase based (*Sesbania grandiflora*) cropping system under protective irrigation

The experiment was conducted at Mandya & Vellayani with objective to study the effect of cropping system on fodder yield, quality economic parameters and & soil fertility. On locational mean basis, Napier Bajra hybrid with Agase (2:1) proved superior in terms of GFY and DFY.

K-16-AST-2: Effect of different techniques of seed priming on productivity of forage maize

The trial was conducted at Urulikanchan, Anand, Jabalpur, Kalyani and Bhubaneswar to study the effects of seed priming methods on germination, yield and economics of forage maize. The results of third year on locational mean basis indicated that all the treatments improved the green and dry biomass yield significantly over control.

K-17-AST-1: Studies on performance of top feeds under varied planting geometry with and without intercrop

The was initiated during 2017 at three locations in South Zone to assess the performance of different plant species as top feed, standardize their plant population under sole and intercropping system for green quality forage yield. Intercropping of Napier Bajra Hybrid grass + top feed species proved better than sole. Planting Geometry consisting of top feed species at 2m x 0.5m spacing proved most suitable.

K-17-AST-3: Effect of new generation herbicides on weeds and forage yield of forage maize.

The trial was conducted at Jabalpur, Raipur, Urulikanchan, Rahuri and Anand in central zone and at Ranchi, and Faizabad in North east zone with the objective to study the associated weed flora and identify suitable dose of new post emergence herbicides for fodder maize. Tembotrione + Atrazine @120g+ 250g/ha at 20 DAS and Topramezone + Atrazine @35g+ 250g/ha at 20 DAS treatments proved better. It also recorded lowest weed index and higher net return and B:C ratio.

K-18-AST-2: Evaluation of fodder value of maize varieties as influenced by nitrogen levels and de-toping before physiological maturity.

The field trial was conducted at eight locations to assess the influence of nitrogen on yield parameter and yield of maize varieties and economics as well as nutritive value of de-topped maize stem. Detopping produced additionally 70.8 and 62.5 q GFY in fodder and grain type varieties. However, no de-toping proved better and recorded higher net monetary return and B:C ratio.

<u>Location Specific Trials</u>

K-15-AST-5 L: Studies on carbon sequestration in subabul (*Leucaena leucocephala*) based silvi-pastoral cropping system under rain fed agriculture

The trial was conducted at Hyderabad with the objective to study the organic matter input to soil through *Leucaena* based perennial fodder cropping system and to study organic matter partitioning added through the ROTH-C in existing Subabul based Cropping system.

Total CO_2 sequestered by the silvi-pastoral cropping system was significantly highest APBN-1 alone or along with *Desmanthus* and *Stylo* intercrops. Treatments involving APBN-1 as intercrop recorded highest total carbon sequestration.

K-15-AST-6L: Nutrient management in genotypes of B x Napier hybrid.
The field experiment was initiated at Rahuri to find out the optimum fertilizer dose for BxN Hybrid genotypes. Application of 150 % RDF (225:75:60 Kg NPK ha^{-1}) significantly improved the growth and yield. Phule Gunwant recorded significantly better growth parameters.

K-15 AST-8-7L: Screening of genotypes of fodder bajra under sodic soil
The experiment was conducted at Faizabad centre to screen the fodder pearl millet entries for their performance under sodic condition. NDFB-939 was superior in all growth, yield and monetary terms.

K-17-AST-4L: Effect of Teosinte + Rice bean intercropping system and INM on succeeding Kharif rice
A field experiment was initiated at Jorhat to study the productivity and economics of rice based food - forage cropping system as influenced by integrated nutrient management and planting geometry of Teosinte + rice bean intercropping systems. Highest GFEY of the system was recorded in Teosinte + Rice bean intercropping at 3:3 row ratio. INM with 50% RDF + 50% N through Vermicompost recorded the highest GFEY and CP yield.

AVT-2 Trials
K-18-AST-3: Effect of nitrogen levels on forage yield of promising entries of forage hybrid maize
A field trial (AVTM-2) was conducted at four locations; two in North East Zone and two in South Zone to find out the response of promising entries of forage hybrid maize to graded doses of nitrogen. The study was undertaken with two entries namely, 2 national and one Hybrid check under influence of five levels of nitrogen 0, 40, 80, 120 and 160 Kg/ ha). In North East, South as well as overall mean basis, no entry could surpass the national checks in terms of green, dry **or CP yields.** The growth parameters, herbage yield and crude protein yield increased consistently with increasing level of nitrogen up to 120 Kg N/ha**.**

K-18-AST-4: Effect of nitrogen levels on forage yield of promising entries of forage pearl millet (AVTPM-2-1)
A field trial AVTPM-2 was conducted to at four locations; two in North West Zone and two in South Zone with two entries, one national check and two zonal checks. All the entries were tested under four level of nitrogen application i.e. 0, 30, 60 and 90 kg/ha. In North West Zone and overall mean basis, no entry could surpass the national check or Zonal checks. In south zone entry TSFB-15-4 produced maximum GFY and DMY. The growth parameters, herbage yield and crude protein yield increased consistently with increasing level of nitrogen up to 90 Kg N/ha.

C. FORAGE CROP PROTECTION
In Forage crop protection 6 experiments were conducted at 6 locations. Research aspect consisted of monitoring of pests and diseases in kharif forage crops ecosystem, evaluation of breeding material for pest and disease resistance and development of suitable crop protection technologies for pests and diseases of economic importance in different fodder crops.

PPT 1: Monitoring of diseases and insect pests in kharif forage crops ecosystem

During *kharif* 2018, study of population dynamics of important diseases and insect pest in *kharif* forages (sorghum, maize, bajra and cowpea and Bajra X Napier hybrids) was carried out at several locations.

Ludhiana

In Pearl millet, Leaf blast on variety FBC-16 started appearing in the first week of August and progressed at alarming rate till end of September.The incidence of downy mildew was observed on FBC-16 from 1st week of August upto end of September with maximum disease incidence of 33.5 percent. In Sorghum, Grey leaf spot appeared on SL-44 variety in the first week of August and progressed slowly upto last week of September with 29.5 percent disease severity. The occurrence of zonate leaf spot on SL-44 variety of sorghum was very less i.e. 10.0 per cent. Anthracnose on SL-44 variety was observed from last week of July upto last week of September with maximum disease severity of 49.5 percent. In maize, leaf blight appeared in the end of July on J-1006 variety and progressed slowly upto end of September with severity of 55.0 percent.

Entomological observations

At Ludhiana, The population of sorghum shoot fly started appearing in the month of June (25th SMW) and it was recorded on young seedlings of sorghum entries. The attack of this pest starts after one week of sowing and was reported to be in range of 10-75 % deadhearts in sorghum across different meteorological weeks. The stem borer population also started appearing in the month of June and peak population was observed in the month of June-July in both maize and sorghum with slightly higher pest incidence on sorghum. The sporadic attack of rice grasshopper in pearl millet, Bajra X Napier hybrids was recorded in the month of July. In Bajra X Napier hybrids, minor attack of cotton grey weevil was also recorded during rainy and post rainy season. The spotted pod borer, *Maruca vitrata* in cowpea was observed in different entries of cowpea. It was reported in the month of September.

Dharwad: In cowpea, *Aphis craccivora* population was active during 30th to 35th Standard Meteorological Week (SMW) and reached peak population of 610.2 on 33rd SMW. Hairy caterpillar *Spilosoma obliqua* was highest of 5.4/plant on 30th SMW. Cowpea yellow mosaic virus was observed on cowpea and highest incidence of 42.80% was noticed during 32nd SMW.

Palampur: Wilt-root rot complex (55%) and leaf spots & blight (45%) were the major diseases of cowpea, whereas pod borer and aphids were also observed with mild intensity (10%). In Maize, leaf bight (22%) and BLSB (15%) were the major diseases along with stem borer with 7% incidence. Sorghum was severely infected with zonate leaf spot having 47 percent disease severity. Leaf blight (27%) in Bajra was observed as major disease.

Rahuri: The incidence of stem borer was negligible on maize (< 5%). In cowpea, low to moderate level of infestation of aphids per plant (4.67 to 15.67/plant) was noticed. The symptom of yellow mosaic virus was found low to moderate throughout the crop period. In pearl millet insect-pests and diseases were not observed.

Bhubaneswar: Wilt-root rot complex (28%) and leaf spots (30%) and Yellow mosaic virus (22%) were the major diseases of cowpea, whereas leaf defoliators and aphids were also observed with incidence of 31% and 15% respectively. In Maize, leaf bight (20%) and Banded leaf and sheath blight (29%) were the major diseases. Bajra was infected with leaf blight having 24 percent severity. In Rice bean, incidence of leaf defoliators (24%) and leaf spot (18%), root rot (44%) and Yellow mosaic virus (21%) was observed.

Jhansi: Defoliators (35%) and aphids (15%) were major insect-pests of cowpea. In Maize, leaf blight (55%) was major disease along with leaf folder damage of 15%. Bajra was severly infected with leaf blast with severity of as high as 60% and defoliators damage of 20%. Sorghum was severely infected with zonate leaf spot having 55 per cent disease severity.

PPT-2: Evaluation of kharif breeding materials for their resistance to diseases and insect-pests under natural conditions

Various contributed entries along with national and zonal checks were screened for the occurrence of diseases and insect pests under natural conditions.

IVT in Pearl Millet: At Rahuri, in IVTPM, no insect-pests and disease infestation/ incidence was noticed on pearl millet. **At Ludhiana**, all the entries showed moderately resistant disease reaction to leaf blast except FBL-1 and ADV160061 which were resistant. Downy mildew incidence was very less in all the entries except JKFBH 1521 and Giant bajra. All the entries showed low incidence of grasshopper per ten plants and its range was recorded to be 0.66 - 4.00. **At Bhubaneswar,** 13 entries of pearl millet were evaluated under IVT programme and out of those ADV160061, FBL-2, TSFB-17-7 and AFB-38 were resistant to both leaf blast as well as defoliators. Other entries were moderately resistant to leaf blight and defoliators. However the entries RBB-10 and FBL-3, showed susceptible reaction during the season. **At Jhansi,** entries FBL-1, FBL-2, AFB-38, K-25 and JPM-18-3 were moderately resistant to leaf blast and rest were in moderately susceptible to susceptible category.

AVT in Pearl Millet: In AVTPM-2, at Ludhiana, All entries showed moderately resistant reaction to leaf blast. Downy mildew incidence was very less in all the entries. All the entries showed very less incidence of grasshopper per ten plants and its range recorded was from 0.33 - 1.33. **In AVTPM-2 (Seed), at Ludhiana**, All entries showed moderately resistant disease reaction to leaf blast. Downy mildew incidence was very less. All the entries showed less incidence of grasshopper per ten plants and its range recorded was from 0.66-1.66.

IVT in cowpea: At Rahuri, all the entries showed less than 10 aphids/plant throughout the crop period. It indicate that all the entries were less susceptible to aphids. All the entries were resistant except HFC-16-3 and UPC-5286 which were susceptible and highly susceptible respectively. **At Palampur**, all the entries were found either susceptible or highly susceptible to wilt root rot complex. **At Ludhiana**, UPC-1801, MFC-16-1, PFC 31, Bundel Lobia-2, RFC-1-(RCC-46), HFC-16-3, Bundel Lobia-1 and UPC-5286, were moderately resistant to cowpea mosaic virus and rest entries were susceptible. **At Bhubaneswar,** in IVTC, UPC-1801, MFC-16-1 and UPC-5286 were resistant to both Root rot and yellow mosaic virus (YMV) and others were moderately resistant to Root rot. However the entries PFC 31, RFC-1 (RCC-46) and C-150 expressed susceptibility to YMV. **At Jhansi,** all the entries showed intermediate level of resistance against defoliators as compared to national checks.

AVT in cowpea: At Palampur, In case of AVTC-1 trial all the 9 entries each were found highly susceptible to root-rot/wilt complex.

IVT in Maize: At Rahuri, all the entries were found resistant to stem borer. For leaf blight, all the entries were resistant except BAIF Maize-6, which was found susceptible to leaf blight. **At Palampur,** all the entries were moderately resistant except IMHBG-18KF-1 and AH-8070, which were moderately susceptible. **At Ludhiana,** Vivek Maize Hybrid VMH 45 & IMHBG - 18KF-1 showed resistant disease reaction and rest of entries gave moderately resistant reaction to leaf blight of maize. Numerically higher per cent of deadhearts were recorded in ADV-6781 and lowest in TNFM 131-9, MF-2018, IMHBG-18KF-2 and KDFM-3. **At Bhubaneswar,** out of 22 IVTM entries evaluated, TNFM 131-9, PFM-9, PFM-10, HPFM -9, ADV 6781, IMHBG - 18KF-1, AH 8071R, TSFM-16-10, AH 8070, IMHBG-18KF-2, were found resistant to both leaf blight and banded leaf and sheath blight (BLSB) disease. Other entries showed moderate resistance.

However the entries viz. DFH-1, J-1006, MF-2018 were susceptible to BLSB and leaf blight whereas SCH-201 expressed moderate resistant to BLSB, but susceptible reaction to leaf blight disease. **At Jhansi,** entries DFH-1, ADV-6781, AFH–6, MF–2018, Star-111, AH-8070, CMVLBC-2 and KDFM-3 were moderately resistant to leaf blight and rest of the entries were in susceptible to moderately susceptible category.

Combined Advanced Varietal Trial in Maize (CAVTM-1 & 2): At Bhubaneswar, ADV-6737, IMH-1527, J-1006 and DMRH-1410 were found resistant to both leaf blight and banded leaf and sheath blight and others were moderately resistant except CO HM-8 which was susceptible to both leaf blight and banded leaf and sheath blight.

VT-Setaria: At Palampur, 6 entries of Setaria were evaluated for leaf spot and all the entries were found Resistant. The disease on these entries was very low i.e less than 10%.

VT-BxN: At Palampur, 9 entries of BxN were evaluated for leaf spot and all the entries were found Resistant. The disease on these entries was very low i.e. less than 10 per cent.

PPT-21: Integrated management of BLSB of forage maize (modified)
The experiment was conducted at Palampur and Bhubaneswar. Seed treatment with carbendazim followed by two foliar sprays with tryfloxystrobin + tebuconazole was found highly effective at both locations with 69.2 % disease control and 10.6% increase in yield over check at Palampur and 82.5% disease control and 21.2% increase in yield over check at Bhubaneswar.

PPT-22: Integrated disease management of foliar diseases of forage sorghum
The experiment was conducted at Palampur and Ludhiana. At Palampur, seed treatment with carbendazim followed by two foliar sprays of propiconazole was found highly effective which gave 75.9% disease control with 14.4% increase in the yield over check. At Ludhiana, among all the treatments, maximum anthracnose disease control of 45.36 and 38.62 percent was observed in seed treatment with carbendazim @ 2g/kg seed + one spray each with neem bio-pesticide (Achook) @ 3% and propiconazole @ 1g/l. In case of grey leaf spot, same treatment showed minimum disease severity (18.0 %) with percent disease control of 37.93 as compare to check at Ludhiana.

PPT-23: Management of downy mildew of pearl millet using bioagents
The experiment was conducted at Ludhiana. The downy mildew incidence was observed very less in treatment involving seed treatment with *Bacillus subtilis* @ 5g/kg seed + two foliar sprays of *Bacillus subtilis* @ 5g/l with 16.00 % disease incidence as compare to check (32.93 %). Green fodder yield was also maximum (393.39 q/ha) in the same treatment as compared to check (243.24 q/ha).

PPT-25: Non-chemical management of *Helminthosporium* leaf blight in fodder maize
The experiment was conducted at Ludhiana. Leaf blight severity was observed very less in treatment involving two foliar sprays of chitosan @ 0.05% at 10 days interval followed by two foliar sprays of *Murraya koenigii* @ 3.0% at 10 days interval, with 21.50 and 26.00 percent respectively and 49.6 and 39.07 percent disease control as compared to check (42.67 %). Maximum green fodder yield was recorded in both the treatments i.e. 573.89 and 557.50 q/ha respectively as compared to check 404.44 q/ha.

D. FORAGE CROPS BREEDER SEED PRODUCTION

In *Kharif*-2018, the indent for Breeder Seed Production of 87.94q (Indent year Kharif 2019) was received from DAC, GOI for 8 varieties of four forage crops *viz*., fodder Maize, Pearl millet, rice bean and f Cowpea. It was allocated to seven SAUs/ICAR/NGO institutes. Maximum indent was for Maize (74.14 q) followed by Cowpea (12.05q), Pearl millet (1.50q) and minimum was for rice bean (0.25q). The final Breeder Seed Production Report (BSP-IV) as well as availability of previous year breeder seed revealed that the overall breeder seed production was higher in pearl millet; maize and rice bean whereas it failed to meet the target in cowpea. As compared to allocation, final production was 118.36q surplus in Maize, 1.50q surplus in Pearl millet, equal in cowpea var. UPC 8705, 1.50q deficit in EC 4216 and 1.25q deficit in Bundel Lobia-2. Thus in cowpea total deficit was 2.75q. However in cowpea, IGFRI Jhansi and PAU Ludhiana has surplus of 0.6q and 0.71q breeder seed respectively of notified and good varieties. The overall breeder seed production (82.55q) and previous year availability (12.50q) was 206.05 q as against indent of 87.94q. Many centers have also produced breeder seed of the varieties are also available totaling 6.25q.

E. FORAGE TECHNOLOGY DEMONSTRATIONS

To popularize the forage production technologies and make the farmers aware about various new fodder crop varieties, a total of 715 FTD's were allocated to AICRP coordinating and co-operating centres during *Kharif* 2018 for the crops *viz*., BN hybrid, sorghum (including multicut and perennial), rice bean, maize, pearl millet, guar, setaria, Para and guinea grass. Out of 715 FTD's, 360 were allocated to BN Hybrid, 25 to Rice bean, 105 to Maize, 60 to forage sorghum, 45 to Pearl millet, 50 to Cowpea, 10 to guinea grass, 20 to Congo-signal grass and 40 to Setaria grass.

F. TRIBAL SUB PLAN

Tribal sub-plan activities were carried out by different AICRP forage crops centers with the theme Fodder and Livestock based technological modules for upliftment of tribal. The objectives were sustainable improvement in existing production system and livelihood of tribals; Developing linkages with development and marketing institutions; Capacity building and skill up gradation of stakeholders. The activities included intervention in Integrated Farming System mode through participatory approach, skill improvement through capacity building programmes, providing inputs for activities in farming and livestock component.

G. IN HOUSE BREEDING PROGRAMME

Scientists at different coordinating centers are conducting experiments to generate breeding material in their mandated forage crops. The section provides summary of the activities like germplasm resources, hybridization, station trial and evaluation, mutations etc. being carried out in the respective crops.

H. OTHER ACTIVITIES

Scientists at different coordinated centers are also actively involved in teaching, extension, linkage, publication, dissemination of technologies like radio/TV talks, demonstrations, training etc. The section provides a glimpse of these activities.

I. WEATHER REPORT

Weather data of crop growth duration has been provided of different centers so as to enable the researchers to compare the growth and quality data with the weather parameters to draw suitable conclusions.

ALL INDIA COORDINATED RESEARCH PROJECT ON FORAGE CROPS & UTILIZATION
ZONE, COORDINATED CENTERS AND TESTING LOCATIONS

Zone	Coordinated Centers				Testing Locations		
	S. N.	**Location**	**Establishment Year**	**State**	**S. N.**	**Location**	**State/Union Territory**
I. Hill States = 3 Locations = 3	1.	Palampur, CSKHPKV	1970	Himachal Pradesh	1.	Almora, ICAR-VPKAS*	Uttarakhand
					2.	Rajouri, SKUAST-J	J & K
	2.	Srinagar, SKUAS&T-K	2010	Jammu & Kashmir	3.	Bajoura (Kullu)	H P
II. North West States = 5 Locations = 13	3.	Ludhiana, PAU	1989	Punjab	4.	Meerut, SVBPUA&T	Uttar Pradesh
					5.	Ballowal Sankhari	Punjab
	4.	Hisar, CCS HAU	1970	Haryana	6.	Avikanagar, IGFRI-RRS*	Rajasthan
	5.	Pantnagar, GBPUAT	1995	Uttarakhand	7.	Jodhpur, ICAR-CAZRI*	Rajasthan
	6.	Bikaner, SKRAU	1995	Rajasthan	8.	DFRS, Arjla, Bhilwara	Rajasthan
					9.	Udaipur, MPUAT	Rajasthan
					10.	Pali-Marwar, ICAR-CAZRI-RRS*	Rajasthan
					11.	Jaisalmer, ICAR-CAZRI-RRS*	Rajasthan
					12.	Fatehpur Shekhawati/ARS Sikar	Rajasthan
					13.	Jalore, SKRAU ARS Keshwana	Rajasthan
III. North East States = 8 Locations = 9	7.	Faizabad, NDUAT	1982	Uttar Pradesh	14.	Umiam (Barapani), ICAR Res. Complex for NEH Region*	Meghalaya
	8.	Ranchi, BAU	1970	Jharkhand	15.	Visva Bharti, Shantiniketan Sriniketan	West Bengal
	9.	Kalyani, BCKV	1972	West Bengal	16.	Medziphema	Nagaland
	10.	Bhubaneswar,OUAT	1987	Orissa	17.	Sabour, BAU	Bihar
	11.	Jorhat, AAU	1970	Assam			
	12.	Imphal, CAU	2010	Manipur			
	13.	Pusa, RPCAU	2017	Bihar			

Zone	Coordinated Centers				Testing Locations		
	S.N.	**Location**	**Establishment Year**	**State**	**S. N.**	**Location**	**State/Union Territory**
IV. Central States = 6 Locations = 10	14.	Anand, AAU	1970	Gujarat	18.	Kanpur, CSAU&T	Uttar Pradesh
	15.	Jabalpur, JNKVV	1970	Madhya Pradesh	19.	Jhansi, ICAR-IGFRI*	Uttar Pradesh
	16.	Rahuri, MPKV	1971	Maharashtra	20.	Dhari,JAU	Gujarat
					21.	Karjat	Maharashtra
	17.	Urulikanchan, BAIF	1982	Maharashtra	22.	Akola, PDKVV	Maharashtra
	18.	Raipur, IGKV	2010	Chhattisgarh	23.	Dapoli & Palghar, DBSKKV	Maharashtra
V. South States = 6 Locations = 7	19.	Mandya, UAS (B)	1986	Karnataka	24.	Dharwad, ICAR-IGFRI-RRS*	Karnataka
	20.	Coimbatore, TNAU	1976	Tamil Nadu	25.	Pudducherry, PJLNCA & RI, Karaikal	Pudducherry
	21.	Vellayani, KAU	1971	Kerala	26.	Tirupati/Guntur, ANGRAU	Andhra Pradesh
	22.	Hyderabad, PJTSAU	1970	Telangana	27.	Raichur, UAS, Raichur	Karnataka
					28.	Mattupetty	Kerala

Summary: Zone = 5, States = 24, Coordinating Centers = 22, Testing Locations = 28

*ICAR Institute

Entries Code for Kharif-2018

1. IVTM

S.N.	Contributor	Entry name	Code name
1	HPKV, Palampur	HPFM - 9	IVTM - 5
2	PAU, Ludhiana	PFM - 9	IVTM - 2
3	PAU, Ludhiana	PFM - 10	IVTM - 4
4	BAIF, Uralikanchan	BAIF Maize - 6	IVTM - 10
5	TNAU, Coimbatore	TNFM 131 - 9	IVTM - 1
6	SKUAST - K Srinagar	KDFM - 3	IVTM - 22
7	VPKAS Almora	Vivek Maize Hybrid VMH 45	IVTM - 3
8	VPKAS Almora	CMVLBC 2	IVTM - 21
9	IARI Delhi (NO hill zone)	AFH – 6	IVTM - 8
10	IIMR Begusarai	IMHBG - 18KF - 1	IVTM - 9
11	IIMR Begusarai	IMHBG - 18KF - 2	IVTM - 20
12	GBPUA&T Pantnagar	DFH 1	IVTM - 6
13	Advanta Seeds Ltd	ADV 6781	IVTM - 7
14	Star Agro Pvt Ltd	Star 111	IVTM - 15
15	PJTSAU, Hyderabad	TSFM - 16 - 10	IVTM - 16
16	Dholi, Muzzaffarpur	MF - 2018	IVTM - 14
17	UAS, Dharwad	AH 8070	IVTM - 19
18	UAS, Dharwad	AH 8071R	IVTM - 13
19	Rasi Seed Pvt Ltd	SCH 201	IVTM - 17
20	NC	African Tall	IVTM - 18
21	NC	J - 1006	IVTM - 12
22	NC (hybrid)	CO HM - 8	IVTM - 11

2. CAVTM 1 & 2

S.N.	Contributor	Entry name	Code name
1	PJTSAU, Hyderabad	TSFM - 16 - 3	CAVTM - 2
2	IIMR, Delhi	IMH 1527	CAVTM - 3
3	IIMR, Ludhiana	DMRH - 1410	CAVTM - 8
4	ADVANTA UPL Ltd.	ADV 6737	CAVTM - 1
5	PJTSAU, Hyderabad	TSFM - 15 - 5	CAVTM - 5
6	NC	African Tall	CAVTM - 7
7	NC	J - 1006	CAVTM - 6
8	NC hybrid	CO HM - 8	CAVTM - 4

3. IVTPM

S.N.	Contributor	Entry name	Code name
1	SKRAU, Bikaner	RBB - 10	IVTPM - 5
2	PJTSAU, Hyderabad	TSFB - 17 - 7	IVTPM - 6

3. IVTPM

S.N.	Contributor	Entry name	Code name
3	PAU, Ludhiana	AFB - 38	IVTPM - 9
4	PAU, Ludhiana	FBL - 1	IVTPM - 1
5	PAU, Ludhiana	FBL - 2	IVTPM - 3
6	ADVANTA UPL Ltd.	FBL - 3	IVTPM - 12
7	JNKVV, Jabalpur	ADV160061	IVTPM - 2
8	Star Agrotech Pvt Ltd	JPM - 18 - 3	IVTPM - 11
9	Kanchan Ganga	Star chandra	IVTPM - 4
10	JK agri	K - 25	IVTPM - 10
11	ZC (NWZ)	JKFBH 1521	IVTPM - 14
12	ZC (NEZ)	AFB - 3	IVTPM - 8
13	ZC (CZ)	APFB - 9 - 1	IVTPM - 8
14	ZC (SZ)	BAIF Bajra 1	IVTPM - 8
15	(NC)	Moti Bajra	IVTPM - 8
16		Giant Bajra	IVTPM - 7

4. AVTPM-2

S.N.	Contributor	Entry name	Code name
1	PJTSAU, Hyderabad	TSFB - 15 - 8	AVT2PM - 1
2	PJTSAU, Hyderabad	TSFB - 15 - 4	AVT2PM - 4
3	ZC (NWZ)	AFB - 3	AVT2PM - 2
4	ZC (SZ)	Moti Bajra	AVT2PM - 2
5	(NC)	Giant Bajra	AVT2PM - 3

5. AVTPM-2 (seed)

S.N.	Contributor	Entry name	Code name
1	PJTSAU, Hyderabad	TSFB - 15 - 8	AVT2PMS - 1
2	PJTSAU, Hyderabad	TSFB - 15 - 4	AVT2PMS - 4
3	ZC (NWZ)	AFB - 3	AVT2PMS - 2
4	ZC (SZ)	Moti Bajra	AVT2PMS - 2
5	(NC)	Giant Bajra	AVT2PMS - 3

6. IVTC

S.N.	Contributor	Entry name	Code name
1	ZRS, Mandya	MFC - 16 - 1	IVTC - 2
2	IGKV, Raipur	RFC - 1 - (RCC - 46)	IVTC - 6
3	GBPUAT, Pantnagar	UPC - 1801	IVTC - 1
4	PJTSAU, Hyderabad	TSFC - 17 - 3	IVTC - 7
5	PAU, Ludhiana	PFC 31	IVTC - 4
6	IGFRI RRS Dharwad	C - 150	IVTC - 8
7	IGKV, Raipur	RFC - 2 - (RCC - 48)	IVTC - 3

6. IVTC

S.N.	Contributor	Entry name	Code name
8	HAU, Hisar	HFC - 16 - 3	IVTC - 9
9	ZC (HZ)	UPC - 622	IVTC - 5
10	ZC (NEZ)	UPC - 628	IVTC - 5
11	ZC (NWZ)	Bundel Lobia - 2	IVTC - 5
12	ZC (CZ)	UPC - 9202	IVTC - 5
13	ZC (SZ)	MFC - 09 - 1	IVTC - 5
14	(NC)	Bundel Lobia - 1	IVTC - 10
15	(NC)	UPC - 5286	IVTC - 11

7. AVTC - 1

S.N.	Contributor	Entry name	Code name
1	ZRS, Mandya	MFC - 16 - 4	AVT1C - 7
2	IGFRI RRS Dharwad	C - 217	AVT1C - 3
3	PJTSAU, Hyderabad	TSFC - 16 - 1	AVT1C - 5
4	PAU, Ludhiana	PFC - 12	AVT1C - 2
5	HAU, Hisar	HFC - 16 - 1	AVT1C - 9
6	ZRS, Mandya	MFC - 16 - 3	AVT1C - 4
7	ZC (SZ)	MFC - 8 - 14	AVT1C - 1
8	ZC (HZ)	UPC 622	AVT1C - 1
9	(NC)	Bundel Lobia - 1	AVT1C - 8
10	(NC)	UPC - 5286	AVT1C - 6

8. IVT Rice Bean + AVT - 2 Rice bean

S.N.	Contributor	Entry name	Code name
1	AAU, Jorhat	JOR - 18 - 1	IVTRB - 2
2	AAU, Jorhat	JOR - 18 - 2	IVTRB - 3
3	JNKVV, Jabalpur	JRBJ 08 - 4	IVTRB - 7
4	BCKV, Kalyani	KRB - 11	IVTRB - 6
5	JNKVV, Jabalpur	JRBJ 07 - 4	IVTRB - 1
6	(NC)	K - 1 (Bidhan - 1)	IVTRB - 4
7	(NC)	Bidhan - 2	IVTRB - 5

9. IVT Rice Bean + AVT - 2 Rice bean (seed)

S.N.	Contributor	Entry name	Code name
1	AAU, Jorhat	JOR - 18 - 1	AVTRB - S - 2
2	AAU, Jorhat	JOR - 18 - 2	AVTRB - S - 3
3	JNKVV, Jabalpur	JRBJ 08 - 4	AVTRB - S - 7
4	BCKV, Kalyani	KRB - 11	AVTRB - S - 6
5	JNKVV, Jabalpur	JRBJ 07 - 4	AVTRB - S - 1
6	(NC)	K - 1 (Bidhan - 1)	AVTRB - S - 4
7	(NC)	Bidhan - 2	AVTRB - S - 5

10. VT *Cenchrus ciliaris* -2015 (4th year): (Perennial)

S.N.	Contributor	Entry name	Code name
1	IGFRI	IGFRI-67-75	VTCC-15-2
2	IGFRI	IGFRI-96-79	VTCC-15-6
3	IGFRI	IG-67-365	VTCC-15-9
4	Bikaner	RCCB-03-23	VTCC-15-1
5	Bikaner	RCCB-04-3	VTCC-15-5
6	CAZRI	CAZRI-231	VTCC-15-8
7	NC	IGFRI 3108	VTCC-15-4
8	NC	IGFRI 727	VTCC-15-7
9	NC	CAZRI 75	VTCC-15-3

11. VT *Cenchrus setigerus* -2015 (4th year): (Perennial)

S.N.	Contributor	Entry name	Code name
1	Bikaner	RCSB-02-7	VTCS-15-2
2	Bikaner	RCSB-02-58	VTCS-15-6
3	Bikaner	RCSB-02-60	VTCS-15-9
4	Coimbatore	TNCS-265	VTCS-15-1
5	CAZRI	CAZRI 2397 (CAZRI-76-1)	VTCS-15-5
6	IGFRI	IGFRI-96-593	VTCS-15-8
7	IGFRI	IGFRI-96-706	VTCS-15-4
8	IGFRI	IGFRI-97-395	VTCS-15-7
9	NC	CAZRI-76	VTCS-15-3

12. VTBN-2015 (4th year): Bajra Napier Hybrid (Perennial)

S.N.	Contributor	Entry name	Code name
1	Ludhiana	PBN 351	VTBN-15-5
2	TNAU	TNCN 1280	VTBN-15-1
3	BAIF	BNH-11	VTBN-15-8
4	BAIF	BNH-12	VTBN-15-6
5	BAIF	BNH-14	VTBN-15-2
6	BAIF	BNH-22	VTBN-15-4
7	NC	NB-21	VTBN-15-7
8	NC	CO-3	VTBN-15-9
9	NC	CO (BN) 5	VTBN-15-3

13. VT *Setaria* -2015 (4th year): *Setaria anceps* (Perennial)

S.N.	Contributor	Entry name	Code name
1	Palampur	S-4	VTSG-15-3
2		S-6	VTSG-15-6
3		S-25	VTSG-15-4
4		PSS-1	VTSG-15-1
5		S-18	VTSG-15-5
6		S-92	VTSG-15-2

14. VT Pennisetum hybrids – 2015 (3rd year)

S.N.	Contributor	Entry name	Code name
1	IGFRI, Jhansi	IGPISH-1	VTPH-15-3
2		IGPISH-2	VTPH-15-6
3		IGPISH-3	VTPH-15-10
4		IGPISH-4	VTPH-15-7
5		IGPISH-5	VTPH-15-4
6		IGPISH-6	VTPH-15-9
7		IGPISH-7	VTPH-15-1
8		*Cenchrus*	VTPH-15-2
9		*Heteropogon*	VTPH-15-5
10		*Chrysopogon*	VTPH-15-8

15. VT Desmanthus -2016 (2nd Year)

S.N.	Contributor	Entry name	Code name
1	Coimbatore	TND-1308	VTD-6
2	Coimbatore	TND-1309	VTD-3
3	Hyderabad	TSHL-1	VTD-5
4	Rahuri	RHDV-2014-1	VTD-2
5	BAIF Urulikanchan	BAIF Dashrath -1	VTD-1
6	Checks	Desmanthus CO-1	VTD-4

Entries Code AVT-2 Agronomical Trials

K-18-AST-3: (AVTM- 2)

S.N	Entry	Code
1	African Tall (NC)	AVTM- 2-1
2	TSFM-15-5	AVTM - 2-2
3	J-1006 (NC)	AVTM- 2-3
4	ADV-6737	AVTM- 2-4
5	Hybrid COHM-8 (NC)	AVTM- 2-5

K-18-AST-4: (AVTPM-2-1)

S.N	Entry	Code
1	TSFB-15-8	AVTPM- 2-1
2	AFB-3 (ZC-NWZ),	AVTPM - 2-2
3	TSFB-15-4	AVTPM- 2-3
4	Giant Bajra (NC),	AVTPM- 2-4
5	Moti Bajra (ZC-SZ)	AVTPM- 2-5

Entries Code AVT-2 Agronomical Trials

1. AVTM-2-1			
S. N.	**Contributor**	**Entry name**	**Code name**
1		JHM-15-1	AVTM 2-3
2	(NC)	African Tall	AVTM 2-1
3	(NC)	J-1006	AVTM 2-2

2. AVTM-2-2			
S. N.	**Contributor**	**Entry name**	**Code name**
1		PAC-746	AVTMR 2-1
2	(NC)	African Tall	AVTM R 2-3
3	(NC)	J-1006	AVTM R 2-2

3. AVTPM-2-1 (Agronomy)			
S. N.	**Contributor**	**Entry name**	**Code name**
1		TSFB-13-12	AVTPM 2-4
2		RBB-6	AVTPM 2-2
3		TSFB-10-5	AVTPM 2-1
4		TSFB-14-10	AVTPM 2-3
5	ZC (NWZ)	AFB-3	AVTPM 2-7
6	ZC (SZ)	Moti Bajra	AVTPM 2-7
7	(NC)	Raj Bajra Chari-2	AVTPM 2-6
8	(NC)	Giant Bajra	AVTPM 2-5

4. AVTC-2 (Agronomy)			
S .N.	**Contributor**	**Entry name**	**Code name**
1		MFC-09-13	AVTC2-2
2		Vellayani-1	AVTC2-3
3		TSFC-12-15	AVTC2-4
4		MFC-09-3	AVTC2-1
5	ZC (HZ)	UPC-622	AVTC2-7
6	ZC (CZ)	UPC-9202	AVTC2-7
7	ZC (SZ)	MFC-8-14	AVTC2-7
8	(NC)	Bundel Lobia-1	AVTC2-5
9	(NC)	UPC-5286	AVTC2-6

Foreword

Global trend in animal production indicates a rapid and considerable increase in the consumption of livestock products. However, deficiency in feed and fodder remains the major constraint in achieving desired level of livestock productivity. There is general perception that the amount and quality of future feed and fodder supplies will be of vital importance in sustaining the growth of animal husbandry. India inhabits 15 per cent of world livestock population on 2 per cent geographical area, which itself is an indicative of the extent of livestock pressure on our resources in comparison to other countries. Due to competing land use, area under cultivated fodder is static for last four decades and thus, can hardly compete with other sectors of agriculture to expand. Hence, only option available is to catalyze horizontal increase in underutilized areas and vertical increase in the forage productivity to meet the increasing demand of the fodder for economic livestock production. At present the productivity of cultivated fodder species is low due to meager attention and allocation of minimal production resources on one hand and adoption of the production techniques among stakeholders involved in the forage resource development. This needs to be tackled by educating the farmers about the production packages of fodder crops like selection of appropriate species, varieties and management techniques to sustain forage yields and soil fertility.

The country has varied agro climatic conditions as well as farming situation. In these circumstances, the objective of improving the forage varieties and forage productivity is complicated. Each crop has to be dealt in specific and targeted manner to accommodate the information on sowing technique, varieties, nutrient management, water management, crop protection, quality attributes and harvesting to realize the optimal production. AICRP on Forage Crops & Utilization is pursuing successfully the mandate for development of varieties, technique for raising cultivated forage crops and grasses of annual and perennial nature and eco-friendly crop protection technologies.

I would like to congratulate Project Coordinator and scientists of AICRP (FC&U) unit and cooperating centres who have contributed in the execution of trials, compilation and preparation of the Annual Report *Kharif*-2018 thus, helped in achieving the set targets.

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PREFACE

The Annual Report (2018-19), Part I–*Kharif*-2018 embodies the results of various research trials conducted in the areas of forage crop improvement, crop production and crop protection with the view to develop and test the technologies for better quality/quantity of forages in different agro climatic situations. This report is the outcome of sincere efforts made by all contributing scientists and staff at the Coordinating Unit and AICRP-FCU Centers. The trials and activities were successfully conducted as per the technical programme approved for *Kharif*-2018. The forage crops tested during the period under report, included forage cereals and legumes adaptable to a wide range of agro-ecological regions of the country. The report is divided into chapters' i.e., Crop Improvement, Crop Production, Crop Protection, Forage Technology Demonstrations etc. The results of multi-locational evaluation of newly developed genetic material for single and perennial forage species are compiled in Crop Improvement chapter. The trials presented in Crop Production chapter focused on optimization of fertilizer levels in different cropping systems, planting geometry, location specific research on weed management and agronomical trial for AVT entries. The chapter on Crop Protection deals with monitoring of pest and disease dynamics, evaluation of pest/disease resistance level in important Kharif forage crops *viz*., Pearl millet, Sorghum, Maize, Cowpea, Rice bean etc. as well as generation of technologies for pest management. Weather data from coordinating and voluntary centers has also been compiled to correlate the growth and yield of forage crops with weather parameters at different sites during crop period. Other chapters include details of in-house breeding activities, other activities etc.

The sincere efforts made by scientists and members of their team at the centers in conducting the trials and data analyses deserve appreciation and is gratefully acknowledged.

My colleagues at Project Coordinating Unit, Dr. R. K. Agrawal, Principal Investigator (Agronomy), Dr. Nitish R. Bhardwaj, Principal Investigator (Plant protection) and Dr. Subhash Chand, Scientist Genetics and Plant Breeding along with technical officers, Shri H. K. Agarwal and Shri R.S. Patel, provided support in distribution of seed/planting material, analysis and tabulation of data of trials conducted at various locations. Their contributions are thankfully acknowledged.

The administrative support and cooperation received from Dr. Khem Chand, Director, IGFRI during the period is thankfully acknowledged. I also record my sincere thanks to all my colleagues at IGFRI for their kind support and encouragement.

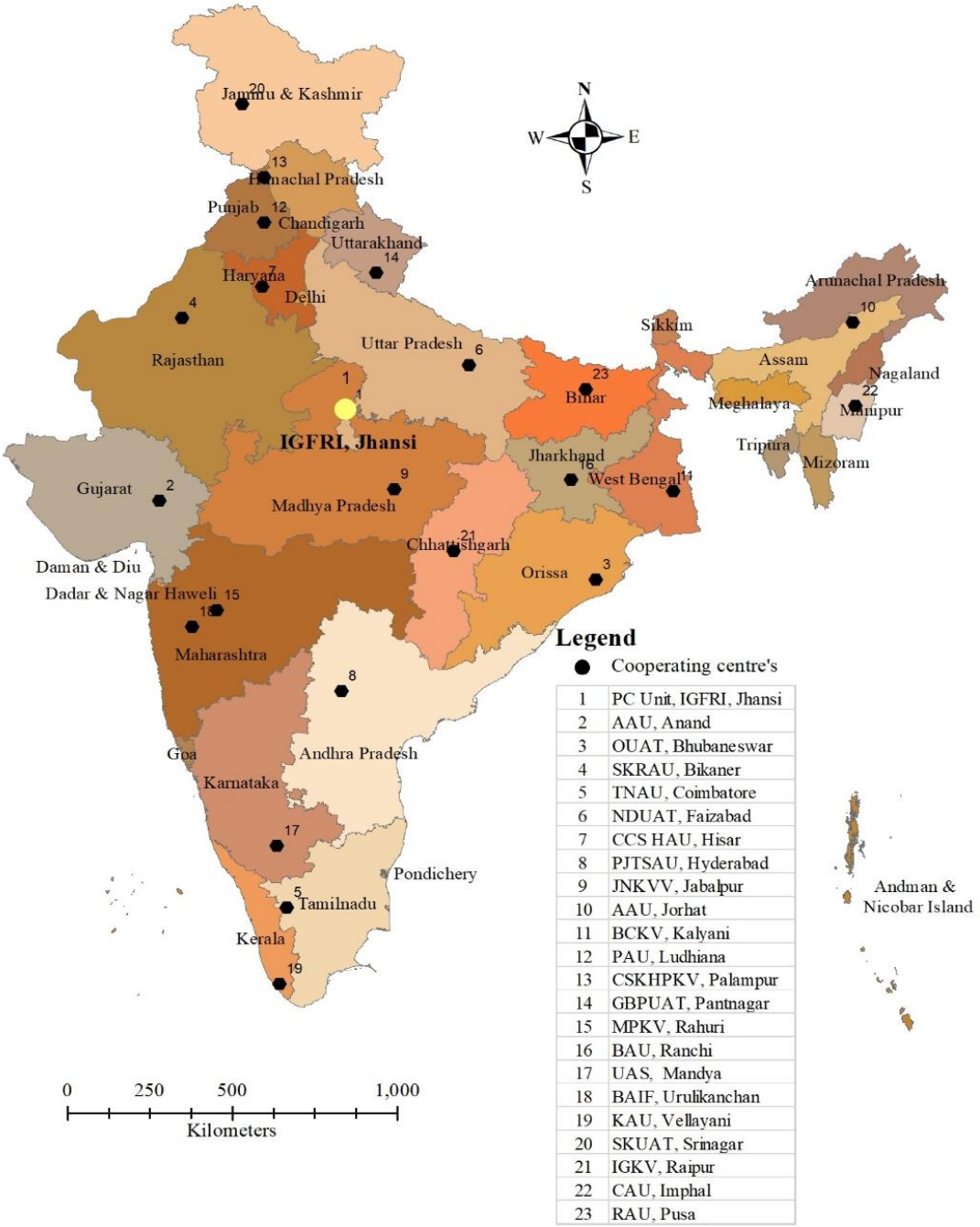
Meeting all the targeted activities would not have been possible without the active leadership, support, guidance and encouragement received from Dr. T. Mohapatra, Secretary DARE & DG, ICAR; Dr. A.K. Singh, DDG (CS); Dr. R.K. Singh, ADG (FFC); Dr. D.K. Yadava, ADG (seed) and Dr. Dinesh Kumar, Principal Scientist (FFC). Each and every one in the team at AICRP on Forage Crops & Utilization gratefully acknowledges their guidance and support.

15/7/19

A. K. Roy
Project Coordinator

AICRP on Forage crops and Utilization

Cooperating centers



1	PC Unit, IGFRI, Jhansi
2	AAU, Anand
3	OUAT, Bhubaneswar
4	SKRAU, Bikaner
5	TNAU, Coimbatore
6	NDUAT, Faizabad
7	CCS HAU, Hisar
8	PJTSAU, Hyderabad
9	JNKVV, Jabalpur
10	AAU, Jorhat
11	BCKV, Kalyani
12	PAU, Ludhiana
13	CSKHPKV, Palampur
14	GBPUAT, Pantnagar
15	MPKV, Rahuri
16	BAU, Ranchi
17	UAS, Mandya
18	BAIF, Urulikanchan
19	KAU, Vellayani
20	SKUAT, Srinagar
21	IGKV, Raipur
22	CAU, Imphal
23	RAU, Pusa

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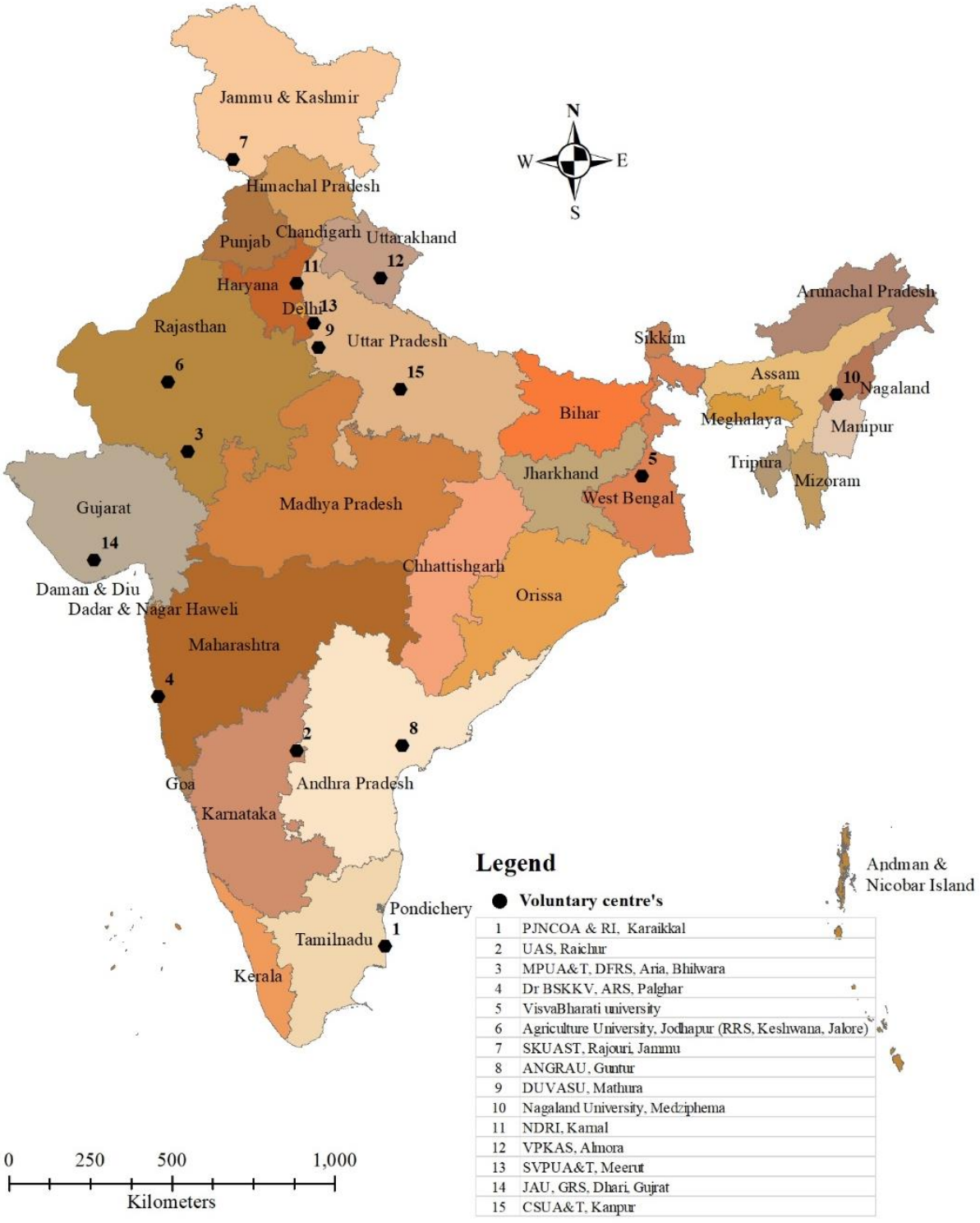
Voluntary centers



1. IVTM: INITIAL VARIETAL TRIAL IN FORAGE MAIZE

(Reference Tables: 1.1 to 1.9)

An initial varietal trial in forage maize comprising of nineteen entries with three national checks *viz.*, African Tall, J-1006 and CO-HM-8 (NC hybrid) was conducted at 23 locations in five zones of the country. There were 4 locations each in hill, north-west and south zones, 5 in NE zone and 6 in central zone.

For green forage yield (q/ha), entries TNFM-131-9 (22.0%), PFM-9 (11.7%), PFM-10 (13.6%), HPFM-9 (6.9%), ADV-6781 (17.6%), TSFM-16-10 (15.3%) in hill zone; PFM-9 (17.6%), AH-8070 (21.8%) in NW zone; entries TNFM-131-9 (10.7%); PFM-10 (9.2%) in NE zone; entries TNFM-131-9 (10.0%), ADV 6781 (9.4%), TSFM-16-10 (9.3%), AH-8070 (7.9%), CMVLBC-2 (8.2%) in south zone showed superiority over the best check in their respective zones. At all India level, entries TNFM-131-9 (7.6%), PFM-10 (5.2%) showed superiority over the best check. In other zones and at all India level, other entries were either marginally superior or inferior to checks for GFY.

For dry matter yield (q/ha), entries TNFM-131-9 (25.7%), PFM-9 (23.8%), PFM-10 (9.6%), HPFM-9 (10.4%), ADV 6781 (10.1%), IMHBG-18KF-1 (6.0%), TSFM-16-10 (16.5%), IMHBG-18KF-2 (13.7%) in hill zone; entries PFM-9 (17.6%), PFM-10 (6.2%), ADV-6781 (7.6%), AH-8071R (7.9%), SCH-201 (6.4%), AH-8070 (41.6%) in NW zone; TNFM-131-9 (6.1%), PFM-10 (9.9%) in NE zone; entry AH-8071R (7.8%) in central zone; entry ADV-6781 (16.6%) in south zone were superior to the best check. At all India level, entries TNFM-131-9 (10.6%), PFM-9 (9.3%), PFM-10 (8.1%), ADV-6781 (11.2%), AH-8071R (5.5%), TSFM-16-10 (5.0%) and AH-8070 (12.3%) were superior over the best check. Other entries were either marginally superior or inferior to checks for GFY.

For green fodder per day productivity (q/ha/day), entry AH-8070 (6.31q/ha/day) was best followed by CMVLBC-2 (6.17q/ha/day). Best national check J-1006 showed productivity of 5.55q/ha/day only. For dry fodder per day productivity, entry AH-8070 (1.35q/ha/day) was best followed by ADV-6781 (1.30q/ha/day). Best national check CO-HM-8 showed productivity of 1.19q/ha/day only.

For plant height, national check African Tall (209.6 cm) was adjudged best performer followed by PFM-10 (209.1). For leafiness, IMHBG-18KF-1 and IMHBG-18KF-2 ranked joint first.

For crude protein yield (q/ha), entry AH-8070 ranked first (6.7q/ha) followed by national check African Tall (6.6 q/ha). For crude protein (%), entries KDFM-3 and TSFM-16-10 ranked joint first (8.1 %). For other quality parameters, IMHBG-18KF-2 for ADF (37.6%), NDF (62.7%) and IVDMD (56.3%) was best performer.

Table 1.1 IVTM: Initial Varietal Trial in Forage Maize: Green Forage Yield (q/ha)

Entries	Hill Zone							North West Zone						
	Palam-pur	Sri-nagar	Rajo-uri	Alm-ora	Aver-age	Ra-nk	Superi-ority%	Ludh-iana	His-ar	Udai-pur	Pant-nagar	Aver-age	Ra-nk	Super-iority%
TNFM 131 - 9	758.7	518.3	691.5	302.5	567.7	1	22.0	226.2	407.9	328.7	183.7	286.6	9	
PFM - 9	638.7	490.0	598.6	351.9	519.8	5	11.7	304.9	490.7	340.3	288.9	356.2	2	17.6
Vivek Maize Hybrid VMH 45	459.0	458.3	458.1	228.4	400.9	19		238.4	369.4	145.8	125.9	219.9	18	
PFM - 10	676.1	498.3	667.2	272.8	528.6	4	13.6	263.4	531.9	328.7	139.3	315.8	4	4.3
HPFM - 9	602.5	454.6	624.8	308.6	497.6	6	6.9	219.4	509.3	175.9	135.6	260.0	13	
DFH 1				28.4					194.4					
ADV 6781	695.2	507.7	753.7	233.3	547.5	2	17.6	230.1	452.8	245.4	259.3	296.9	7	
AFH – 6			537.9					106.9	310.2	104.2	116.3	159.4	21	
IMHBG - 18KF - 1	615.8	500.6	567.7	193.8	469.5	9	0.9	229.6	258.3	150.5	200.0	209.6	19	
BAIF Maize - 6	571.4	455.2	427.9	166.7	405.3	17		151.9	157.4	201.4	142.2	163.2	20	
AH 8071R	593.0	422.9	589.4	330.9	484.0	7	4.0	319.0	546.3	298.6	105.2	317.3	3	4.8
MF - 2018	452.7	455.2	448.5	306.2	415.6	16		252.3	486.1	252.3	152.9	285.9	10	
Star 111	452.6	421.6	448.1	290.1	403.1	18		124.1	504.9	180.6	167.4	244.3	16	
TSFM - 16 - 10	685.1	458.7	680.8	321.0	536.4	3	15.3	244.4	467.6	277.8	197.0	296.7	8	
SCH 201	436.8	422.9	612.1	195.1	416.7	15		243.3	456.0	157.4	134.1	247.7	15	
AH 8070	520.6	503.7	518.8	308.6	462.9	11		471.3	518.5	282.4	203.0	368.8	1	21.8
IMHBG - 18KF - 2	596.8	413.4	588.0	330.9	482.3	8	3.6	272.7	527.8	243.1	189.6	308.3	5	1.8
CMVLBC 2	540.3	418.1	437.2	321.6	429.3	14		219.4	402.8	138.9	123.0	221.0	17	
KDFM – 3	433.6	416.1	428.6	211.1	372.4	20		233.8	361.1	150.5		248.5	14	
CO HM - 8 (NC Hybrid)	539.6	502.9	535.0	284.0	465.4	10		295.8	397.7	206.0	182.2	270.4	12	
J - 1006 (NC)	495.2	492.3	491.4	280.3	439.8	12		242.6	476.9	206.0	202.2	281.9	11	
African Tall (NC)	476.2	465.5	467.2	342.0	437.7	13		301.4	324.1	263.9	322.2	302.9	6	
Mean	**562.0**	**463.8**	**551.1**	**267.0**	**447.7**			**247.2**	**416.0**	**222.8**	**178.5**	**266.2**		
CD at 5%	**130.7**	**22.5**	**122.9**	**90.4**				**104.1**	**116.4**	**64.5**	**36.6**			
CV%	**14.1**	**8.7**	**14.1**	**20.4**				**13.6**	**16.5**	**12.9**	**8.2**			

Table 1.1 IVTM: Initial Varietal Trial in Forage Maize: Green Forage Yield (q/ha)

Entries	North East Zone							
	Bhubaneswar	**Ranchi**	**Pusa**	**Faizabad**	**Imphal**	**Average**	**Rank**	**Superiority%**
TNFM 131 - 9	293.7	325.5	269.3	363.5	410.0	332.4	1	10.7
PFM - 9	335.4	300.5	257.3	224.5	403.5	304.2	5	1.3
Vivek Maize Hybrid VMH 45	266.6	250.5	266.3	285.8	377.3	289.3	11	
PFM - 10	330.2	298.2	268.0	408.3	334.4	327.8	2	9.2
HPFM - 9	325.0	243.1	266.3	302.2	379.0	303.1	6	0.9
DFH 1	258.3	247.7	149.3	318.6		243.5	22	
ADV 6781	285.4	335.2	258.3	224.5	340.0	288.7	12	
AFH – 6	268.7	249.6	276.7	310.3	274.4	275.9	15	
IMHBG - 18KF - 1	319.7	242.6	264.3	224.5	294.4	269.1	18	
BAIF Maize - 6	266.6	225.9	270.0	240.9	327.1	266.1	20	
AH 8071R	308.3	241.7	281.3	277.7	356.3	293.0	9	
MF - 2018	260.4	268.1	268.7	253.2	316.0	273.3	16	
Star 111	268.7	285.7	271.0	330.9	262.3	283.7	13	
TSFM - 16 - 10	281.2	257.9	272.0	277.7	387.5	295.3	8	
SCH 201	231.2	273.6	271.7	245.1	281.3	260.6	21	
AH 8070	303.1	259.7	228.3	404.4	330.4	305.2	4	1.6
IMHBG - 18KF - 2	296.8	263.9	271.0	245.1	316.3	278.6	14	
CMVLBC 2	279.1	298.2	278.3	253.2	436.5	309.0	3	2.9
KDFM - 3	273.9	272.7	267.0	253.2	383.8	290.1	10	
CO HM - 8 (NC Hybrid)	275.0	240.3	274.7	224.5	324.4	267.8	19	
J - 1006 (NC)	256.2	224.6	273.3	281.9	322.3	271.6	17	
African Tall (NC)	279.1	262.5	246.0	388.0	325.8	300.3	7	
Mean	**284.7**	**266.7**	**261.3**	**288.1**	**342.0**	**287.7**		
CD at 5%	1.9	22.3	**11.1**	64.6	18.1			
CV%	8.5	5.1	**12.7**	13.6	3.4			

Table 1.1 IVTM: Initial Varietal Trial in Forage Maize: Green Forage Yield (q/ha)

Entries	Central Zone								
	Anand	**Raipur**	**Jabalpur**	**Rahuri**	**Urulikanchan**	**Jhansi**	**Average**	**Rank**	**Superiority%**
TNFM 131 - 9	125.0	236.1	437.4	487.3	653.4	231.5	361.8	5	
PFM - 9	259.3	291.7	231.2	415.4	669.7	266.2	355.6	7	
Vivek Maize Hybrid VMH 45	128.3	152.8	283.2	348.6	384.8	164.4	243.7	20	
PFM - 10	279.7	236.1	256.2	469.4	755.9	249.1	374.4	4	
HPFM - 9	152.8	191.7	220.8	405.2	513.9	223.6	284.7	16	
DFH 1	120.4	83.3	120.8	91.2	167.5	0.0	97.2	22	
ADV 6781	126.9	296.3	362.4	433.4	660.1	229.2	351.4	8	
AFH – 6	137.0	138.9	185.3	241.8	308.7	108.8	186.7	21	
IMHBG - 18KF - 1	172.7	256.9	274.9	407.6	483.9	209.7	301.0	13	
BAIF Maize - 6	169.5	191.7	268.7	433.3	514.9	143.5	286.9	15	
AH 8071R	240.3	321.3	404.1	505.1	634.0	250.0	392.5	1	3.9
MF - 2018	112.0	206.8	295.7	416.7	563.1	159.7	292.3	14	
Star 111	182.4	169.5	245.8	344.5	425.4	121.3	248.1	19	
TSFM - 16 - 10	275.9	243.5	285.3	371.2	557.2	210.6	324.0	12	
SCH 201	130.6	183.3	308.2	377.6	443.6	196.8	273.3	17	
AH 8070	218.1	215.7	412.4	457.5	641.4	215.3	360.1	6	
IMHBG - 18KF - 2	149.1	217.6	354.1	439.2	614.8	196.8	328.6	11	
CMVLBC 2	131.5	236.1	362.4	598.4	495.9	192.1	336.1	9	
KDFM - 3	136.1	180.6	302.0	409.9	466.5	138.9	272.3	18	
CO HM - 8 (NC Hybrid)	213.4	218.5	377.0	359.8	540.4	290.7	333.3	10	
J - 1006 (NC)	307.4	287.0	360.3	445.9	618.3	248.6	377.9	3	
African Tall (NC)	155.1	217.6	291.6	562.4	876.3	203.7	384.5	2	
Mean	**178.3**	**217.0**	**301.8**	**410.1**	**545.0**	**193.2**	**307.6**		
CD at 5%	**39.1**	**49.7**	**65.5**	**65.6**	**67.3**	**20.1**			
CV%	**13.3**	**13.4**	**13.5**	**9.7**	**7.5**	**11.9**			

Table 1.1 IVTM: Initial Varietal Trial in Forage Maize: Green Forage Yield (q/ha)

Entries	South Zone							All India		
	Hydera-bad	Coimba-tore	Man-dya	Karai-kal	Aver-age	Ra-nk	Superi-ority%	Aver-age	Ra-nk	Superi-ority%
TNFM 131 - 9	305.8	594.9	484.7	385.8	442.8	2	10.0	392.2	1	7.6
PFM - 9	296.5	557.9	488.9	205.2	387.1	13		378.6	5	3.9
Vivek Maize Hybrid VMH 45	291.9	400.5	310.9	254.2	314.4	21		289.1	20	
PFM - 10	338.2	546.3	463.5	204.7	388.2	12		383.3	2	5.2
HPFM - 9	347.5	486.1	452.5	291.1	394.3	8		340.5	13	
DFH 1		78.7						143.0	22	
ADV 6781	305.8	564.8	510.9	405.5	446.7	1	9.4	379.0	4	4.0
AFH – 6	203.9	407.4	387.9		333.1	19		246.0	21	
IMHBG - 18KF - 1	278.0	412.0	485.3	395.5	392.7	9		323.4	14	
BAIF Maize - 6	305.8	412.0	405.8	251.4	343.8	16		291.4	19	
AH 8071R	370.7	476.9	412.8	252.4	378.2	14		371.2	6	1.9
MF - 2018	287.3	425.9	407.0	252.6	343.2	17		317.4	15	
Star 111	333.6	393.5	423.3	182.9	333.3	18		297.0	18	
TSFM - 16 - 10	417.0	527.8	502.9	312.6	440.1	3	9.3	370.1	7	1.6
SCH 201	273.4	472.2	449.5	359.3	388.6	11		311.1	16	
AH 8070	282.6	535.2	525.9	395.1	434.7	5	7.9	380.5	3	4.4
IMHBG - 18KF - 2	301.2	481.5	535.5	299.3	404.4	6	0.4	354.1	9	
CMVLBC 2	333.6	523.1	543.4	343.1	435.8	4	8.2	343.7	11	
KDFM - 3	296.5	481.5	398.2	135.4	327.9	20		301.4	17	
CO HM - 8 (NC Hybrid)	333.6	449.1	366.4	417.4	391.6	10		341.2	12	
J - 1006 (NC)	259.5	550.9	357.5	226.2	348.5	15		343.8	10	
African Tall (NC)	324.3	585.6	522.9	178.1	402.7	7		364.4	8	
Mean	**308.9**	**471.1**	**449.3**	**287.4**	**370.5**			**330.1**		
CD at 5%	47.5	19.0	29.8	6895.0						
CV%	9.3	2.5	9.5	14.5						

Table 1.2 IVTM: Initial Varietal Trial in Forage Maize: Dry Matter Yield (q/ha)

Entries	Hill Zone							North West Zone					
	Palam-pur	Sri-nagar	Rajo-uri	Alm-ora	Aver-age	Ra-nk	Superi-ority%	Ludh-iana	His-ar	Pant-nagar	Aver-age	Ra-nk	Superi-ority%
TNFM 131 - 9	120.7	108.6	119.9	53.7	100.7	1	25.7	52.2	72.9	29.4	51.5	14	
PFM - 9	97.9	105.0	96.6	97.2	99.2	2	23.8	69.5	92.4	46.8	69.6	2	17.6
Vivek Maize Hybrid VMH 45	68.4	99.4	67.8	31.7	66.8	18		55.8	62.8	28.0	48.9	17	
PFM - 10	99.0	105.5	96.9	49.9	87.8	7	9.6	60.6	102.3	25.8	62.9	7	6.2
HPFM - 9	105.3	94.9	104.8	48.4	88.4	5	10.4	50.0	79.2	29.8	53.0	12	
DFH 1				4.2					32.0				
ADV 6781	99.8	107.8	97.2	48.0	88.2	6	10.1	54.1	83.7	53.4	63.7	5	7.6
AFH – 6			107.9				34.7	24.0	54.6	14.0	30.9	20	
IMHBG - 18KF - 1	108.2	106.0	84.7	40.7	84.9	8	6.0	52.8	46.5	36.4	45.2	19	
BAIF Maize - 6	76.7	96.4	75.8	28.1	69.2	15		35.5	31.5	20.2	29.1	21	
AH 8071R	90.5	88.5	90.2	65.9	83.7	9	4.5	75.3	95.7	20.6	63.9	4	7.9
MF - 2018	59.2	97.7	57.1	59.8	68.5	17		60.1	92.4	17.0	56.5	10	
Star 111	67.5	89.1	59.9	47.1	65.9	19		28.7	91.1	33.7	51.2	15	
TSFM - 16 - 10	112.1	97.7	109.5	53.7	93.3	3	16.5	57.2	76.9	24.7	53.0	12	
SCH 201	71.4	90.9	74.4	38.4	68.8	16		56.9	83.8	48.2	63.0	6	6.4
AH 8070	73.4	107.3	71.9	63.5	79.0	11		110.3	95.9	45.4	83.8	1	41.6
IMHBG - 18KF - 2	104.1	87.5	101.6	71.3	91.1	4	13.7	63.8	87.3	41.5	64.2	3	4.7
CMVLBC 2	90.3	88.5	90.3	41.5	77.6	12		51.4	74.4	30.8	52.2	13	
KDFM – 3	73.0	89.1	69.4	26.8	64.6	20		54.7	63.8	25.1	47.8	18	
CO HM - 8 (NC Hybrid)	75.0	105.4	74.5	43.9	74.7	14		70.1	63.5	37.3	57.0	9	
J - 1006 (NC)	73.3	104.2	73.3	51.1	75.5	13		55.3	80.7	41.8	59.2	8	
African Tall (NC)	84.2	98.6	84.2	53.4	80.1	10		70.5	56.8	21.4	49.6	16	
Mean	**87.5**	**98.4**	**86.1**	**48.5**	**78.2**			**57.6**	**73.6**	**32.0**	**54.0**		
CD at 5%	**23.9**	**8.3**	**12.6**	**25.7**				**58.8**	**23.1**	**6.3**			
CV%	**16.5**	**5.3**	**9.3**	**32.0**				**12.9**	**18.5**	**11.2**			

Table 1.2 IVTM: Initial Varietal Trial in Forage Maize: Dry Matter Yield (q/ha)

Entries	North East Zone							
	Bhubaneswar	**Ranchi**	**Pusa**	**Faizabad**	**Imphal**	**Average**	**Rank**	**Superiority%**
TNFM 131 - 9	71.2	63.5	66.2	84.1	70.2	71.0	2	6.1
PFM - 9	81.2	57.1	64.0	52.7	64.3	63.9	9	
Vivek Maize Hybrid VMH 45	67.7	55.5	72.9	68.6	60.8	65.1	6	
PFM - 10	83.6	63.6	62.7	100.0	57.6	73.5	1	9.9
HPFM - 9	76.4	51.5	60.7	67.9	60.4	63.4	10	
DFH 1	58.7	47.9	47.9	73.3		56.9	19	
ADV 6781	68.8	63.7	61.1	56.1	57.1	61.4	14	
AFH – 6	65.2	46.2	72.5	74.8	50.1	61.7	12	
IMHBG - 18KF - 1	78.4	52.2	63.8	53.9	50.7	59.8	16	
BAIF Maize - 6	63.2	44.8	64.8	52.9	50.9	55.3	20	
AH 8071R	74.7	49.9	65.2	66.7	57.7	62.8	11	
MF - 2018	58.4	54.5	64.2	56.9	64.0	59.6	17	
Star 111	65.1	58.6	66.8	76.5	41.6	61.7	12	
TSFM - 16 - 10	69.1	59.3	63.0	65.2	79.1	67.1	4	0.3
SCH 201	53.0	59.3	69.1	58.8	50.8	58.2	18	
AH 8070	70.2	48.5	51.9	101.0	68.6	68.0	3	1.6
IMHBG - 18KF - 2	76.7	56.3	63.6	61.3	64.3	64.4	8	
CMVLBC 2	73.2	59.6	66.9	64.5	59.0	64.6	7	
KDFM - 3	64.4	54.5	65.0	65.7	58.5	61.6	13	
CO HM - 8 (NC Hybrid)	65.3	46.9	62.7	53.9	55.5	56.9	19	
J - 1006 (NC)	60.6	47.9	67.9	66.2	59.0	60.3	15	
African Tall (NC)	65.8	52.9	63.2	93.1	59.6	66.9	5	
Mean	**68.7**	**54.3**	**63.9**	**68.8**	**59.0**	**62.9**		
CD at 5%	**0.5**	**6.0**	**13.2**	**15.3**	**14.6**			
CV%	**8.6**	**6.4**	**3.7**	**13.5**	**15.7**			

Table 1.2 IVTM: Initial Varietal Trial in Forage Maize: Dry Matter Yield (q/ha)

Entries	Central Zone								
	Anand	Raipur	Jabalpur	Rahuri	Urulikanchan	Jhansi	Average	Rank	Superiority%
TNFM 131 - 9	27.8	55.4	104.5	87.7	87.9	40.3	67.3	9	
PFM - 9	62.1	75.6	51.6	86.4	124.8	48.6	74.9	4	
Vivek Maize Hybrid VMH 45	33.5	35.8	63.3	51.5	57.4	26.3	44.6	19	
PFM - 10	66.2	58.4	55.8	89.8	121.2	43.9	72.5	5	
HPFM - 9	36.4	56.4	48.3	67.4	86.4	40.1	55.8	14	
DFH 1	27.8	17.9	25.4	18.3	26.1	0.0	19.3	21	
ADV 6781	35.9	78.0	85.4	87.1	93.4	44.5	70.7	7	
AFH – 6	35.8	40.3	41.6	36.0	50.8	17.6	37.0	20	
IMHBG - 18KF - 1	46.1	68.9	63.7	85.2	87.4	34.4	64.3	10	
BAIF Maize - 6	41.8	48.2	61.8	68.2	73.3	28.5	53.6	16	
AH 8071R	58.7	85.9	95.4	101.1	107.5	40.0	81.4	1	7.8
MF - 2018	27.4	49.3	68.7	77.7	77.4	30.9	55.2	15	
Star 111	45.7	50.0	56.8	53.4	82.5	23.7	52.0	18	
TSFM - 16 - 10	68.7	50.9	66.4	59.3	98.4	35.8	63.2	11	
SCH 201	36.5	51.5	72.7	77.8	76.0	35.7	58.4	13	
AH 8070	55.3	57.1	98.1	87.8	117.4	34.8	75.1	3	
IMHBG - 18KF - 2	36.0	63.1	83.3	91.2	104.0	37.0	69.1	8	
CMVLBC 2	37.0	56.3	85.2	89.0	71.3	36.4	62.5	12	
KDFM - 3	39.8	44.9	70.8	62.9	74.1	26.1	53.1	17	
CO HM - 8 (NC Hybrid)	53.9	56.3	88.9	75.7	71.2	57.5	67.3	9	
J - 1006 (NC)	79.8	65.8	84.5	94.5	82.5	45.1	75.4	2	
African Tall (NC)	35.3	44.7	67.4	110.7	134.8	31.9	70.8	6	
Mean	**44.9**	**55.0**	**70.0**	**75.4**	**86.6**	**34.5**	**61.1**		
CD at 5%	**13.8**	**13.8**	**15.6**	**12.5**	**10.1**	**5.0**			
CV%	**18.7**	**14.7**	**13.6**	**10.0**	**7.6**	**2.9**			

Table 1.2 IVTM: Initial Varietal Trial in Forage Maize: Dry Matter Yield (q/ha)

Entries	South Zone							All India		
	Hydera-bad	Coimb-atore	Man-dya	Karai-kal	Aver-age	Ra-nk	Superi-ority%	Aver-age	Ra-nk	Superi-ority%
TNFM 131 - 9	50.3	136.0	99.6	117.7	100.9	2	3.7	78.2	3	10.6
PFM - 9	50.7	125.9	104.6	45.9	81.8	13		77.3	4	9.3
Vivek Maize Hybrid VMH 45	49.6	91.1	75.1	63.4	69.8	18		58.5	18	
PFM - 10	57.0	125.6	107.5	47.5	84.4	10		76.4	5	8.1
HPFM - 9	59.5	108.7	91.1	83.4	85.7	9		68.5	14	
DFH 1		16.9						30.5	22	
ADV 6781	52.4	129.5	126.2	146.1	113.5	1	16.6	78.6	2	11.2
AFH – 6	33.6	87.8	84.4		68.6	19		52.1	21	
IMHBG - 18KF - 1	35.3	88.4	101.2	127.0	88.0	7		68.7	13	
BAIF Maize - 6	48.9	90.5	82.7	58.7	70.2	18		56.5	20	
AH 8071R	59.0	102.2	82.4	67.5	77.8	14		74.6	6	5.5
MF - 2018	49.5	92.0	86.1	72.3	75.0	16		62.4	16	
Star 111	52.3	83.9	84.8	42.4	65.9	20		59.1	17	
TSFM - 16 - 10	82.1	113.2	103.8	85.5	96.1	5		74.2	7	5.0
SCH 201	47.0	106.4	92.0	99.0	86.1	8		65.9	15	
AH 8070	46.5	112.4	106.8	122.3	97.0	4		79.4	1	12.3
IMHBG - 18KF - 2	49.7	103.9	107.2	74.7	83.9	11		74.1	8	4.8
CMVLBC 2	51.3	106.2	105.1	96.8	89.9	6		69.3	12	
KDFM - 3	45.4	92.6	85.7	29.3	63.2	21		58.2	19	
CO HM - 8 (NC Hybrid)	56.7	102.0	96.3	134.3	97.3	3		70.3	10	
J - 1006 (NC)	42.7	119.9	85.5	55.3	75.9	15		69.9	11	
African Tall (NC)	53.0	133.3	102.4	38.9	81.9	12		70.7	9	
Mean	**51.1**	**103.1**	**95.7**	**80.4**	**80.4**			**67.0**		
CD at 5%	**7.9**	**5.1**	**7.3**	**25.9**						
CV%	**9.3**	**3.0**	**10.6**	**19.5**						

Table 1.3 IVTM: Initial Varietal Trial in Forage Maize: Green Forage Yield (q/ha/day)

Entries	Palampur	Srinagar	Ludhiana	Hisar	Pantnagar	Bhubaneswar	Ranchi	Pusa	Faizabad
TNFM 131 - 9	10.59	7.10	2.90	5.83	2.87	5.06	5.39	4.27	5.34
PFM - 9	8.70	6.85	3.90	7.01	4.59	6.21	4.95	4.03	3.45
Vivek Maize Hybrid VMH 45	6.66	6.38	3.10	5.28	2.06	5.13	5.01	4.04	4.08
PFM - 10	8.96	6.73	3.40	7.60	2.21	5.69	4.97	4.49	5.44
HPFM - 9	9.60	6.23	2.80	7.28	2.12	6.13	4.39	4.70	4.79
DFH 1				2.78		4.87	3.79	1.88	4.90
ADV 6781	9.36	6.76	2.90	6.47	4.05	4.84	5.44	4.35	3.50
AFH – 6			1.40	4.43	1.97	4.89	4.51	3.97	4.56
IMHBG - 18KF - 1	8.95	6.69	2.90	3.69	3.17	5.81	4.21	4.39	3.62
BAIF Maize - 6	8.61	6.40	1.90	2.25	2.29	4.94	3.57	4.29	3.76
AH 8071R	8.62	5.79	4.10	7.80	3.16	5.71	4.14	4.29	4.14
MF - 2018	6.25	6.30	3.20	6.94	1.70	5.01	4.37	4.22	3.89
Star 111	6.76	5.91	1.60	7.21	2.72	4.98	5.23	3.81	5.01
TSFM - 16 - 10	9.03	6.28	3.10	6.68	2.62	4.69	3.74	4.40	3.96
SCH 201	6.09	5.93	3.10	6.51	3.46	4.45	5.07	4.62	3.45
AH 8070	7.54	6.90	6.00	7.41	5.11	5.83	4.31	4.49	5.77
IMHBG - 18KF - 2	8.76	5.73	3.50	7.54	3.17	5.30	4.50	4.00	3.55
CMVLBC 2	8.56	5.68	2.80	5.75	3.51	5.37	5.92	4.02	3.56
KDFM – 3	6.79	5.70	3.00	5.16	2.16	5.37	5.35	4.28	4.01
CO HM - 8 (NC Hybrid)	7.84	6.82	3.80	5.68	3.04	5.19	4.22	4.54	3.35
J - 1006 (NC)	7.18	6.81	3.10	6.81	3.59	4.42	3.53	3.96	4.62
African Tall (NC)	6.47	6.38	3.90	4.63	2.06	4.58	3.96	4.83	5.46
Mean	**8.07**	**6.37**	**3.16**	**5.94**	**2.93**	**5.20**	**4.57**	**4.18**	**4.28**

Table 1.3 IVTM: Initial Varietal Trial in Forage Maize: Green Forage Yield (q/ha/day)

Entries	Ana-nd	Rai-pur	Jabal-pur	Rah-uri	Urulikan-chan	Hydera-bad	Coimb-atore	Man-dya	Kara-ikal	Aver-age	Ra-nk
TNFM 131 - 9	2.02	4.14	7.29	8.26	10.54	4.65	9.44	7.70	5.46	6.05	4
PFM - 9	4.05	5.12	3.55	7.16	10.80	4.63	8.45	7.80	2.70	5.78	7
Vivek Maize Hybrid VMH 45	2.10	3.18	5.66	8.50	7.70	4.66	7.15	6.10	3.61	5.02	17
PFM - 10	4.24	4.00	3.82	7.69	12.19	5.20	8.28	8.30	2.69	5.88	6
HPFM - 9	2.32	3.36	4.32	7.79	8.71	5.43	8.68	8.10	4.10	5.60	9
DFH 1	1.90	1.41	1.80	1.44	2.54		1.27			2.60	22
ADV 6781	1.87	5.20	5.32	7.30	11.19	4.80	8.97	9.70	5.69	5.98	5
AFH – 6	2.08	2.67	2.80	5.04	4.98	3.15	6.79	7.70		4.06	21
IMHBG - 18KF - 1	2.70	4.94	4.16	7.46	8.20	4.41	6.65	8.80	5.85	5.37	14
BAIF Maize - 6	2.91	3.36	5.37	7.78	8.73	4.75	6.54	7.10	3.34	4.88	20
AH 8071R	3.81	5.99	7.48	9.41	10.74	5.76	7.69	7.40	3.33	6.08	3
MF - 2018	1.84	3.69	5.01	7.67	9.08	4.38	6.87	6.70	3.33	5.02	18
Star 111	2.64	2.92	4.81	6.38	7.21	5.13	6.45	7.40	2.54	4.93	19
TSFM - 16 - 10	4.25	4.27	4.32	5.57	8.44	6.19	8.12	9.00	4.43	5.50	12
SCH 201	1.93	3.11	5.60	6.82	7.52	4.34	7.87	7.50	5.09	5.14	16
AH 8070	3.52	3.60	7.11	8.47	9.72	4.46	8.77	8.80	5.84	6.31	1
IMHBG - 18KF - 2	2.48	3.89	6.10	8.19	9.32	4.70	8.02	8.50	4.18	5.63	8
CMVLBC 2	2.02	4.00	7.55	12.38	9.92	5.39	9.34	10.40	4.81	6.17	2
KDFM - 3	2.13	3.06	6.16	8.09	9.33	4.61	8.60	7.90	1.78	5.19	15
CO HM - 8 (NC Hybrid)	3.28	3.83	6.28	6.43	9.16	5.19	7.61	6.80	6.23	5.52	11
J - 1006 (NC)	4.95	5.04	6.00	8.06	9.97	3.92	8.48	6.50	3.00	5.55	10
African Tall (NC)	2.42	3.82	4.48	8.07	13.28	4.95	8.49	8.70	2.31	5.49	13
Mean	**2.79**	**3.85**	**5.23**	**7.45**	**9.06**	**4.80**	**7.66**	**7.95**	**4.01**	**5.35**	

Table 1.4 IVTM: Initial Varietal Trial in Forage Maize: Dry Matter Yield (q/ha/day)

Entries	Srinagar	Ludhiana	Hisar	Pantnagar	Bhubaneswar	Ranchi	Faizabad
TNFM 131 - 9	1.47	0.70	1.04	0.46	1.23	1.05	1.23
PFM - 9	1.42	0.90	1.32	0.74	1.50	0.94	0.81
Vivek Maize Hybrid VMH 45	1.32	0.70	0.90	0.46	1.30	1.11	0.98
PFM - 10	1.44	0.80	1.46	0.41	1.44	1.06	1.33
HPFM - 9	1.31	0.60	1.13	0.47	1.44	0.93	1.07
DFH 1			0.46		1.11	0.73	1.12
ADV 6781	1.41	0.70	1.20	0.83	1.17	1.03	0.87
AFH – 6		0.30	0.78	0.24	1.19	0.83	1.09
IMHBG - 18KF - 1	1.45	0.70	0.66	0.58	1.42	0.90	0.86
BAIF Maize - 6	1.35	0.50	0.45	0.33	1.17	0.71	0.85
AH 8071R	1.25	1.00	1.37	0.32	1.38	0.86	1.09
MF - 2018	1.32	0.80	1.32	0.27	1.12	0.89	0.81
Star 111	1.22	0.40	1.30	0.60	1.21	1.07	1.14
TSFM - 16 - 10	1.26	0.70	1.10	0.38	1.15	0.86	1.00
SCH 201	1.22	0.70	1.20	0.85	1.02	1.10	0.89
AH 8070	1.43	1.40	1.37	0.72	1.35	0.80	1.44
IMHBG - 18KF - 2	1.17	0.80	1.25	0.65	1.37	0.96	0.88
CMVLBC 2	1.24	0.70	1.06	0.57	1.41	1.18	0.90
KDFM – 3	1.24	0.70	0.91	0.44	1.26	1.07	1.04
CO HM - 8 (NC Hybrid)	1.46	0.90	0.91	0.62	1.23	0.82	0.84
J - 1006 (NC)	1.40	0.70	1.15	0.65	1.05	0.75	0.98
African Tall (NC)	1.32	0.90	0.81	0.33	1.08	0.80	1.33
Mean	**1.34**	**0.74**	**1.05**	**0.52**	**1.25**	**0.93**	**1.03**

Table 1.4 IVTM: Initial Varietal Trial in Forage Maize: Dry Matter Yield (q/ha/day)

Entries	Ana-nd	Rai-pur	Jabal-pur	Rah-uri	Urulikan-chan	Hydera-bad	Coimb-atore	Man-dya	Karai-kal	Aver-age	Ra-nk
TNFM 131 - 9	0.45	0.97	1.74	1.49	1.42	0.77	2.16	1.60	1.66	1.22	5
PFM - 9	0.97	1.33	0.79	1.49	2.01	0.79	1.91	1.70	0.60	1.20	6
Vivek Maize Hybrid VMH 45	0.55	0.74	1.26	1.26	1.15	0.79	1.63	1.50	0.90	1.03	15
PFM - 10	1.00	0.99	0.83	1.47	1.96	0.88	1.90	1.90	0.62	1.22	5
HPFM - 9	0.55	0.99	0.94	1.30	1.47	0.93	1.94	1.60	1.17	1.12	10
DFH 1	0.44	0.30	0.38	0.29	0.39		0.27			0.55	19
ADV 6781	0.53	1.37	1.25	1.47	1.58	0.82	2.05	2.40	2.05	1.30	2
AFH – 6	0.54	0.77	0.63	0.75	0.82	0.52	1.46	1.70		0.83	18
IMHBG - 18KF - 1	0.72	1.33	0.96	1.56	1.48	0.56	1.43	1.80	1.88	1.14	9
BAIF Maize - 6	0.72	0.85	1.23	1.23	1.24	0.76	1.44	1.50	0.78	0.94	17
AH 8071R	0.93	1.48	1.76	1.88	1.82	0.92	1.65	1.50	0.89	1.26	3
MF - 2018	0.45	0.88	1.61	1.43	1.25	0.75	1.48	1.40	0.95	1.05	13
Star 111	0.66	0.86	1.11	0.99	1.40	0.80	1.38	1.50	0.59	1.01	16
TSFM - 16 - 10	1.06	0.89	1.00	0.89	1.49	1.22	1.74	1.90	1.21	1.12	10
SCH 201	0.54	0.87	1.32	1.41	1.29	0.75	1.77	1.50	1.40	1.11	11
AH 8070	0.89	0.95	1.69	1.63	1.78	0.73	1.84	1.80	1.81	1.35	1
IMHBG - 18KF - 2	0.60	1.13	1.43	1.70	1.58	0.78	1.73	1.70	1.04	1.17	8
CMVLBC 2	0.57	0.95	1.77	1.84	1.43	0.83	1.90	2.00	1.36	1.23	4
KDFM - 3	0.62	0.76	1.44	1.24	1.48	0.70	1.65	1.70	0.38	1.04	14
CO HM - 8 (NC Hybrid)	0.83	0.99	1.48	1.35	1.21	0.88	1.73	1.80	2.00	1.19	7
J - 1006 (NC)	1.29	1.15	1.40	1.71	1.33	0.64	1.84	1.50	0.74	1.14	9
African Tall (NC)	0.55	0.78	1.03	1.59	2.04	0.81	1.93	1.70	0.50	1.09	12
Mean	**0.70**	**0.97**	**1.23**	**1.36**	**1.44**	**0.79**	**1.67**	**1.70**	**1.13**	**1.11**	

Table 1.5 IVTM: Initial Varietal Trial in Forage Maize: Crude Protein Yield (q/ha)

Entries	Palampur	Ludhiana	Bhubaneswar	Faizabad	Imphal	Ranchi
TNFM 131 - 9	10.9	5.6	5.3	6.6	5.2	3.9
PFM - 9	10.0	7.3	6.0	4.1	4.7	4.7
Vivek Maize Hybrid VMH 45	7.4	5.0	4.8	5.4	4.8	4.3
PFM - 10	10.4	5.8	5.9	8.8	4.2	3.9
HPFM - 9	9.2	4.1	5.9	5.5	4.3	3.7
DFH 1			5.0	6.0		3.3
ADV 6781	9.0	5.1	5.1	4.7	4.2	4.5
AFH – 6		2.3	4.8	6.5	3.7	3.6
IMHBG - 18KF - 1	10.2	4.4	5.8	4.3	3.7	4.0
BAIF Maize - 6	8.3	3.3	4.8	4.1	3.7	3.0
AH 8071R	7.7	7.0	5.6	5.2	3.9	4.5
MF - 2018	5.7	6.7	4.7	4.7	4.7	3.8
Star 111	6.5	2.6	4.8	6.1	3.2	4.1
TSFM - 16 - 10	11.1	4.9	5.1	5.1	5.9	4.0
SCH 201	6.6	4.1	4.2	4.5	3.8	5.0
AH 8070	6.8	8.7	5.5	8.6	4.9	3.3
IMHBG - 18KF - 2	10.6	7.6	5.3	4.6	4.6	3.9
CMVLBC 2	9.5	4.4	5.0	5.2	5.0	4.0
KDFM – 3	7.7	5.5	4.9	5.3	4.8	5.1
CO HM - 8 (NC Hybrid)	6.6	5.9	5.0	4.4	3.9	3.7
J - 1006 (NC)	7.5	4.5	4.6	5.0	3.9	3.2
African Tall (NC)	8.4	5.4	5.0	7.5	4.0	5.7
Mean	**8.5**	**5.2**	**5.1**	**5.5**	**4.3**	**4.0**

Table 1.5 IVTM: Initial Varietal Trial in Forage Maize: Crude Protein Yield (q/ha)

Entries	Ana-nd	Rai-pur	Jabal-pur	Rah-uri	Urulikan-chan	Hydera-bad	Coimb-atore	Man-dya	Aver-age	Ra-nk
TNFM 131 - 9	1.4	7.9	8.5	5.2	6.9	2.4	12.5	5.7	6.3	5
PFM - 9	3.1	12.5	4.1	7.0	8.7	2.9	9.9	6.4	6.5	3
Vivek Maize Hybrid VMH 45	1.7	4.9	4.8	4.2	4.5	3.5	7.2	5.6	4.9	13
PFM - 10	3.2	7.8	4.3	6.7	9.1	4.5	11.6	7.5	6.7	1
HPFM - 9	1.8	7.0	3.8	4.7	6.3	4.4	7.6	7.2	5.4	9
DFH 1	1.4	2.5	1.8	1.2	1.7		1.3		2.7	16
ADV 6781	1.7	10.2	6.8	5.9	7.3	3.9	10.2	7.7	6.2	6
AFH – 6	1.8	5.7	3.1	2.7	3.9	3.5	5.8	5.6	4.1	15
IMHBG - 18KF - 1	2.3	8.8	5.0	6.3	6.1	2.6	5.0	5.4	5.3	10
BAIF Maize - 6	2.0	6.7	5.0	4.9	5.9	3.4	5.5	6.1	4.8	14
AH 8071R	2.9	11.2	7.7	8.0	8.4	4.7	7.6	5.0	6.4	4
MF - 2018	1.4	7.6	5.4	6.0	6.2	3.6	6.8	4.9	5.1	12
Star 111	2.3	6.7	4.5	4.0	5.8	5.3	8.5	7.1	5.1	12
TSFM - 16 - 10	3.4	7.1	5.2	4.4	6.6	9.0	12.9	8.4	6.7	1
SCH 201	1.8	7.4	5.8	5.4	5.5	2.7	8.8	6.4	5.1	12
AH 8070	2.7	7.8	7.9	6.5	9.0	4.1	10.3	7.9	6.7	1
IMHBG - 18KF - 2	1.8	8.7	6.6	7.0	8.3	4.1	10.0	7.9	6.5	3
CMVLBC 2	1.8	7.7	6.8	6.8	4.9	3.1	7.4	7.8	5.7	8
KDFM - 3	2.0	6.0	5.6	4.4	6.7	2.7	8.1	6.8	5.4	9
CO HM - 8 (NC Hybrid)	2.7	8.2	7.3	5.8	5.1	4.5	4.9	5.3	5.2	11
J - 1006 (NC)	3.9	8.5	6.8	7.4	6.5	3.5	10.0	6.0	5.8	7
African Tall (NC)	1.8	6.4	5.4	8.2	9.8	4.2	12.3	7.5	6.6	2
Mean	**2.2**	**7.6**	**5.6**	**5.6**	**6.5**	**3.9**	**8.4**	**6.6**	**5.6**	

Table 1.6 IVTM: Initial Varietal Trial in Forage Maize: Crude Protein (%)

Entries	Palampur	Ludhiana	Bhubaneswar	Ranchi	Faizabad	Imphal
TNFM 131 - 9	9.0	10.7	7.4	6.1	7.8	7.3
PFM - 9	10.2	10.5	7.4	8.3	7.8	7.4
Vivek Maize Hybrid VMH 45	10.8	8.9	7.1	7.7	7.9	7.9
PFM - 10	10.5	9.5	7.1	6.1	8.8	7.3
HPFM - 9	8.8	8.1	7.7	7.2	7.9	7.1
DFH 1			8.5	6.8	8.2	
ADV 6781	9.0	9.5	7.5	7.0	8.4	7.3
AFH – 6		9.6	7.4	7.7	8.7	7.3
IMHBG - 18KF - 1	9.3	8.4	7.3	7.7	7.9	7.3
BAIF Maize - 6	10.8	9.3	7.6	6.6	7.8	7.3
AH 8071R	8.5	9.3	7.4	9.0	7.8	6.8
MF - 2018	9.6	11.2	8.0	7.0	8.3	7.2
Star 111	9.6	8.9	7.4	7.0	8.0	7.8
TSFM - 16 - 10	9.9	8.6	7.3	6.8	7.9	7.4
SCH 201	9.3	7.2	7.8	8.5	7.7	7.5
AH 8070	9.3	7.9	7.8	6.8	8.5	7.2
IMHBG - 18KF - 2	10.2	11.9	7.0	7.0	7.6	7.1
CMVLBC 2	10.5	8.6	6.9	6.7	8.0	8.5
KDFM - 3	10.5	10.1	7.7	9.4	8.1	8.3
CO HM - 8 (NC Hybrid)	8.8	8.4	7.6	7.9	8.2	7.1
J - 1006 (NC)	10.2	8.2	7.6	6.6	7.6	6.5
African Tall (NC)	9.9	7.7	7.6	10.7	8.1	6.7
Mean	**9.7**	**9.2**	**7.5**	**7.5**	**8.0**	**7.4**

Table 1.6 IVTM: Initial Varietal Trial in Forage Maize: Crude Protein (%)

Entries	Anand	Raipur	Jabalpur	Rahuri	Urulikanchan	Hyderabad	Coimbatore	Mandya	Average	Rank
TNFM 131 - 9	4.9	7.1	8.3	5.9	7.9	4.8	9.2	5.7	7.3	10
PFM - 9	5.0	6.1	8.1	8.1	6.9	5.7	7.9	6.1	7.5	8
Vivek Maize Hybrid VMH 45	5.0	7.2	8.0	8.1	7.9	7.0	7.9	7.4	7.8	4
PFM - 10	4.8	7.5	8.0	7.4	7.5	7.9	9.2	7.0	7.8	4
HPFM - 9	4.9	8.0	8.0	7.0	7.3	7.4	7.0	7.9	7.4	9
DFH 1	5.0	7.2	7.4	6.8	6.5		7.4		7.1	12
ADV 6781	4.9	7.6	8.2	6.8	7.8	7.4	7.9	6.1	7.5	8
AFH – 6	4.9	7.1	7.7	7.4	7.6	10.4	6.6	6.6	7.6	7
IMHBG - 18KF - 1	5.0	7.9	8.1	7.4	6.9	7.4	5.7	5.3	7.3	10
BAIF Maize - 6	4.9	7.2	8.1	7.2	8.0	7.0	6.1	7.4	7.5	8
AH 8071R	5.0	7.7	8.2	7.9	7.8	7.9	7.4	6.1	7.6	7
MF - 2018	5.0	6.5	8.1	7.7	8.0	7.4	7.4	5.7	7.7	6
Star 111	4.9	7.5	8.1	7.4	7.1	10.1	10.1	8.3	8.0	2
TSFM - 16 - 10	5.0	7.2	8.1	7.4	6.7	11.0	11.4	8.1	8.1	1
SCH 201	5.0	7.0	8.1	7.0	7.2	5.7	8.3	7.0	7.4	9
AH 8070	4.9	7.3	8.2	7.4	7.7	8.8	9.2	7.4	7.7	6
IMHBG - 18KF - 2	4.9	7.3	8.2	7.7	8.0	8.3	9.6	7.4	8.0	2
CMVLBC 2	4.8	7.3	8.2	7.7	6.8	6.1	7.0	7.4	7.5	8
KDFM - 3	5.0	7.4	8.1	7.0	9.0	6.1	8.8	7.9	8.1	1
CO HM - 8 (NC Hybrid)	5.0	6.9	8.2	7.7	7.1	7.9	4.8	5.5	7.2	11
J - 1006 (NC)	4.9	7.7	8.2	7.9	7.9	8.3	8.3	7.0	7.6	7
African Tall (NC)	5.2	7.0	8.1	7.4	7.3	7.9	9.2	7.4	7.9	3
Mean	**4.9**	**7.3**	**8.1**	**7.4**	**7.5**	**7.6**	**8.0**	**6.9**	**7.6**	

Table 1.7 IVTM: Initial Varietal Trial in Forage Maize: Plant Height (cm)

Entries	Palam-pur	Sri-nagar	Rajo-uri	Ludh-iana	His-ar	Udai-pur	Pant-nagar	Bhuban-eswar	Ran-chi	Pu-sa	Faiza-bad	Imp-hal
TNFM 131 - 9	295.0	191.6	284.8	190.0	185.8	204.0	134.9	170.3	204.0	200.0	168.0	217.4
PFM - 9	271.7	195.5	269.1	215.0	197.8	186.0	134.5	186.3	213.0	180.0	172.0	194.2
Vivek Maize Hybrid VMH 45	242.3	179.5	246.0	140.0	188.3	163.0	107.8	149.1	140.3	204.3	163.0	169.0
PFM - 10	320.7	204.3	318.4	195.0	232.2	180.0	130.5	181.6	202.3	179.7	174.5	214.6
HPFM - 9	335.3	195.5	328.0	205.0	212.2	171.0	150.3	178.3	151.7	211.7	161.5	206.3
DFH 1					163.9			137.3	137.7	120.7	150.0	
ADV 6781	307.7	191.2	303.5	195.0	155.6	145.0	149.9	167.5	131.0	181.7	154.0	184.9
AFH – 6			328.5	140.0	210.0	147.0	152.7	152.1	152.7	219.3	162.0	182.6
IMHBG - 18KF - 1	339.7	190.5	330.5	145.0	169.9	188.0	147.2	184.4	138.3	205.0	170.5	195.4
BAIF Maize - 6	311.0	195.4	303.8	135.0	175.0	158.0	158.2	145.1	160.7	177.3	155.0	208.2
AH 8071R	244.3	170.6	236.9	165.0	208.9	168.0	125.1	176.1	139.3	206.0	145.0	191.8
MF - 2018	249.3	186.0	251.3	150.0	214.4	160.0	18.7	170.5	139.7	211.7	171.0	198.1
Star 111	280.0	172.4	276.0	160.0	248.3	161.0	146.8	154.3	146.0	198.7	166.0	194.9
TSFM - 16 - 10	322.7	185.6	315.2	210.0	179.4	173.0	121.4	165.6	165.7	193.7	145.5	250.4
SCH 201	263.0	166.1	271.3	150.0	221.7	173.0	142.7	135.0	157.7	180.0	139.0	193.7
AH 8070	316.0	190.8	312.4	185.0	164.4	185.0	148.7	173.3	155.0	228.0	175.5	192.7
IMHBG - 18KF - 2	281.7	161.3	281.0	170.0	164.4	179.0	131.7	141.2	164.7	206.7	169.5	172.2
CMVLBC 2	235.7	166.5	237.7	130.0	142.2	147.0	125.6	164.3	142.0	228.3	163.0	183.2
KDFM – 3	260.3	168.0	262.5	125.0	164.6	152.0	117.5	158.1	136.7	200.0	164.0	176.8
CO HM - 8 (NC Hybrid)	291.0	187.1	285.4	180.0	302.8	194.0	150.8	159.3	176.7	190.0	161.5	191.6
J - 1006 (NC)	275.7	188.6	274.8	150.0	240.0	188.0	141.1	135.5	175.0	208.3	169.5	199.4
African Tall (NC)	301.7	185.8	301.0	240.0	199.4	168.0	129.0	162.1	164.7	213.3	170.5	238.2
Mean	**287.2**	**183.6**	**286.6**	**170.2**	**197.3**	**171.0**	**131.7**	**161.2**	**158.8**	**197.5**	**162.3**	**197.9**

Table 1.7 IVTM: Initial Varietal Trial in Forage Maize: Plant Height (cm)

Entries	Ana-nd	Rai-pur	Jabal-pur	Rah-uri	Urulikan-chan	Jha-nsi	Hydera-bad	Coimb-atore	Man-dya	Kara-ikal	Aver-age	Ra-nk
TNFM 131 - 9	197.0	210.1	196.6	187.0	224.1	177.1	207.0	228.0	224.0	214.4	205.0	3
PFM - 9	193.9	230.2	163.7	199.0	221.0	180.2	213.0	227.2	229.5	206.7	203.6	4
Vivek Maize Hybrid VMH 45	155.9	171.6	132.9	155.7	153.1	117.6	149.3	169.1	139.9	152.6	163.2	21
PFM - 10	197.8	231.2	157.6	194.6	214.7	175.8	213.3	234.0	262.3	185.9	209.1	2
HPFM - 9	188.0	216.9	146.3	183.1	187.2	168.3	200.4	209.4	159.7	207.6	198.8	8
DFH 1	187.0	204.2	110.7	112.9	180.4	0.0		175.6			140.0	22
ADV 6781	164.7	203.6	181.0	185.9	188.0	134.2	171.5	186.6	174.1	183.0	183.6	14
AFH – 6	171.7	185.7	136.1	162.4	190.7	148.4	170.0	185.8	175.1		177.5	18
IMHBG - 18KF - 1	185.8	206.5	142.0	184.0	192.1	164.9	186.0	202.3	209.8	188.8	193.9	10
BAIF Maize - 6	185.7	226.5	161.4	180.0	206.9	193.0	220.7	242.6	153.1	197.0	193.2	11
AH 8071R	186.4	215.2	186.7	195.3	205.8	176.6	218.6	187.5	186.5	200.1	188.0	12
MF - 2018	181.5	193.0	168.6	176.6	201.7	160.5	189.8	203.8	171.8	195.1	180.1	17
Star 111	186.6	188.8	157.0	176.9	195.4	144.3	187.7	200.0	177.9	179.6	186.3	13
TSFM - 16 - 10	187.4	226.1	158.6	205.0	202.9	168.6	227.7	206.8	254.7	188.8	202.5	6
SCH 201	196.4	177.5	170.2	180.7	173.4	159.0	161.4	192.1	220.5	168.3	181.5	16
AH 8070	175.9	181.9	190.8	195.6	201.6	160.8	192.4	222.2	205.3	184.5	197.2	9
IMHBG - 18KF - 2	187.8	198.4	169.4	187.3	182.1	135.2	165.9	196.0	190.9	167.4	182.0	15
CMVLBC 2	177.9	182.6	178.7	175.3	160.1	113.6	159.1	165.0	145.1	165.2	167.6	20
KDFM - 3	171.3	193.6	164.4	173.4	186.5	141.0	178.3	205.0	151.5	163.7	173.4	19
CO HM - 8 (NC Hybrid)	197.0	188.9	182.0	179.0	202.3	182.2	211.5	215.5	229.7	208.9	203.0	5
J - 1006 (NC)	215.3	243.1	161.6	184.2	204.6	195.7	208.9	207.0	218.1	215.3	200.0	7
African Tall (NC)	183.5	227.1	159.2	230.3	256.8	166.2	223.3	234.6	269.8	186.9	209.6	1
Mean	**185.2**	**204.6**	**162.5**	**182.0**	**196.9**	**152.9**	**193.1**	**204.4**	**197.6**	**188.0**	**188.1**	

Table 1.8 IVTM: Initial Varietal Trial in Forage Maize: Leaf Stem Ratio

Entries	Palam-pur	Sri-nagar	Ludh-iana	His-ar	Pant-nagar	Bhuban-eswar	Ran-chi	Pu-sa	Faiza-bad	Imp-hal
TNFM 131 - 9	0.31	0.34	1.18	0.47	0.47	1.15	0.44	0.47	0.57	0.63
PFM - 9	0.38	0.35	1.52	0.42	0.39	1.41	0.54	0.40	0.55	0.73
Vivek Maize Hybrid VMH 45	0.41	0.34	1.45	0.49	0.34	0.81	0.32	0.46	0.51	0.61
PFM - 10	0.30	0.35	0.98	0.49	0.39	1.35	0.40	0.44	0.67	0.67
HPFM - 9	0.30	0.35	1.30	0.35	0.30	1.34	0.42	0.46	0.65	0.65
DFH 1				0.48		0.75	0.38	0.21	0.60	0.00
ADV 6781	0.46	0.32	1.12	0.54	0.40	1.11	0.59	0.44	0.61	0.84
AFH – 6			0.98	0.62	0.24	0.84	0.35	0.43	0.56	0.75
IMHBG - 18KF – 1	0.38	0.35	2.00	0.53	0.39	1.29	0.61	0.44	0.62	0.66
BAIF Maize - 6	0.27	0.34	1.35	0.29	0.28	0.79	0.31	0.45	0.58	0.85
AH 8071R	0.45	0.37	2.33	0.54	0.35	1.24	0.40	0.45	0.68	0.52
MF - 2018	0.49	0.36	2.12	0.40	0.39	0.78	0.52	0.46	0.59	0.51
Star 111	0.44	0.35	1.40	0.60	0.30	0.87	0.30	0.44	0.54	0.82
TSFM - 16 - 10	0.39	0.33	1.85	0.47	0.49	1.07	0.32	0.43	0.67	0.59
SCH 201	0.49	0.32	1.26	0.47	0.25	0.74	0.54	0.42	0.66	0.65
AH 8070	0.45	0.37	2.15	0.41	0.36	1.20	0.49	0.52	0.68	0.46
IMHBG - 18KF - 2	0.44	0.39	2.00	0.43	0.42	1.17	0.53	0.48	0.67	0.60
CMVLBC 2	0.39	0.36	1.67	0.53	0.24	1.03	0.29	0.48	0.64	0.63
KDFM – 3	0.37	0.35	1.45	0.59	0.28	0.90	0.43	0.46	0.69	0.53
CO HM - 8 (NC Hybrid)	0.32	0.41	1.85	0.70	0.33	0.94	0.32	0.43	0.68	0.71
J - 1006 (NC)	0.42	0.39	1.26	0.46	0.43	0.74	0.45	0.41	0.56	0.68
African Tall (NC)	0.52	0.36	1.80	0.62	0.40	0.97	0.37	0.51	0.65	0.69
Mean	**0.40**	**0.36**	**1.57**	**0.50**	**0.35**	**1.02**	**0.42**	**0.44**	**0.62**	**0.63**

Table 1.8 IVTM: Initial Varietal Trial in Forage Maize: Leaf Stem Ratio

Entries	Ana-nd	Rai-pur	Jabal-pur	Rah-uri	Urulikan-chan	Jha-nsi	Hydera-bad	Coimb-atore	Man-dya	Kara-ikal	Aver-age	Ra-nk
TNFM 131 - 9	0.43	0.33	0.68	0.29	1.14	0.46	0.34	0.33	0.49	0.42	0.55	10
PFM - 9	0.60	0.34	0.50	0.31	0.98	0.50	0.41	0.28	0.46	0.59	0.58	7
Vivek Maize Hybrid VMH 45	0.59	0.62	0.53	0.48	1.53	0.54	0.57	0.27	0.48	1.00	0.62	3
PFM - 10	0.35	0.37	0.52	0.33	1.31	0.45	0.42	0.31	0.65	0.47	0.56	9
HPFM - 9	0.33	0.34	0.51	0.97	1.11	0.45	0.42	0.27	0.47	0.37	0.57	8
DFH 1	0.54	0.30	0.39	0.36	0.94	0.00		0.28			0.40	13
ADV 6781	0.60	0.58	0.49	0.37	1.80	0.68	0.56	0.32	0.62	0.63	0.65	2
AFH – 6	0.45	0.47	0.54	0.39	0.96	0.50	0.46	0.28	0.50		0.55	10
IMHBG - 18KF - 1	0.92	0.54	0.52	0.35	1.35	0.40	0.60	0.27	0.53	0.49	0.66	1
BAIF Maize - 6	0.15	0.25	0.58	0.31	0.97	0.43	0.30	0.27	0.58	0.37	0.49	12
AH 8071R	0.74	0.48	0.64	0.31	1.18	0.45	0.38	0.27	0.60	0.53	0.65	2
MF - 2018	0.58	0.43	0.57	0.36	1.46	0.34	0.49	0.31	0.45	0.41	0.60	5
Star 111	0.48	0.46	0.53	0.42	1.35	0.54	0.48	0.30	0.56	0.63	0.59	6
TSFM - 16 - 10	0.88	0.39	0.47	0.28	0.97	0.35	0.34	0.26	0.54	0.44	0.58	7
SCH 201	0.43	0.45	0.52	0.35	1.67	0.49	0.44	0.21	0.52	1.13	0.60	5
AH 8070	0.26	0.49	0.66	0.34	1.21	0.48	0.49	0.30	0.50	0.44	0.61	4
IMHBG - 18KF - 2	0.60	0.56	0.54	0.41	1.43	0.58	0.46	0.29	0.56	0.62	0.66	1
CMVLBC 2	0.38	0.45	0.50	0.36	1.41	0.62	0.57	0.27	0.58	0.59	0.60	5
KDFM - 3	0.63	0.32	0.54	0.39	1.36	0.48	0.40	0.28	0.46	0.61	0.58	7
CO HM - 8 (NC Hybrid)	0.36	0.44	0.61	0.31	1.20	0.38	0.71	0.28	0.68	0.42	0.60	5
J - 1006 (NC)	0.45	0.37	0.47	0.34	1.20	0.47	0.46	0.27	0.45	0.45	0.54	11
African Tall (NC)	0.47	0.44	0.56	0.31	1.07	0.40	0.32	0.33	0.50	0.48	0.59	6
Mean	**0.51**	**0.43**	**0.54**	**0.38**	**1.25**	**0.45**	**0.46**	**0.28**	**0.53**	**0.55**	**0.58**	

Table 1.9 IVTM: Initial Varietal Trial in Forage Maize: ADF (%), NDF (%), & IVDMD

Entries	ADF (%)		NDF (%)		IVDMD (%)	
	Ludhiana	Rank	Ludhiana	Rank	Ludhiana	Rank
TNFM 131 - 9	39.2	4	64.2	4	54.2	2
PFM - 9	39.4	5	63.7	3	53.4	
Vivek Maize Hybrid VMH 45	42.4	11	65.7	9	49.2	14
PFM - 10	40.3	6	65.7	9	50.4	14
HPFM - 9	44.1	16	66.8	11	50.6	13
DFH 1						
ADV 6781	40.7	7	64.9	7	51.0	11
AFH – 6	41.3	8	65.2	8	54.1	3
IMHBG - 18KF - 1	41.3	8	65.9	10	51.3	9
BAIF Maize - 6	41.6	10	64.2	5	52.6	7
AH 8071R	41.4	9	64.8	6	52.1	8
MF - 2018	38.1	2	63.3	2	53.4	5
Star 111	43.3	13	70.2	16	51.2	10
TSFM - 16 - 10	43.9	15	68.3	12	50.4	13
SCH 201	44.7	17	71.2	17	48.1	17
AH 8070	45.1	18	71.3	18	48.6	15
IMHBG - 18KF - 2	37.6	1	62.7	1	56.3	1
CMVLBC 2	43.6	14	69.3	13	50.7	12
KDFM – 3	38.7	3	64.9	7	53.0	6
CO HM - 8 (NC Hybrid)	42.9	12	65.7	9	48.4	16
J - 1006 (NC)	42.4	11	69.7	14	51.3	9
African Tall (NC)	45.3	19	69.9	15	47.2	18
Mean	**41.8**		**66.6**		**51.3**	

2. COMBINED AVTM-1 & AVTM-2: COMBINED FIRST AND SECOND ADVANCED VARIETAL TRIAL IN FORAGE MAIZE

(Reference Tables: 2.1 to 2.10)

AVTM-1 and AVTM-2 were merged to form **Combined AVTM-1&2.** An advanced varietal trial **Combined first and Second Advanced Varietal Trial in Forage Maize** comprising five entries [**03 for AVT-1: DMRH-1410, IMH-1527, TSFM-16-3** promoted from IVT to AVT-1 ; and **02 for AVT-2: TSFM-15-5, ADV-6737** promoted from AVT-1 to AVT-2] and three national checks *viz.*, African Tall, J-1006 and CO-HM-8 (NC hybrid) was conducted at 9 locations distributed in two zones viz., north east zone (5 locations) and south zone (4 locations).

For AVT-2, two entries TSFM-15-5 and ADV-6737 were evaluated.

For green forage yield (q/ha), national check was better in NE zone and combining both zones, whereas in south zone ADV 6737 and TSFM-15-5 showed superiority of 4.3% and 4.0% respectively.

For dry matter yield, national check J-1006 was superior in NE zone whereas entry ADV-6737 showed marginal superiority over the best check in south zone and combining both zones.

For per day productivity, both green and dry fodder (q/ha/day) entry ADV 6737 was better than the best check. For plant height, National check African Tall ranked first whereas for leafiness entry ADV-6737 ranked first.

For crude protein yield (q/ha), entry TSFM-15-5 ranked first (7.1q) as compared to best check J-1006 (6.9 q). For crude protein content also, entry TSFM-15-5 ranked first 8.8 % as compared to best check J-1006 (8.7%). For other quality parameters, checks performed better than entries for NDF, ADF and IVDMD.

For AVT-1, three entries DMRH-1410, IMH 1527 and TSFM-16-3 promoted from IVT to AVT-1 were evaluated.

For green forage yield (q/ha) and dry matter yield (q/ha), check J-1006 in NE zone, south zone and combining both zones performed best.

For per day productivity forage production potential (q/ha/day), national check J-1006 was superior for both green and dry matter production. For the character leafiness (L/S ratio) and plant height, none of the entries could beat checks.

For crude protein yield (q/ha), and crude protein content (%), also the national check was best. For other quality parameters, national check was best for ADF, NDF and IVDMD.

Table 2.1 Combined AVTM-1 & 2: Combined Advanced Varietal Trial 1 & 2 in Forage Maize: Green Forage Yield (q/ha)

Entries	North East Zone							South Zone							All India	
	Bhuban-eswar	Ran-chi	Jor-hat	Faiza-bad	Imp-hal	Aver-age	Ra-nk	Hydera-bad	Coimb-atore	Man-dya	Karai-kal	Aver-age	Ra-nk	Super-iority%	Aver-age	Ra-nk
ADV 6737	340.2	328.5	334.7	265.4	314.6	316.7	2	509.2	538.0	472.9	351.1	467.8	1	4.3	383.8	2
TSFM - 16 - 3	237.6	324.7	246.7	255.3	427.7	298.4	4	525.3	431.6	411.6	137.0	376.4	8		333.0	7
IMH 1527	277.7	341.7	198.9	308.3	327.1	290.7	6	506.5	479.1	375.1	326.0	421.7	6		348.9	6
TSFM - 15 – 5	255.3	359.0	275.0	247.1	387.7	304.8	3	594.2	513.9	437.1	320.2	466.3	2	4.0	376.6	3
DMRH - 1410	301.7	329.2	217.8	269.6	356.3	294.9	5	429.0	548.0	423.9	364.6	441.4	4		360.0	4
CO HM - 8 (NC hybrid)	231.3	308.7	258.1	261.4	326.0	277.1	8	454.0	497.2	451.2	196.8	399.8	7		331.6	8
J - 1006 (NC)	324.1	312.5	301.9	306.4	422.9	333.5	1	440.4	522.2	475.6	354.9	448.3	3		384.5	1
African Tall (NC)	240.7	317.0	191.0	224.6	463.1	287.3	7	437.0	579.7	445.0	277.8	434.9	5		352.9	5
Mean	**276.1**	**327.7**	**253.0**	**267.3**	**378.2**	**300.4**		**487.0**	**513.7**	**436.6**	**291.0**	**432.1**			**358.9**	
CD at 5%	**2.3**	**25.9**	**6.0**	**42.0**	**14.6**			**41.0**	**6.7**	**60.4**	**87.9**					
CV%	**4.9**	**4.5**	**7.6**	**9.0**	**2.2**			**4.9**	**0.8**	**7.9**	**17.2**					

Table 2.2 Combined AVTM-1 &2: Combined Advanced Varietal Trial 1 & 2 in Forage Maize: Dry Matter Yield (q/ha)

Entries	North East Zone							South Zone							All India		
	Bhuban-eswar	Ran-chi	Jor-hat	Faiza-bad	Imp-hal	Aver-age	Ra-nk	Hydera-bad	Coimba-tore	Man-dya	Karai-kal	Aver-age	Ra-nk	Super-iority%	Aver-age	Ra-nk	Superi-ority%
ADV 6737	79.9	71.2	66.1	70.7	56.6	68.9	2	87.4	116.2	109.3	87.9	100.2	1	1.7	82.8	1	0.1
TSFM - 16 - 3	57.9	59.5	48.8	61.6	70.9	59.7	6	94.6	96.4	78.1	31.6	75.2	8		66.6	8	
IMH 1527	65.7	68.9	40.3	86.3	62.6	64.7	4	74.8	105.6	83.5	84.4	87.1	7		74.7	5	
TSFM - 15 – 5	60.6	56.8	47.9	63.1	92.2	64.1	5	112.1	113.7	87.1	84.1	99.3	2	0.8	79.7	3	
DMRH – 1410	73.0	71.9	43.2	81.0	66.6	67.1	3	73.3	117.8	82.4	104.3	94.5	5		79.3	4	
CO HM - 8 (NC hybrid)	55.5	62.8	51.3	56.9	52.1	55.7	7	77.0	113.4	131.7	52.1	93.5	6		72.5	7	
J - 1006 (NC)	78.0	65.6	56.3	88.8	61.7	70.1	1	77.0	118.4	98.9	99.6	98.5	3		82.7	2	
African Tall (NC)	58.0	41.2	35.3	56.5	79.9	54.2	8	66.8	125.8	104.3	86.0	95.7	4		72.6	6	
Mean	**66.1**	**62.2**	**48.7**	**70.6**	**67.8**	**63.1**		**82.9**	**113.4**	**96.9**	**78.7**	**93.0**			**76.4**		
CD at 5%	**0.6**	**3.9**	**4.4**	**11.7**	**15.3**			**12.4**	**6.1**	**16.7**	**20.4**						
CV%	**5.0**	**5.5**	**12.8**	**9.46**	**12.9**			**8.5**	**3.1**	**9.8**	**14.8**						

Table 2.3 Combined AVTM-1 & 2: Combined Advanced Varietal Trial 1 & 2 in Forage Maize: Green Forage Yield (q/ha/day)

Entries	Bhubaneswar	Ranchi	Jorhat	Faizabad	Hyderabad	Coimbatore	Mandya	Karaikal	Average	Rank
ADV 6737	5.37	5.94	5.77	4.02	8.13	8.68	8.45	5.04	6.43	1
TSFM - 16 - 3	4.05	5.32	4.57	3.92	7.92	6.85	7.05	1.72	5.17	8
IMH 1527	4.63	6.61	3.55	4.53	7.92	7.99	6.86	4.22	5.79	5
TSFM - 15 – 5	4.33	6.49	4.74	3.92	9.20	7.56	7.45	4.69	6.05	3
DMRH - 1410	4.81	5.81	4.19	4.64	6.81	8.70	7.71	5.14	5.98	4
CO HM - 8 (NC hybrid)	3.54	5.79	4.69	4.93	7.31	8.15	8.51	2.85	5.72	6
J - 1006 (NC)	5.69	6.05	5.30	4.71	6.67	8.03	8.10	5.07	6.20	2
African Tall (NC)	3.95	4.98	3.13	3.74	6.56	8.40	7.15	3.54	5.18	7
Mean	**4.55**	**5.87**	**4.49**	**4.30**	**7.57**	**8.04**	**7.66**	**4.03**	**5.81**	

Table 2.4 Combined AVTM-1 & 2: Combined Advanced Varietal Trial 1 & 2 in Forage Maize: Dry Matter Yield (q/ha/day)

Entries	Bhubaneswar	Ranchi	Jorhat	Faizabad	Hyderabad	Coimbatore	Mandya	Karaikal	Average	Rank
ADV 6737	1.26	1.29	1.14	1.07	1.40	1.87	1.95	1.27	1.41	1
TSFM - 16 - 3	0.99	0.98	0.90	0.94	1.43	1.53	1.34	0.39	1.06	8
IMH 1527	1.09	1.33	0.72	1.26	1.17	1.76	1.53	1.09	1.24	6
TSFM - 15 – 5	1.03	1.03	0.83	1.00	1.74	1.67	1.49	1.23	1.25	5
DMRH - 1410	1.16	1.27	0.83	1.39	1.16	1.87	1.50	1.47	1.33	3
CO HM - 8 (NC hybrid)	0.85	1.18	0.93	1.07	1.24	1.86	2.48	0.75	1.30	4
J - 1006 (NC)	1.37	1.27	0.99	1.36	1.17	1.82	1.69	1.42	1.39	2
African Tall (NC)	0.95	0.65	0.58	0.94	1.00	1.82	1.68	1.09	1.09	7
Mean	**1.09**	**1.12**	**0.86**	**1.13**	**1.29**	**1.78**	**1.71**	**1.09**	**1.26**	

Table 2.5 Combined AVTM-1 & 2: Combined Advanced Varietal Trial 1 & 2 in Forage Maize: Crude Protein Yield (q/ha)

Entries	Bhubaneswar	Ranchi	Jorhat	Faizabad	Imphal	Coimbatore	Hyderabad	Average	Rank
ADV 6737	6.5	4.3	5.8	5.7	4.6	8.6	6.2	6.0	3
TSFM - 16 - 3	4.2	4.6	4.6	5.1	5.2	9.7	7.9	5.9	4
IMH 1527	4.9	4.7	3.5	7.5	4.9	6.0	8.1	5.7	6
TSFM - 15 – 5	5.2	3.7	4.6	5.0	6.8	12.1	12.0	7.1	1
DMRH - 1410	5.3	5.2	3.6	6.8	4.6	10.4	4.4	5.8	5
CO HM - 8 (NC hybrid)	4.1	4.4	5.0	4.7	3.8	6.9	4.6	4.8	8
J - 1006 (NC)	5.7	5.6	5.1	7.6	4.6	11.4	8.2	6.9	2
African Tall (NC)	4.2	3.3	2.9	4.9	5.6	9.9	5.3	5.2	7
Mean	**5.0**	**4.5**	**4.4**	**5.9**	**5.0**	**9.4**	**7.1**	**5.9**	

Table 2.6 Combined AVTM-1 & 2: Combined Advanced Varietal Trial 1 & 2 in Forage Maize: Crude Protein (%)

Entries	Bhubaneswar	Ranchi	Jorhat	Faizabad	Imphal	Coimbatore	Hyderabad	Average	Rank
ADV 6737	8.1	6.1	8.8	8.1	8.0	7.4	7.0	7.7	6
TSFM - 16 - 3	7.2	7.7	9.5	8.3	7.3	10.1	8.4	8.4	3
IMH 1527	7.5	6.8	8.8	8.7	7.9	5.7	10.8	8.0	4
TSFM - 15 – 5	8.5	6.6	9.7	8.0	7.4	10.6	10.7	8.8	1
DMRH - 1410	7.3	7.2	8.5	8.4	6.9	8.8	6.1	7.6	7
CO HM - 8 (NC hybrid)	7.4	7.0	9.8	8.2	7.3	6.1	6.1	7.4	8
J - 1006 (NC)	7.3	8.5	9.1	8.5	7.5	9.6	10.7	8.7	2
African Tall (NC)	7.3	8.1	8.3	8.6	7.0	7.9	7.9	7.9	5
Mean	**7.6**	**7.2**	**9.1**	**8.4**	**7.4**	**8.3**	**8.5**	**8.1**	

Table 2.7 Combined AVTM-1 & 2: Combined Advanced Varietal Trial 1 & 2 in Forage Maize: Plant Height (cm)

Entries	Bhubaneswar	Ranchi	Jorhat	Faizabad	Imphal	Hyderabad	Coimbatore	Mandya	Karaikal	Average	Rank
ADV 6737	184.3	141.3	195.9	165.5	158.2	174.3	203.0	170.6	122.9	168.4	8
TSFM - 16 - 3	159.9	204.3	201.8	172.0	180.8	226.6	251.0	247.5	143.0	198.5	3
IMH 1527	175.1	206.3	189.8	180.5	178.8	220.1	210.0	167.0	161.3	187.7	5
TSFM - 15 – 5	173.2	207.7	109.7	164.0	226.8	269.5	264.1	235.3	170.9	202.3	2
DMRH - 1410	180.2	192.7	128.3	170.0	179.1	189.8	213.0	147.1	167.8	174.2	7
CO HM - 8 (NC hybrid)	164.3	194.7	131.8	161.0	200.7	206.6	210.1	191.6	176.3	181.9	6
J - 1006 (NC)	188.0	177.3	136.9	172.0	199.1	232.2	251.0	215.3	181.1	194.8	4
African Tall (NC)	169.5	195.7	134.3	169.0	279.6	239.1	270.2	302.8	135.4	210.6	1
Mean	**174.3**	**190.0**	**153.6**	**169.3**	**200.4**	**219.8**	**234.1**	**209.7**	**157.3**	**189.8**	

Table 2.8 Combined AVTM-1 & 2: Combined Advanced Varietal Trial 1 & 2 in Forage Maize: Leaf Stem Ratio

Entries	Bhubaneswar	Ranchi	Jorhat	Faizabad	Imphal	Hyderabad	Coimbatore	Mandya	Karaikal	Average	Rank
ADV 6737	1.39	0.52	0.89	0.65	0.79	0.52	0.31	0.54	0.56	0.69	1
TSFM - 16 - 3	0.92	0.74	0.84	0.68	0.79	0.34	0.27	0.65	0.51	0.64	4
IMH 1527	1.14	0.49	0.65	0.73	0.77	0.45	0.28	0.60	0.59	0.63	5
TSFM - 15 – 5	1.09	0.55	1.04	0.61	0.52	0.51	0.29	0.61	0.61	0.65	3
DMRH - 1410	1.25	0.52	0.66	0.70	0.68	0.39	0.32	0.65	0.41	0.62	6
CO HM - 8 (NC hybrid)	0.90	0.48	0.98	0.63	0.74	0.42	0.27	0.63	0.50	0.62	6
J - 1006 (NC)	1.30	0.52	0.91	0.71	0.80	0.37	0.28	0.75	0.48	0.68	2
African Tall (NC)	0.95	0.86	0.78	0.67	0.57	0.31	0.34	0.57	0.56	0.62	6
Mean	**1.12**	**0.59**	**0.84**	**0.67**	**0.71**	**0.41**	**0.30**	**0.63**	**0.53**	**0.64**	

Table 2.9 Combined AVTM-1 & 2: Combined Advanced Varietal Trial 1 & 2 in Forage Maize: ADF (%), NDF (%), & IVDMD (%)

Entries	ADF (%)		NDF (%)		IVDMD (%)	
	Ranchi	Rank	Ranchi	Rank	Ranchi	Rank
ADV 6737	45.6	3	66.5	3	53.9	4
TSFM - 16 - 3	48.1	5	67.2	5	52.9	5
IMH 1527	44.8	2	62.1	2	54.6	3
TSFM - 15 – 5	48.9	7	71.6	7	52.4	6
DMRH - 1410	48.4	6	72.3	8	51.6	7
CO HM - 8 (NC hybrid)	37.6	1	59.1	1	60.2	1
J - 1006 (NC)	44.8	2	66.9	4	55.4	2
African Tall (NC)	46.9	4	69.7	6	52.9	5
Mean	**45.6**		**66.9**		**54.2**	

3. IVTPM: INITIAL VARIETAL TRIAL IN FORAGE PEARL MILLET

(Reference Tables: 3.1 to 3.9)

An initial varietal trial in forage Pearl millet comprising of eleven entries along with one national check *i.e*. Giant Bajra and respective zonal checks was conducted at 18 centres located in four zones of the country. It included 4 locations each in North-west and north- east and 7 locations in central and 3 locations in south zone.

For green forage yield (q/ha), entries ADV-160061 (17.0%), TSFB-17-7 (13.7%), K-25 (14.1%) and JKFBH-1521 (12.7%) in south zone showed superiority over best check. In other zones and at all India level, national or zonal checks were best performers.

For dry matter yield (q/ha), entries ADV-160061 (15.0%), TSFB-17-7 (21.2%), K-25 (17.9%) and JKFBH-1521 (16.3%) in south zone showed superiority over best check. In other zones and at all India level, national or zonal checks were best performers.

For green forage production potential (q/ha/day), National check Giant Bajra (6.71 q/ha/day) was best performer followed by ADV-160061 (6.64 q/ha/day). For dry forage production potential (q/ha/day), entry ADV-160061 (1.63 q/ha/day) was best followed by National check Giant Bajra 1.61 q/ha/day).

In growth parameters, national check Giant Bajra was best for plant height (218.5 cm). Entry FBL-3 was best performer (value 0.50) for leafiness.

In quality parameters, for crude protein yield (q/ha), entry TSFB-17-7 ranked first (8.4 q/ha) followed by JKFBH-1521 (8.0 q/ha). For CP content, entry TSFB-17-7 ranked first with value of 8.3%. Entries AFB -38, JKFBH 1521, Giant Bajra ranked joint second with value of 7.9%.

For other quality parameters, entry JPM-18-3 for ADF (48.3%), entry JKFBH-1521 for NDF (69.3%) and IVDMD (59.4%) recorded superiority.

Table 3.1 IVTPM: Initial Varietal Trial in Forage Pearl millet: Green Forage Yield (q/ha)

Entries	North West Zone						North East Zone					
	Ludh-iana	His-ar	Bika-ner	Jal-ore	Aver-age	Ra-nk	Faiza-bad	Pu-sa	Bhuban-eswar	Ran-chi	Aver-age	Ra-nk
FBL - 1	431.5	930.6	132.6	270.4	441.3	8	449.3	322.3	341.6	362.1	368.8	4
ADV160061	631.9	504.6	233.6	467.1	459.3	7	559.6	313.0	308.3	390.3	392.8	3
FBL - 2	499.1	773.1	202.4	264.4	434.7	11	441.2	263.3	327.0	412.5	361.0	6
Star chandra	496.3	907.4	205.8	379.2	497.2	2	363.5	268.0	288.5	433.8	338.5	10
RBB - 10	492.6	745.4	332.5	330.1	475.2	5	383.8	285.0	252.0	377.3	324.6	11
TSFB - 17 – 7	526.4	601.9	165.7	469.4	440.9	9	535.1	325.0	298.9	460.2	404.8	2
AFB - 38	595.4	504.6	176.1	347.7	405.9	13	359.3	211.7	315.6	294.5	295.3	13
K - 25	554.2	675.9	289.4	410.6	482.5	4	408.3	314.7	265.6	302.3	322.7	12
JPM-18-3	568.5	643.5	233.7	514.4	490.0	3	375.7	316.0	283.3	397.3	343.1	8
FBL - 3	543.5	588.0	243.4	288.0	415.7	12	420.6	301.7	260.4	377.3	340.0	9
JKFBH 1521	459.3	555.6	326.8	406.9	437.2	10	465.7	266.0	304.1	421.8	364.4	5
Giant Bajra (NC)	516.2	736.1	307.6	508.8	517.2	1	551.5	312.3	294.7	473.6	408.0	1
AFB - 3 (ZC-NWZ)	511.1	754.6	322.6	281.9	467.6	6						
APFB - 9 - 1 (ZC-NEZ)							424.8	290.7	275.0	391.2	345.4	7
Mean	**525.1**	**686.3**	**244.0**	**379.9**	**458.8**		**441.4**	**291.5**	**293.5**	**391.9**	**354.6**	
CD at 5%	**60.2**	**139.0**	**52.7**	**143.1**			**65.7**	**11.1**	**1.6**	**39.2**		
CV%	**11.6**	**11.9**	**12.8**	**22.4**			**8.8**	**6.4**	**6.8**	**5.9**		

Table 3.1 IVTPM: Initial Varietal Trial in Forage Pearl millet: Green Forage Yield (q/ha)

Entries	Central Zone								
	Ana-nd	Rai-pur	Jabal-pur	Rah-uri	Urulikan-chan	Jha-nsi	Mee-rut	Aver-age	Ra-nk
FBL - 1	176.9	267.6	345.7	423.0	465.9	169.9	682.4	361.6	11
ADV160061	430.6	481.5	395.7	625.5	542.3	300.9	787.0	509.1	2
FBL - 2	329.7	150.9	322.8	435.1	429.9	127.3	708.3	357.7	12
Star chandra	254.7	192.6	481.1	433.2	447.4	173.1	649.1	375.9	9
RBB - 10	241.7	252.8	374.9	435.2	443.1	129.2	700.0	368.1	10
TSFB - 17 - 7	247.2	379.6	333.2	608.0	693.3	255.1	662.0	454.1	5
AFB - 38	75.9	238.0	291.6	399.2	349.7	187.5	707.4	321.3	13
K - 25	324.1	364.8	362.4	544.3	460.6	303.2	756.9	445.2	6
JPM-18-3	148.2	333.3	366.6	576.1	830.6	199.1	527.8	426.0	7
FBL - 3	263.9	275.0	333.2	387.0	504.5	275.5	703.7	391.8	8
JKFBH 1521	172.2	439.8	360.3	712.4	699.4	196.8	762.0	477.5	4
Giant Bajra (NC)	388.0	453.7	406.1	539.4	536.1	276.4	884.3	497.7	3
BAIF Bajra 1 (ZC-CZ)	370.4	453.7	360.3	637.0	656.3	305.6	1041.7	546.4	1
Mean	**263.3**	**329.5**	**364.1**	**519.7**	**543.0**	**223.0**	**736.4**	**425.6**	
CD at 5%	**70.1**	**85.1**	**76.2**	**74.1**	**94.9**	**18.1**	**67.8**		
CV%	**15.8**	**15.1**	**12.4**	**8.5**	**10.3**	**10.7**	**5.5**		

Table 3.1 IVTPM: Initial Varietal Trial in Forage Pearl millet: Green Forage Yield (q/ha)

Entries	South Zone						All India	
	Coimb-atore	Hydera-bad	Man-dya	Aver-age	Rank	Super-iority%	Aver-age	Ra-nk
FBL - 1	342.6	324.3	117.1	261.3	12		364.2	11
ADV160061	629.6	296.5	217.5	381.2	1	17.0	450.9	2
FBL - 2	375.0	389.2	183.6	315.9	7		368.6	9
Star chandra	398.1	310.4	189.7	299.4	10		381.8	7
RBB - 10	342.6	342.9	229.4	305.0	8		371.7	8
TSFB - 17 - 7	550.9	412.4	147.9	370.4	3	13.7	426.2	3
AFB - 38	347.2	324.3	105.5	259.0	13		324.0	12
K - 25	546.3	361.4	207.4	371.7	2	14.1	414.0	5
JPM-18-3	564.8	240.9	106.8	304.2	9		401.5	6
FBL - 3	361.1	352.1	122.8	278.7	11		366.8	10
JKFBH 1521	625.0	319.7	157.3	367.3	4	12.7	425.1	4
Giant Bajra (NC)	569.4	222.4	185.5	325.8	6		453.5	1
Moti Bajra (ZC-SZ)	523.1	315.1	239.7	359.3	5			
Mean	**475.1**	**324.0**	**170.0**	**323.0**			**395.7**	
CD at 5%	**15.6**	**49.6**	**25.8**					
CV%	**1.9**	**9.0**	**10.3**					

Table 3.2 IVTPM: Initial Varietal Trial in Forage Pearl millet: Dry Matter Yield (q/ha)

Entries	North West Zone						North East Zone					
	Ludh-iana	His-ar	Bika-ner	Jal-ore	Aver-age	Ra-nk	Faiza-bad	Pu-sa	Bhuban-eswar	Ran-chi	Aver-age	Ra-nk
FBL - 1	75.5	167.5	35.3	69.4	86.9	8	115.4	76.6	76.9	91.1	90.0	6
ADV160061	108.4	81.1	81.2	118.5	97.3	4	163.2	79.7	72.0	84.6	99.9	3
FBL - 2	84.8	123.7	58.9	70.4	84.4	10	109.1	74.0	73.4	114.8	92.8	5
Star chandra	88.3	122.4	49.0	112.0	92.9	6	76.2	70.5	65.6	120.0	83.1	9
RBB - 10	81.3	100.8	88.7	86.1	89.2	7	92.2	71.6	60.0	105.7	82.4	10
TSFB - 17 - 7	91.6	83.8	56.9	100.5	83.2	11	149.8	85.1	74.7	109.7	104.8	2
Giant Bajra (NC)	88.3	106.9	85.7	123.6	101.1	1	163.0	82.7	72.0	119.2	109.2	1
AFB - 38	108.4	90.8	47.3	71.8	79.6	13	88.7	70.9	74.3	76.1	77.5	12
K - 25	100.9	108.8	73.1	108.3	97.8	3	104.7	80.0	60.8	60.5	76.5	13
JPM-18-3	103.5	103.0	55.3	134.3	99.0	2	103.2	82.8	64.6	102.6	88.3	7
FBL - 3	98.9	79.3	75.3	67.1	80.2	12	94.6	79.7	61.4	103.1	84.7	8
JKFBH 1521	83.6	74.8	93.2	94.4	86.5	9	109.3	70.9	74.7	141.3	99.0	4
Giant Bajra (NC)	88.3	106.9	85.7	123.6	101.1	1	163.0	82.7	72.0	119.2	109.2	1
AFB - 3 (ZC-NWZ)	91.0	132.3	83.4	70.8	94.4	5						
APFB - 9 - 1 (ZC-NEZ)							110.3	75.8	61.9	73.7	80.4	11
Mean	**92.7**	**105.8**	**67.9**	**94.4**	**90.2**		**113.8**	**76.9**	**68.6**	**100.2**	**89.9**	
CD at 5%	**21.7**	**24.0**	**21.1**	**41.2**			**17.2**	**2.9**	**0.35**	**10.0**		
CV%	**12.1**	**13.4**	**18.4**	**26.0**			**9.0**	**6.3**	**6.39**	**8.2**		

Table 3.2 IVTPM: Initial Varietal Trial in Forage Pearl millet: Dry Matter Yield (q/ha)

Entries	Central Zone								
	Ana-nd	Rai-pur	Jabal-pur	Rah-uri	Urulikan-chan	Jha-nsi	Mee-rut	Aver-age	Ra-nk
FBL - 1	35.5	81.5	78.7	79.0	104.9	33.7	211.2	89.2	12
ADV160061	96.5	143.8	93.1	146.2	166.4	57.9	237.8	134.5	2
FBL - 2	94.2	41.7	72.6	78.8	98.9	23.2	241.3	93.0	10
Star chandra	56.3	54.2	114.9	74.2	99.6	31.1	211.4	91.7	11
RBB - 10	79.9	95.7	87.9	86.5	104.3	24.6	264.8	106.2	7
TSFB - 17 – 7	42.1	134.9	74.9	144.2	186.6	49.8	211.3	120.5	5
AFB - 38	18.2	72.4	66.0	72.9	75.9	29.4	186.9	74.5	13
K - 25	68.8	108.4	84.9	95.6	99.9	49.1	233.1	105.7	8
JPM-18-3	27.7	95.0	86.0	135.4	185.9	37.5	188.3	108.0	6
FBL - 3	63.8	120.2	74.3	66.3	127.5	52.6	197.3	100.3	9
JKFBH 1521	36.5	118.8	84.1	162.8	205.7	37.2	270.6	130.8	3
Giant Bajra (NC)	83.8	146.9	96.2	127.0	138.2	47.0	273.6	130.4	4
BAIF Bajra 1 (ZC-CZ)	69.4	106.6	83.9	145.2	168.4	53.9	327.5	136.4	1
Mean	**59.4**	**101.5**	**84.4**	**108.8**	**135.5**	**40.5**	**235.0**	**109.3**	
CD at 5%	**16.7**	**28.5**	**19.1**	**15.6**	**25.8**	**9.6**	**35.5**		
CV%	**16.6**	**16.5**	**13.4**	**8.5**	**11.2**	**5.7**	**9.0**		

Table 3.2 IVTPM: Initial Varietal Trial in Forage Pearl millet: Dry Matter Yield (q/ha)

Entries	South Zone						All India		
	Coim-batore	Hydera-bad	Man-dya	Aver-age	Ra-nk	Super-iority%	Aver-age	Ra-nk	Super-iority%
FBL - 1	65.6	74.2	28.1	56.0	13		83.3	11	
ADV160061	124.7	69.2	40.8	78.2	4	15.0	109.2	1	0.4
FBL - 2	73.5	87.4	42.4	67.8	8		86.8	8	
Star chandra	75.4	72.3	51.8	66.5	9		85.8	9	
RBB - 10	66.9	77.2	60.6	68.2	6		90.8	7	
TSFB - 17 - 7	110.7	96.1	40.5	82.4	1	21.2	102.4	4	
AFB - 38	67.7	74.9	28.3	57.0	12		73.4	12	
K - 25	105.6	82.2	52.8	80.2	2	17.9	93.2	7	
JPM-18-3	113.7	49.2	29.6	64.2	10		94.3	5	
FBL - 3	72.6	75.8	25.0	57.8	11		85.3	10	
JKFBH 1521	120.6	73.0	43.6	79.1	3	16.3	105.3	3	
Giant Bajra (NC)	116.9	47.1	40.0	68.0	7		108.8	2	
Moti Bajra (ZC-SZ)	102.9	62.4	68.3	77.9	5				
Mean	**93.6**	**72.4**	**42.4**	**69.5**			**93.2**		
CD at 5%	**4.0**	**11.2**	**9.2**						
CV%	**2.5**	**9.1**	**14.7**						

Table 3.3 IVTPM: Initial Varietal Trial in Forage Pearl millet: Green Forage Yield (q/ha/day)

Entries	Ludh-iana	His-ar	Bika-ner	Faiza-bad	Pu-sa	Bhuban-eswar	Ran-chi	Ana-nd	Rai-pur	Jabal-pur	Rah-uri	Urulikan-chan	Coimb-atore	Hydera-bad	Man-dya	Aver-age	Ra-nk
FBL - 1	5.50	13.29	2.04	6.41	6.40	6.33	6.96	3.05	5.35	4.26	9.54	7.64	6.85	6.27	2.70	6.17	5
ADV160061	7.40	7.21	2.85	7.77	5.00	4.60	4.15	6.95	9.63	4.94	8.23	12.05	10.16	4.92	3.80	6.64	2
FBL - 2	6.40	11.04	3.11	5.88	4.80	5.84	7.73	5.08	2.85	3.93	9.26	6.82	7.21	6.79	3.90	6.04	6
Star chandra	6.40	12.96	3.17	4.78	5.10	4.97	7.66	4.05	3.85	5.66	8.72	7.33	7.96	6.17	3.80	6.17	5
RBB - 10	6.30	10.65	5.12	5.18	5.40	4.76	6.95	4.03	4.68	4.80	9.20	8.06	6.99	6.78	5.00	6.26	4
TSFB - 17 – 7	6.20	8.60	2.02	6.44	5.10	4.40	5.88	3.74	7.16	4.44	8.22	14.15	0.00	6.80	2.70	5.72	10
AFB - 38	7.60	7.21	2.71	4.72	3.60	5.01	4.65	1.13	4.76	3.64	7.83	6.60	6.94	6.40	2.10	4.99	11
K – 25	7.10	9.66	4.45	5.59	4.90	4.35	4.70	5.23	6.63	4.89	9.96	9.03	10.93	6.73	4.40	6.57	3
JPM-18-3	6.70	9.19	2.85	4.94	4.70	4.50	4.11	2.28	7.41	4.70	7.68	13.62	9.74	4.15	2.00	5.90	9
FBL - 3	7.00	8.40	3.74	5.68	4.90	4.57	7.08	4.47	5.50	4.16	8.18	8.27	7.37	6.71	2.60	5.91	8
JKFBH 1521	5.40	7.94	3.99	6.20	5.20	4.61	4.19	2.82	7.85	4.50	8.32	11.46	9.77	5.27	2.80	6.02	7
Giant Bajra (NC)	6.10	10.52	3.75	6.72	4.60	4.54	6.26	7.05	10.08	5.61	7.32	10.51	10.17	3.97	3.40	6.71	1
AFB - 3 (ZC-NWZ)	6.60	10.78	4.96														
APFB - 9 - 1 (ZC-NEZ)				5.44	4.70	4.17	6.38										
BAIF Bajra 1 (ZC-CZ)								5.78	8.40	4.50	8.69	12.87					
Moti Bajra (ZC-SZ)													10.46	6.17	4.30		
Mean	**6.52**	**9.80**	**3.44**	**5.83**	**4.95**	**4.82**	**5.90**	**4.28**	**6.47**	**4.62**	**8.55**	**9.88**	**8.04**	**5.93**	**3.35**	**6.09**	

Table 3.4 IVTPM: Initial Varietal Trial in Forage Pearl millet: Dry Matter Yield (q/ha/day)

Entries	Ludh-iana	His-ar	Bika-ner	Faiza-bad	Bhuban eswar	Ran-chi	Ana-nd	Rai-pur	Jabal-pur	Rah-uri	Urulikan-chan	Coimb-atore	Hydera bad	Man-dya	Aver-age	Rank
FBL - 1	1.00	2.39	0.54	1.64	1.42	1.75	0.61	1.63	0.97	1.78	1.72	1.31	1.43	0.60	1.34	8
ADV160061	1.30	1.16	0.99	2.26	1.08	0.90	1.56	2.88	1.16	1.92	3.70	2.01	1.15	0.70	1.63	1
FBL - 2	1.10	1.77	0.91	1.45	1.31	2.15	1.45	0.79	0.87	1.68	1.57	1.41	1.53	0.90	1.35	7
Star chandra	1.10	1.75	0.75	1.03	1.13	2.12	0.89	1.08	1.35	1.49	1.63	1.51	1.44	1.00	1.31	10
RBB - 10	1.00	1.44	1.36	1.11	1.13	1.94	1.33	1.77	1.12	1.83	1.90	1.37	1.53	1.30	1.44	3
TSFB - 17 – 7	1.10	1.20	0.69	1.82	1.10	1.40	0.64	2.55	0.99	1.95	3.81	0.00	1.58	0.70	1.40	5
AFB - 38	1.40	1.30	0.73	1.16	1.18	1.20	0.27	1.45	0.82	1.43	1.43	1.35	1.48	0.60	1.13	11
K - 25	1.30	1.55	1.12	1.37	1.00	0.94	1.11	1.97	1.14	1.75	1.96	2.11	1.52	1.10	1.42	4
JPM-18-3	1.20	1.47	0.67	1.35	1.03	1.06	0.43	2.11	1.10	1.81	3.05	1.96	0.85	0.50	1.33	9
FBL - 3	1.30	1.13	1.16	1.27	1.08	1.93	1.08	2.40	0.92	1.40	2.09	1.48	1.44	0.50	1.37	6
JKFBH 1521	1.00	1.07	1.14	1.45	1.13	1.40	0.60	2.12	1.05	1.90	3.37	1.88	1.20	0.80	1.44	3
Giant Bajra (NC)	1.00	1.53	1.04	2.08	1.11	1.58	1.52	3.26	1.33	1.72	2.71	2.09	0.84	0.70	1.61	2
AFB - 3 (ZC-NWZ)	1.20	1.89	1.28													
APFB - 9 - 1 (ZC-NEZ)				1.45	0.94	1.20										
BAIF Bajra 1 (ZC-CZ)							1.08	1.97	1.04	1.98	3.30					
Moti Bajra (ZC-SZ)												2.06	1.22	1.20		
Mean	**1.15**	**1.51**	**0.95**	**1.50**	**1.13**	**1.51**	**0.97**	**2.00**	**1.07**	**1.74**	**2.48**	**1.58**	**1.32**	**0.82**	**1.40**	

Table 3.5 IVTPM: Initial Varietal Trial in Forage Pearl millet: Crude Protein Yield (q/ha)

Entries	Ludh-iana	Bika-ner	Faiza-bad	Bhuban-eswar	Ran-chi	Ana-nd	Rai-pur	Jabal-pur	Rah-uri	Urulikan-chan	Coimb-atore	Hydera-bad	Man-dya	Aver-age	Ra-nk
FBL - 1	4.9	1.9	10.0	5.9	6.4	2.9	6.4	6.2	4.3	9.0	5.4	6.5	2.2	5.5	10
ADV160061	8.3	3.6	14.4	5.5	4.1	6.4	9.7	7.5	10.9	12.3	12.0	4.9	3.7	7.9	3
FBL - 2	7.6	2.4	8.7	5.5	7.2	6.0	3.2	5.8	4.7	9.3	10.0	6.1	3.0	6.1	7
Star chandra	6.5	1.8	5.9	4.9	7.3	3.5	3.9	9.2	3.6	9.8	9.6	4.6	3.6	5.7	9
RBB - 10	4.6	3.2	7.5	4.3	4.9	5.2	7.2	6.9	7.6	10.4	7.3	4.4	4.5	6.0	8
TSFB - 17 – 7	6.9	2.9	12.8	5.2	6.7	3.5	10.1	6.0	9.8	14.9	15.3	11.1	4.1	8.4	1
AFB - 38	7.6	3.1	7.3	5.3	4.8	1.5	5.3	4.8	5.1	6.4	7.1	7.5	2.2	5.2	11
K - 25	5.6	4.1	8.1	4.5	4.2	6.0	6.9	6.7	6.3	8.0	12.5	6.8	4.1	6.4	5
JPM-18-3	8.7	1.6	8.6	4.8	6.8	2.6	7.1	6.9	8.0	15.1	12.4	3.6	1.8	6.8	4
FBL - 3	5.5	4.2	7.8	4.4	5.9	5.1	9.2	5.8	5.2	10.8	9.5	6.0	2.0	6.3	6
JKFBH 1521	7.6	5.4	8.7	5.1	8.6	3.5	9.8	6.7	9.3	16.5	13.1	6.0	3.5	8.0	2
Giant Bajra (NC)	6.4	5.3	14.3	5.0	7.0	7.3	11.7	7.7	8.3	9.9	12.3	3.2	4.7	7.9	3
AFB - 3 (ZC-NWZ)	6.6	3.0													
APFB - 9 - 1 (ZC-NEZ)			8.8	4.6	4.5										
BAIF Bajra 1 (ZC-CZ)						5.4	8.1	6.7	13.0	13.6					
Moti Bajra (ZC-SZ)											11.7	5.7	8.0		
Mean	**6.7**	**3.3**	**9.4**	**5.0**	**6.0**	**4.5**	**7.6**	**6.7**	**7.4**	**11.2**	**10.6**	**5.9**	**3.6**	**6.7**	

Table 3.6 IVTPM: Initial Varietal Trial in Forage Pearl millet: Crude Protein (%)

Entries	Ludh-iana	Bika-ner	Faiza-bad	Bhuban-eswar	Ran-chi	Ana-nd	Rai-pur	Jabal-pur	Rah-uri	Urulikan-chan	Coimb-atore	Hydera-bad	Man-dya	Aver-age	Ra-nk
FBL - 1	6.5	5.3	8.7	7.6	7.0	8.1	7.9	8.1	5.5	8.6	8.3	8.8	7.9	7.6	5
ADV160061	7.7	4.4	8.8	7.6	4.8	6.7	6.7	8.1	7.4	7.4	9.6	7.0	9.2	7.3	7
FBL - 2	8.9	4.1	8.0	7.5	6.3	6.4	7.7	8.1	5.9	9.4	13.6	7.0	7.0	7.7	4
Star chandra	7.4	3.6	7.8	7.4	6.1	6.1	7.2	8.2	4.8	9.9	12.7	6.4	7.0	7.3	7
RBB - 10	5.6	3.6	8.1	7.1	4.6	6.5	7.5	8.0	8.8	10.0	10.9	5.6	7.4	7.2	8
TSFB - 17 – 7	7.5	5.2	8.5	7.0	6.1	8.3	7.5	8.0	6.8	8.0	13.8	11.5	10.2	8.3	1
AFB - 38	7.0	6.6	8.2	7.2	6.3	8.5	7.3	7.5	7.0	8.4	10.5	10.1	7.9	7.9	2
K - 25	5.6	5.6	7.8	7.4	7.0	8.8	6.3	8.0	6.6	8.0	11.8	8.3	7.9	7.6	5
JPM-18-3	8.4	2.8	8.3	7.4	6.6	9.3	7.4	8.0	5.9	8.1	10.9	7.4	6.1	7.4	6
FBL - 3	5.6	5.5	8.3	7.2	5.7	7.9	7.7	8.0	7.9	8.5	13.1	7.9	7.9	7.8	3
JKFBH 1521	9.1	5.8	8.0	6.9	6.1	9.6	8.2	7.8	5.7	8.0	10.9	8.3	7.9	7.9	2
Giant Bajra (NC)	7.2	6.2	8.8	6.9	5.9	8.7	7.5	8.1	6.6	7.1	10.5	6.8	11.8	7.9	2
AFB - 3 (ZC-NWZ)	7.2	3.6													
APFB - 9 - 1 (ZC-NEZ)			8.0	7.5	6.1										
BAIF Bajra 1 (ZC-CZ)						7.9	7.6	8.0	9.0	8.1					
Moti Bajra (ZC-SZ)											11.4	9.2	11.8		
Mean	**7.2**	**4.8**	**8.2**	**7.3**	**6.1**	**7.9**	**7.4**	**8.0**	**6.7**	**8.4**	**11.4**	**8.0**	**8.5**	**7.7**	

Table 3.7 IVTPM: Initial Varietal Trial in Forage Pearl millet: Plant Height (cm)

Entries	Ludh-iana	His-ar	Bika-ner	Faiza-bad	Pu-sa	Bhuban-eswar	Ran-chi
FBL - 1	215.0	242.8	206.0	164.0	205.7	215.2	202.0
ADV160061	185.0	204.2	157.0	190.0	196.0	209.4	234.7
FBL - 2	230.0	251.0	186.0	171.5	189.3	211.8	186.3
Star chandra	185.0	253.9	167.0	167.0	186.3	194.2	219.3
RBB - 10	260.0	221.1	273.0	159.0	190.0	173.1	194.7
TSFB - 17 – 7	215.0	233.4	205.0	179.0	225.0	197.3	281.7
AFB - 38	245.0	226.7	179.0	154.0	196.7	207.5	211.3
K - 25	230.0	251.7	187.0	171.5	212.0	179.6	213.0
JPM-18-3	250.0	188.3	253.0	174.5	216.3	185.6	207.7
FBL - 3	255.0	216.7	172.0	173.5	201.3	176.5	213.0
JKFBH 1521	145.0	193.7	120.0	175.5	191.0	201.0	222.7
Giant Bajra (NC)	235.0	241.7	189.0	181.5	219.3	204.2	300.7
AFB - 3 (ZC-NWZ)	230.0	243.9	239.0				
APFB - 9 - 1 (ZC-NEZ)				163.0	199.3	180.3	203.3
Mean	**221.5**	**228.4**	**194.8**	**171.1**	**202.2**	**195.1**	**222.3**

Table 3.7 IVTPM: Initial Varietal Trial in Forage Pearl millet: Plant Height (cm)

Entries	Ana-nd	Rai-pur	Jabal-pur	Rah-uri	Urulikan-chan	Jha-nsi	Coimb-atore	Hydera-bad	Man-dya	Aver-age	Ra-nk
FBL - 1	202.1	212.4	166.2	191.4	191.2	177.0	128.0	168.9	141.3	189.3	9
ADV160061	222.4	261.7	198.3	205.6	165.7	201.0	123.1	220.0	134.8	194.3	6
FBL - 2	228.4	235.1	143.3	191.1	210.7	187.7	120.0	167.4	173.9	192.7	7
Star chandra	209.2	193.1	207.3	178.1	168.9	146.0	111.2	149.0	137.5	179.6	12
RBB - 10	206.6	216.8	189.9	192.6	207.5	164.7	128.0	169.3	170.5	194.8	5
TSFB - 17 - 7	204.9	259.6	160.2	216.6	218.5	174.7	120.0	225.1	139.3	203.4	3
AFB - 38	184.3	224.4	130.0	208.8	202.0	220.7	134.5	168.9	157.1	190.7	8
K - 25	218.8	239.6	174.8	208.1	197.2	212.7	117.5	182.0	154.7	196.9	4
JPM-18-3	205.5	290.9	184.2	244.3	242.3	231.7	121.2	215.8	159.4	210.7	2
FBL - 3	213.9	223.3	156.3	196.6	200.8	179.0	129.7	158.4	158.5	189.0	10
JKFBH 1521	205.6	298.5	180.0	203.4	183.1	179.3	133.2	204.0	164.3	187.5	11
Giant Bajra (NC)	232.3	240.5	199.2	242.8	241.5	268.0	131.2	186.9	182.8	218.5	1
BAIF Bajra 1 (ZC-CZ)	225.1	246.8	179.9	209.2	236.6	244.3					
Moti Bajra (ZC-SZ)							121.2	181.0	178.9		
Mean	**212.2**	**241.7**	**174.6**	**206.8**	**205.1**	**199.0**	**124.5**	**184.4**	**157.9**	**195.6**	

Table 3.8 IVTPM: Initial Varietal Trial in Forage Pearl millet: Leaf Stem Ratio

Entries	Ludhiana	Hisar	Bikaner	Jalore	Faizabad	Pusa	Bhubaneswar	Ranchi
FBL - 1	0.90	0.55	0.30	0.51	0.67	0.46	1.34	0.34
ADV160061	0.98	0.49	0.36	0.50	0.75	0.35	1.20	0.43
FBL - 2	0.75	0.47	0.41	0.47	0.59	0.35	1.30	0.32
Star chandra	0.72	0.61	0.60	0.49	0.63	0.34	0.97	0.43
RBB - 10	0.80	0.53	0.26	0.51	0.57	0.41	0.78	0.40
TSFB - 17 – 7	0.84	0.41	0.28	0.48	0.71	0.54	1.18	0.42
AFB - 38	0.90	0.49	0.53	0.48	0.66	0.46	1.25	0.36
K - 25	1.10	0.54	0.33	0.48	0.64	0.50	0.84	0.53
JPM-18-3	1.00	0.56	0.23	0.52	0.69	0.50	0.93	0.61
FBL - 3	0.78	0.55	0.65	0.49	0.70	0.48	0.80	0.30
JKFBH 1521	0.67	0.40	0.44	0.52	0.71	0.39	1.15	0.27
Giant Bajra (NC)	0.88	0.49	0.38	0.49	0.72	0.47	1.09	0.81
AFB - 3 (ZC-NWZ)	0.92	0.41	0.43	0.48				
APFB - 9 - 1 (ZC-NEZ)					0.63	0.42	0.87	0.38
Mean	**0.86**	**0.50**	**0.40**	**0.49**	**0.67**	**0.44**	**1.05**	**0.43**

Table 3.8 IVTPM: Initial Varietal Trial in Forage Pearl millet: Leaf Stem Ratio

Entries	Ana-nd	Rai-pur	Jabal-pur	Rah-uri	Urulikan-chan	Jha-nsi	Coimb-atore	Hydera-bad	Man-dya	Aver-age	Ra-nk
FBL - 1	0.67	0.17	0.51	0.26	0.53	0.36	0.24	0.18	0.20	0.48	3
ADV160061	0.74	0.19	0.59	0.21	0.53	0.18	0.32	0.19	0.24	0.49	2
FBL - 2	0.56	0.14	0.49	0.25	0.59	0.28	0.28	0.19	0.35	0.46	5
Star chandra	0.61	0.33	0.63	0.30	0.62	0.34	0.25	0.22	0.26	0.49	2
RBB - 10	1.08	0.28	0.50	0.26	0.59	0.32	0.25	0.23	0.33	0.48	3
TSFB - 17 - 7	0.76	0.13	0.58	0.19	0.38	0.21	0.24	0.24	0.21	0.46	4
AFB - 38	0.47	0.23	0.38	0.28	0.61	0.35	0.26	0.22	0.38	0.49	2
K - 25	0.64	0.32	0.52	0.30	0.58	0.25	0.27	0.17	0.35	0.49	2
JPM-18-3	0.70	0.26	0.55	0.22	0.51	0.20	0.27	0.19	0.31	0.49	2
FBL - 3	0.70	0.24	0.50	0.29	0.78	0.32	0.33	0.19	0.47	0.50	1
JKFBH 1521	0.61	0.26	0.53	0.30	0.62	0.17	0.30	0.21	0.57	0.48	3
Giant Bajra (NC)	0.70	0.21	0.61	0.16	0.41	0.16	0.24	0.22	0.32	0.49	2
BAIF Bajra 1 (ZC-CZ)	0.69	0.19	0.45	0.24	0.46	0.19					
Moti Bajra (ZC-SZ)							0.23	0.18	0.33		
Mean	**0.69**	**0.23**	**0.53**	**0.25**	**0.55**	**0.26**	**0.27**	**0.20**	**0.33**	**0.48**	

Table 3.9 IVTPM: Initial Varietal Trial in Forage Pearl millet: ADF (%), NDF (%), & IVDMD (%)

Entries	ADF (%)		NDF (%)		IVDMD (%)	
	Ludhiana	Rank	Ludhiana	Rank	Ludhiana	Rank
FBL - 1	50.7	9	75.4	11	49.8	11
ADV160061	49.4	6	71.6	4	53.7	8
FBL - 2	48.9	3	69.9	2	58.3	3
Star chandra	49.3	5	73.4	8	56.4	5
RBB - 10	52.4	10	73.9	9	49.4	13
TSFB - 17 – 7	48.7	2	72.3	6	51.9	9
AFB - 38	50.6	8	74.3	10	56.0	6
K - 25	52.7	11	73.4	8	50.3	10
JPM-18-3	48.3	1	70.7	3	58.7	2
FBL - 3	53.4	12	76.3	12	48.4	12
JKFBH 1521	48.3	1	69.3	1	59.4	1
Giant Bajra (NC)	49.2	4	72.4	7	56.4	4
AFB - 3 (ZC-NWZ)	50.4	7	71.9	5	54.9	7
Mean	**50.2**		**72.7**		**54.1**	

4. AVTPM-2: ADVANCED VARIETAL TRIAL -2 IN FORAGE PEARL MILLET (Reference Tables: 4.1 to 4.8)

In forage pearl millet, two entries along with one national check *i.e.* Raj Bajra Chari-2 and respective zonal checks were evaluated in second advanced varietal trial conducted at 7 locations situated in two zones, northwest (4 locations) and south zones (3 locations).

For green forage yield (q/ha), zonal check was best in NW zone, whereas in south zone entries TSFB-15-4 (12.2%), TSFB-15-8 (6.1%) excelled in performance as comparison to checks. Combining two zones, national check Giant Bajra was superior.

For dry matter yield (q/ha), entry TSFB-15-4 was better than national chceck by a margin of 2.3% in NW zone whereas in south zone it was better by a margin of 10.2%. Combining both zones also, it was better by a margin of 4.2%.

For green fodder and dry matter per day production potential (q/ha/day), check Giant Bajra ranked first. For plant height, Giant Bajra ranked first (184.4 cm) followed by TSFB-15-4 (168.9 cm). For leaf stem ratio, TSFB-15-4 ranked first (0.52) followed by TSFB-15-8 (0.47) in comparison to best check 0.41).

For CPY (q/ha), TSFB-15-4 ranked first (9.7q) followed by TSFB-15-8 (9.0 q) in comparison to best check Giant Bajra (8.3 q). For crude protein content, entry TSFB-15-4 ranked first (9.2 %) followed by TSFB-15-8 (8.7%) in comparison to best check Giant bajra (8.2%). For other quality parameters, entries TSFB-15-8 and TSFB-15-4 ranked first and second respectively for NDF, ADF and IVDMD.

5. AVTPM-2 (SEED): ADVANCED VARIETAL TRIAL-2 IN FORAGE PEARL MILLET (SEED) (Reference Tables: 5.1)

In forage pearl millet, two entries along with one national check *i.e.* Giant Bajra and respective zonal checks were evaluated in second advanced varietal trial-seed conducted at 7 locations situated in two zones, northwest (4 locations) and south zone (3 locations).

Zonal check AFB-3 was best performer for NW zone yielding 15.4 q/ha, whereas in south zone entry TSFB-15-4 outperformed best check by a margin of 9.4%. Combining zones, entries TSFB-15-4 and TSFB-15-8 outyielded national checks by margins of 4.8 and 3.2% respectively.

Table 4.1 AVTPM-2: Second Advanced Varietal Trial in Forage Pearl millet: Green Forage Yield (q/ha)

Entries	North West Zone						South Zone						All India	
	Ludh-iana	His-ar	Bika-ner	Jal-ore	Aver-age	Ra-nk	Coimb-atore	Hydera-bad	Man-dya	Aver-age	Ra-nk	Super-iority%	Aver-age	Ra-nk
TSFB - 15 – 8	607.0	456.8	309.7	173.0	386.6	3	538.6	516.5	245.1	433.4	2	6.1	406.7	3
TSFB - 15 – 4	417.3	549.8	386.7	167.9	380.4	4	602.8	499.8	271.4	458.0	1	12.2	413.7	2
Giant Bajra (NC)	494.5	557.8	482.0	191.4	431.4	2	583.3	402.3	239.3	408.3	3		421.5	1
AFB - 3 (ZC-NWZ)	573.8	558.3	465.3	148.5	436.5	1								
Moti Bajra (ZC-SZ)							536.6	406.5	233.2	392.1	4			
Mean	**523.2**	**530.7**	**410.9**	**170.2**	**408.7**		**565.4**	**456.3**	**247.3**	**423.0**			**414.0**	
CD at 5(%)	**91.8**	**80.8**	**117.4**	33.6			**9.1**	**27.0**	**17.5**					
CV (%)	**13.8**	**11.6**	**15.7**	14.3			**1.2**	**4.6**	**5.1**					

Table 4.2 AVTPM-2: Second Advanced Varietal Trial in Forage Pearl millet: Dry Matter Yield (q/ha)

Entries	North West Zone							South Zone						All India		
	Ludh-iana	His-ar	Bika-ner	Jal-ore	Aver-age	Ra-nk	Super-iority%	Coimb-atore	Hydera-bad	Man-dya	Aver-age	Ra-nk	Superi-ority%	Aver-age	Ra-nk	Super-iority%
TSFB - 15 – 8	106.8	608.3	72.3	43.2	207.6	4		100.2	118.2	56.4	91.6	2	3.0	157.9	3	
TSFB - 15 – 4	74.7	652.6	111.8	43.0	220.5	1	2.3	112.8	113.7	67.4	98.0	1	10.2	168.0	1	4.2
Giant Bajra (NC)	84.6	617.2	116.9	43.8	215.6	2		114.8	88.3	63.6	88.9	3		161.3	2	
AFB - 3 (ZC-NWZ)	97.6	592.6	125.2	36.2	212.9	3										
Moti Bajra (ZC-SZ)								101.5	86.8	59.1	82.5	4				
Mean	**90.9**	**617.7**	**106.5**	**41.5**	**214.2**			**107.3**	**101.8**	**61.6**	**90.2**			**162.4**		
CD at 5(%)	**32.1**	**97.0**	**34.0**	**11.7**				**4.7**	**6.8**	**6.5**						
CV (%)	**11.9**	**11.9**	**17.5**	**6.7**				**3.2**	**4.8**	**7.6**						

Table 4.3 AVTPM-2: Second Advanced Varietal Trial in Forage Pearl millet: Green Forage Yield (q/ha/day)

Entries	Ludhiana	Hisar	Bikaner	Coimbatore	Hyderabad	Mandya	Average	Rank
TSFB - 15 – 8	7.80	6.53	4.76	9.29	8.3	4.40	6.85	2
TSFB - 15 – 4	5.40	7.85	4.72	9.72	7.5	5.00	6.70	3
Giant Bajra (NC)	6.30	7.97	7.42	10.61	7.5	4.40	7.36	1
AFB - 3 (ZC-NWZ)	7.40	7.98	7.16					
Moti Bajra (ZC -SZ)				9.94	7.0	4.30		
Mean	**6.73**	**7.58**	**6.01**	**9.89**	**7.59**	**4.53**	**6.97**	

Table 4.4 AVTPM-2: Second Advanced Varietal Trial in Forage Pearl millet: Dry Matter Yield (q/ha/day)

Entries	Ludhiana	Hisar	Bikaner	Coimbatore	Hyderabad	Mandya	Average	Rank
TSFB - 15 - 8	1.40	8.69	1.11	1.73	1.91	1.00	2.64	3
TSFB - 15 – 4	1.00	9.32	1.36	1.82	1.71	1.20	2.74	2
Giant Bajra (NC)	1.10	8.82	1.80	2.09	1.64	1.20	2.77	1
AFB - 3 (ZC-NWZ)	1.30	8.47	1.93					
Moti Bajra (ZC -SZ)				1.88	1.50	1.10		
Mean	**1.20**	**8.83**	**1.55**	**1.88**	**1.69**	**1.13**	**2.72**	

Table 4.5 AVTPM-2: Second Advanced Varietal Trial in Forage Pearl millet: Crude Protein Yield (q/ha) & Crude Protein (%)

Entries	Crude Protein Yield (q/ha)						Crude Protein (%)					
	Ludh-iana	Bika-ner	Coimb-atore	Hydera-bad	Aver-age	Ra-nk	Ludh-iana	Bika-ner	Coimb-atore	Hydera-bad	Aver-age	Ra-nk
TSFB - 15 – 8	7.9	3.5	10.5	14.0	9.0	2	7.4	4.9	10.5	11.8	8.7	2
TSFB - 15 – 4	5.5	7.6	12.4	13.2	9.7	1	7.4	6.8	11.0	11.6	9.2	1
Giant Bajra (NC)	5.3	7.8	11.0	9.0	8.3	3	6.3	6.7	9.6	10.2	8.2	3
AFB - 3 (ZC-NWZ)	5.9	4.3					6.0	3.4				
Moti Bajra (ZC -SZ)			9.3	8.4					9.2	9.7		
Mean	**6.2**	**5.8**	**10.8**	**11.2**	**9.0**		**6.8**	**5.4**	**10.1**	**10.8**	**8.7**	

Table 4.6 AVTPM-2: Second Advanced Varietal Trial in Forage Pearl millet: Plant Height (cm)

Entries	Ludhiana	Hisar	Bikaner	Coimbatore	Hyderabad	Mandya	Average	Rank
TSFB - 15 – 8	200.0	112.0	130.0	137.1	238.3	166.1	163.9	3
TSFB - 15 – 4	185.0	108.5	150.0	185.0	219.0	166.1	168.9	2
Giant Bajra (NC)	250.0	136.7	197.0	138.1	207.3	177.0	184.4	1
AFB - 3 (ZC-NWZ)	255.0	192.6	231.0					
Moti Bajra (ZC -SZ)				148.5	180.4	159.3	194.5	
Mean	**222.5**	**137.5**	**177.0**	**152.2**	**211.3**	**167.1**	**177.9**	

Table 4.7 AVTPM-2: Second Advanced Varietal Trial in Forage Pearl millet: Leaf Stem Ratio

Entries	Ludhiana	Hisar	Bikaner	Jalore	Coimbatore	Hyderabad	Mandya	Average	Rank
TSFB - 15 – 8	0.52	0.43	0.94	0.48	0.28	0.35	0.29	0.47	2
TSFB - 15 – 4	0.67	0.56	0.84	0.49	0.30	0.45	0.30	0.52	1
Giant Bajra (NC)	0.75	0.40	0.39	0.50	0.33	0.22	0.25	0.41	3
AFB - 3 (ZC-NWZ)	0.68	0.42	0.29	0.50					
Moti Bajra (ZC -SZ)					0.29	0.20	0.24		
Mean	**0.66**	**0.45**	**0.61**	**0.49**	**0.30**	**0.31**	**0.27**	**0.46**	

Table 4.8 AVTPM-2: Second Advanced Varietal Trial in Forage Pearl millet: ADF (%), NDF (%) & IVDMD (%)

Entries	ADF (%)		NDF (%)		IVDMD (%)	
	Ludhiana	Rank	Ludhiana	Rank	Ludhiana	Rank
TSFB - 15 – 8	38.3	1	70.6	1	55.2	1
TSFB - 15 – 4	39.7	2	70.8	2	55.0	2
Giant Bajra (NC)	40.1	3	71.9	4	53.2	3
AFB - 3 (ZC-NWZ)	40.2	4	71.4	3	50.9	4
Mean	**39.6**		**71.2**		**53.6**	

Table 5.1 AVTPM-2 (seed): Second Advanced Varietal Trial in Forage Pearl millet (seed): Seed Yield (q/ha)

Entries	North West Zone						South Zone						All India		
	Ludh-iana	His-ar	Bika-ner	Jal-ore	Aver-age	Ra-nk	Coimb-atore	Hydera-bad	Man-dya	Aver-age	Ra-nk	Super-iority%	Aver-age	Ra-nk	Super iority%
TSFB - 15 - 8	16.1	15.2	7.1	16.0	13.6	2	10.4	11.7	13.2	11.8	2	0.9	12.8	2	3.2
TSFB - 15 – 4	17.8	14.0	4.3	16.5	13.2	3	14.5	13.2	10.8	12.8	1	9.4	13.0	1	4.8
Giant Bajra (NC)	13.6	12.8	10.2	15.2	13.0	4	12.2	10.9	12.0	11.7	3		12.4	3	
AFB - 3 (ZC-NWZ)	14.8	13.4	16.8	16.4	15.4	1									
Moti Bajra (ZC-SZ)							10.7	10.2	12.3	11.1	4				
Mean	**15.6**	**13.9**	**9.6**	**16.0**	**13.8**		**11.9**	**11.5**	**12.1**	**11.8**			**12.8**		
CD at 5(%)	**2.8**	**4.6**	**3.1**	**2.2**			**0.5**	**2.1**	**1.5**						
CV (%)	**13.2**	**13.5**	**17.9**	**9.9**			**2.9**	**12.7**	**8.8**						

6. IVTC: INITIAL VARIETAL TRIAL IN FORAGE COWPEA

(Reference Tables: 6.1 to 6.9)

In forage cowpea, eight entries along with two national checks namely Bundel Lobia-1 and UPC-5286 and respective zonal checks *viz.*, UPC-622 for hill and Bundel Lobia-2 for north-west, UPC-628 for north-east, UPC-9202 for central and MFC-09-1 for south zone were evaluated in initial varietal trial at 28 locations across the five zones. It included 3 locations in hill zone, 7 locations in north-east, and 6 locations each in north-west, central and south zones.

For green forage yield (q/ha), entries RFC-2 (RCC-48) (8.9%) in central zone and entry HFC-16-3 (6.1%) in south zone showed superiority over best check. In other zones and at all India level, entries were either below par or showed marginal superiority over the best check.

For dry matter yield (q/ha), entry RFC-2 (RCC-48) (5.9%) in north east zone and 6.4% in central zone and entry MFC-16-1 (8.0%) in south zone showed superiority over best check. In other zones and at all India level, entries were either below par or showed marginal superiority over the best check.

For green fodder production potential (q/ha/day), entry RFC-2 (RCC-48) ranked first followed by RFC-1 (RCC-46). For dry fodder production potential (q/ha/day), entry RFC-2 (RCC-48) ranked first followed by national check UPC-5286.

For crude protein yield (q/ha), entry RFC-2 (RCC-48) ranked first (8.2 q/ha) followed by national check UPC-5286 (7.8 q/ha). For crude protein content, entry TSFC-17-3 and national check UPC-5286 ranked joint first with value of 14.6%.

For plant height, entry HFC-16-3 (140.1 cm) ranked first followed by UPC-1801 (139.9 cm). For leafiness (L/S ratio), entry UPC-1801 ranked first. For other quality parameters, entry UPC-1801 ranked first for ADF (%), NDF (%), IVDMD (%).

7. AVTC-1: FIRST ADVANCED VARIETAL TRIAL IN FORAGE COWPEA

(Reference Tables: 7.1 to 7.8)

In first advanced varietal trial in forage cowpea, six entries along with two national checks namely Bundel Lobia-1 (BL-1) and UPC-5286 and respective zonal checks viz. UPC-622 for hill and MFC-08-14 for south zone were tested at 10 locations in two zones *viz.*, hill zone (4 locations) and south zone (6 locations).

For GFY (q/ha), entry MFC-16-4 showed superiority of 22.7% over best check in hill zone. In south zone and combining both zones, national check UPC-5286 was superior. For dry matter yield (q/ha), entries were either below par or showed marginal superiority over best check.

For green and dry fodder production potential (q/ha/day), national check UPC-5286 was best performer. For plant height, entry MFC-16-3 ranked first (94.5 cm) followed by MFC-16-4 (91.6 cm), whereas for leafiness, entry HFC-16-1 ranked first.

For crude protein yield, entry TSFC-16-1 ranked first while for crude protein percent, national check Bundel Lobia-1 ranked first. For other quality parameters, entry C-217 ranked first for ADF, NDF.

Table 6.1 IVTC: Initial Varietal Trial in Forage Cowpea (New): Green Forage Yield (q/ha)

Entries	Hill Zone					North West Zone							
	Palam-pur	Sri-nagar	Raj-ouri	Aver-age	Ra-nk	Ludh-iana	His-ar	Pant-nagar	Bika-ner	Udai-pur	Jal-ore	Aver-age	Ra-nk
UPC - 1801	191.3	189.1	189.6	190.0	2	274.1	430.1	203.7	202.2	268.5	153.7	255.4	2
MFC - 16 - 1	126.5	185.9	126.3	146.2	6	234.0	458.3	214.8	212.6	226.9	144.4	248.5	4
RFC - 2 - (RCC - 48)		160.8	107.7	134.2	8	221.3	476.9	198.5	221.1	199.1	146.8	243.9	7
PFC 31		173.8	84.0	128.9	9	267.1	467.6	140.7	222.7	240.8	127.8	244.5	6
RFC - 1 - (RCC - 46)		174.6	113.0	143.8	7	229.2	467.6	140.7	272.3	187.5	164.8	243.7	8
TSFC - 17 - 3	80.2	163.0	79.6	107.6	11	215.0	469.9	137.0	165.7	155.1	124.1	211.1	11
C - 150	146.9	208.6	144.5	166.6	4	252.1	458.8	144.4	182.1	243.1	161.1	240.3	9
HFC - 16 - 3	123.4	204.9	120.7	149.7	5	240.3	412.5	159.6	232.7	268.5	175.9	248.3	5
Bundel Lobia - 1 (NC)	88.8	192.8	86.4	122.7	10	250.5	384.3	133.3	237.4	169.0	147.7	220.4	10
UPC - 5286 (NC)	169.7	243.3	166.1	193.0	1	288.4	395.4	263.7	173.9	245.4	197.2	260.7	1
UPC - 622 (ZC-HZ)	159.2	238.4	157.4	185.0	3								
Bundel Lobia - 2 (ZC-NWZ)						245.8	449.5	196.3	222.8	245.4	168.5	254.7	3
Mean	**135.8**	**194.1**	**125.0**	**151.6**		**247.1**	**442.8**	**175.7**	**213.2**	**222.7**	**155.6**	**242.9**	
CD at 5%	**39.6**	**12.6**	**24.8**			38.2	73.1	23.8	N.S.	51.9	61.6		
CV%	**16.6**	**7.8**	**11.6**			10.2	9.7	9.6	18.8	13.3	22.2		

Table 6.1 IVTC: Initial Varietal Trial in Forage Cowpea (New): Green Forage Yield (q/ha)

Entries	North East Zone									
	Faiza-bad	Kal-yani	Bhuban-eswar	Jor-hat	Ran-chi	Imp-hal	Pu-sa	Aver-age	Ra-nk	Superi-ority%
UPC - 1801	306.4	366.7	349.9	143.7	309.7	299.0	261.3	291.0	6	
MFC - 16 - 1	302.2	358.9	287.5	171.1	330.5	271.4	269.0	284.4	7	
RFC - 2 - (RCC - 48)	404.4	396.2	360.4	212.9	281.9	268.5	240.0	309.2	1	1.6
PFC 31	253.2	365.0	272.9	221.3	325.6	268.7	246.7	279.1	8	
RFC - 1 - (RCC - 46)	236.8	358.1	216.6	235.2	302.0	267.3	239.3	265.1	11	
TSFC - 17 - 3	228.7	382.1	266.6	207.4	298.6	244.8	270.0	271.2	10	
C - 150	296.1	376.7	203.1	182.5	349.2	262.7	260.7	275.9	9	
HFC - 16 - 3	265.4	340.7	293.7	242.7	388.1	257.6	275.3	294.8	5	
Bundel Lobia - 1 (NC)	412.5	365.7	241.6	196.9	386.0	257.0	262.7	303.2	3	
UPC - 5286 (NC)	379.9	358.3	284.3	160.6	420.1	252.9	274.3	304.3	2	
UPC - 628 (ZC-NEZ)	236.8	369.4	279.1	247.7	375.6	305.1	263.3	296.7	4	
Mean	**302.0**	**367.1**	**277.8**	**202.0**	**342.5**	**268.7**	**260.2**	**288.6**		
CD at 5%	**38.5**	**7.4**	**1.7**	**7.3**	**47.2**	**12.7**	**9.5**			
CV%	**7.7**	**6.5**	**7.3**	**9.1**	**8.0**	**2.8**	**5.1**			

Table 6.1 IVTC: Initial Varietal Trial in Forage Cowpea (New): Green Forage Yield (q/ha)

Entries	Central Zone								
	Ana-nd	Jha-nsi	Rah-uri	Urulikan-chan	Rai-pur	Mee-rut	Aver-age	Ra-nk	Super-iority%
UPC - 1801	235.2	316.4	244.1	384.3	166.7	545.8	315.4	9	
MFC - 16 - 1	233.4	255.4	232.0	416.7	225.0	568.1	321.8	7	
RFC - 2 - (RCC - 48)	180.6	307.1	291.4	508.3		599.1	377.3	1	8.9
PFC 31	125.0	314.1	171.5	469.5		587.0	333.4	5	
RFC - 1 - (RCC - 46)	212.1	311.7	237.2	430.8		607.4	359.8	2	3.9
TSFC - 17 - 3	101.9	311.7	231.4	364.0	123.1	563.0	282.5	11	
C - 150	201.9	344.1	288.6	452.2	171.3	586.1	340.7	4	
HFC - 16 - 3	268.5	265.4	226.1	378.5	166.7	608.3	318.9	8	
Bundel Lobia - 1 (NC)	182.4	325.6	218.2	463.5	62.5	584.7	306.2	10	
UPC - 5286 (NC)	231.5	367.3	221.6	432.8	178.2	646.8	346.4	3	
UPC - 9202 (ZC-CZ)	259.3	293.2	224.8	358.5	189.4	646.3	328.6	6	
Mean	**202.9**	**310.2**	**235.2**	**423.6**	**160.4**	**594.8**	**330.1**		
CD at 5%	**48.0**	**2.0**	**40.0**	**71.4**	**32.4**	**47.3**			
CV%	**13.9**	**0.4**	**10.0**	**9.8**	**12.9**	**4.5**			

Table 6.1 IVTC: Initial Varietal Trial in Forage Cowpea (New): Green Forage Yield (q/ha)

Entries	South Zone									All India	
	Coimb-atore	Man-dya	Hydera-bad	Dhar-wad	Vella-yani	Rai-chur	Aver-age	Ra-nk	Superi-ority%	Aver-age	Ra-nk
UPC - 1801	254.6	196.7	201.3	263.9	190.0	348.2	242.4	10		237.7	5
MFC - 16 - 1	268.5	264.9	174.4	254.6	276.0	303.7	257.0	6		233.8	6
RFC - 2 - (RCC - 48)	215.3	191.2	228.1	238.4	315.0	370.4	259.7	4		234.3	2
PFC 31	185.2	192.8	229.0	226.9	273.0	318.5	237.6	11		228.9	8
RFC - 1 - (RCC - 46)	238.4	187.8	203.6	254.6	273.0	311.1	244.8	8		226.2	7
TSFC - 17 - 3	277.8	204.8	240.6	233.8	282.0	311.1	258.3	5		212.5	10
C - 150	210.6	281.2	214.2	361.1	278.0	288.9	272.3	2	3.9	238.9	4
HFC - 16 - 3	282.4	213.7	178.1	333.3	292.0	370.4	278.3	1	6.1	239.5	3
Bundel Lobia - 1 (NC)	219.9	228.1	227.6	261.6	273.0	363.0	262.2	3		228.0	9
UPC - 5286 (NC)	229.2	199.6	185.5	277.8	264.0	370.4	254.4	7		249.7	1
MFC - 09 - 1 (ZC-SZ)	284.7	182.8	165.2	291.7	273.0	259.3	242.8	9			
Mean	**242.4**	**213.1**	**204.3**	**272.5**	**271.7**	**328.6**	**255.4**			**232.9**	
CD at 5%	**9.2**	**32.6**	**21.3**	**49.1**	**7.9**	**78.1**					
CV%	**2.2**	**9.0**	**6.1**	**10.6**	**1.7**	**14.1**					

Table 6.2 IVTC: Initial Varietal Trial in Forage Cowpea (New): Dry Matter Yield (q/ha)

Entries	Hill Zone					North West Zone						
	Palam-pur	Sri-nagar	Rajo-uri	Aver-age	Ra-nk	Ludh-iana	His-ar	Pant-nagar	Bika-ner	Jal-ore	Aver-age	Ra-nk
UPC - 1801	36.3	33.0	35.2	34.8	2	47.7	73.7	34.6	28.8	30.1	43.0	8
MFC - 16 - 1	23.8	32.5	23.5	26.6	5	43.1	76.7	43.9	31.1	35.3	46.0	5
RFC - 2 - (RCC - 48)		30.1	16.4	23.2	8	40.3	86.5	40.4	35.2	33.7	47.2	4
PFC 31		30.8	17.9	24.4	7	47.0	84.6	38.0	36.6	32.2	47.7	3
RFC - 1 - (RCC - 46)		32.8	19.1	26.0	6	40.6	84.4	28.0	44.2	29.1	45.2	7
TSFC - 17 - 3	15.2	29.1	14.9	19.7	10	39.6	81.4	27.9	28.1	28.4	41.1	10
C - 150	28.8	34.3	27.5	30.2	3	47.4	92.5	33.9	31.6	23.7	45.8	6
HFC - 16 - 3	25.8	34.7	23.8	28.1	4	44.2	81.7	32.5	37.0	30.5	45.2	7
Bundel Lobia - 1 (NC)	16.4	33.7	15.7	21.9	9	46.3	72.6	30.7	39.5	21.7	42.1	9
UPC - 5286 (NC)	33.6	41.1	32.5	35.7	1	53.9	75.3	64.0	26.8	36.7	51.3	1
UPC - 622 (ZC-HZ)	32.0	41.5	30.9	34.8	2							
Bundel Lobia - 2 (ZC-NWZ)						44.0	88.8	46.7	35.8	28.3	48.7	2
Mean	**26.5**	**34.0**	**23.4**	**27.8**		**44.9**	**81.6**	**38.2**	**34.1**	**30.0**	**45.8**	
CD at 5%	**9.7**	**3.3**	**7.7**			16.4	14.1	6.5	N.S.	10.6		
CV%	**20.0**	**5.4**	**19.4**			9.5	10.2	11.3	19.3	19.9		

Table 6.2 IVTC: Initial Varietal Trial in Forage Cowpea (New): Dry Matter Yield (q/ha)

Entries	North East Zone									
	Faizabad	Kalyani	Bhubaneswar	Jorhat	Ranchi	Imphal	Pusa	Average	Rank	Superiority%
UPC - 1801	84.1	73.6	82.8	25.2	61.9	52.9	61.3	63.1	5	
MFC - 16 - 1	77.9	74.5	69.8	34.1	71.6	40.4	64.2	61.8	7	
RFC - 2 - (RCC - 48)	119.1	81.7	85.4	42.1	52.6	60.8	59.7	71.6	1	5.9
PFC 31	66.9	72.9	67.5	43.6	63.5	59.6	60.4	62.1	6	
RFC - 1 - (RCC - 46)	60.3	70.1	51.5	47.8	56.4	56.7	55.8	56.9	11	
TSFC - 17 - 3	59.3	74.8	55.8	41.2	53.2	54.9	63.5	57.5	10	
C - 150	55.6	72.9	49.8	31.8	82.1	52.9	61.2	58.1	9	
HFC - 16 - 3	71.6	65.1	64.4	45.3	75.0	45.3	64.8	61.6	8	
Bundel Lobia - 1 (NC)	130.4	72.6	58.2	36.4	66.9	62.2	60.1	69.5	2	2.8
UPC - 5286 (NC)	108.1	70.2	68.2	31.8	90.3	40.1	64.6	67.6	3	
UPC - 628 (ZC-NEZ)	74.3	73.5	61.6	49.0	85.1	61.3	65.2	67.2	4	
Mean	**82.5**	**72.9**	**65.0**	**38.9**	**69.0**	**53.4**	**61.9**	**63.4**		
CD at 5%	**12.5**	**6.7**	**0.4**	**3.4**	**9.2**	**13.3**	**1.6**			
CV%	**8.9**	**4.2**	**7.7**	**9.5**	**6.4**	**14.6**	**5.5**			

Table 6.2 IVTC: Initial Varietal Trial in Forage Cowpea (New): Dry Matter Yield (q/ha)

Entries	Central Zone								
	Ana-nd	Jha-nsi	Rah-uri	Urulikan-chan	Rai-pur	Mee-rut	Aver-age	Ra-nk	Superi-ority%
UPC - 1801	39.8	10.9	34.9	58.5	33.1	92.3	44.9	8	
MFC - 16 - 1	42.1	8.8	33.2	65.0	41.4	89.5	46.6	7	
RFC - 2 - (RCC - 48)	35.3	10.5	40.1	72.3		108.2	53.3	1	6.4
PFC 31	23.9	10.8	25.9	63.1		92.9	43.3	9	
RFC - 1 - (RCC - 46)	37.5	10.7	34.7	62.6		107.4	50.6	2	1.0
TSFC - 17 – 3	20.4	10.7	34.3	46.0	23.1	102.6	39.5	11	
C – 150	40.9	11.8	46.9	72.0	36.5	94.9	50.5	3	0.8
HFC - 16 – 3	49.7	9.1	34.9	56.7	33.7	112.3	49.4	5	
Bundel Lobia - 1 (NC)	36.8	11.2	30.6	55.0	11.4	100.0	40.8	10	
UPC - 5286 (NC)	44.8	12.6	33.7	72.2	31.4	106.0	50.1	4	
UPC - 9202 (ZC-CZ)	48.4	10.1	40.9	48.5	34.4	112.5	49.1	6	
Mean	**38.1**	**10.6**	**35.5**	**61.1**	**30.6**	**101.7**	**47.1**		
CD at 5%	**10.9**	**1.5**	**5.9**	**10.6**	**7.8**	**11.2**			
CV%	**16.8**	**16.0**	**9.8**	**10.1**	**16.3**	**6.2**			

Table 6.2 IVTC: Initial Varietal Trial in Forage Cowpea (New): Dry Matter Yield (q/ha)

Entries	South Zone								All India		
	Coimb-atore	Man-dya	Hydera-bad	Dhar-wad	Vella-yani	Aver-age	Ra-nk	Superi-ority%	Aver-age	Ra-nk	Super-iority%
UPC - 1801	53.2	53.8	38.1	60.4	72.3	55.5	6		50.3	6	
MFC - 16 - 1	57.8	75.3	39.8	56.4	69.3	59.7	1	8.0	50.8	4	
RFC - 2 - (RCC - 48)	46.1	53.2	40.3	50.7	78.8	53.8	8		55.0	1	2.4
PFC 31	40.3	53.7	45.9	45.2	69.0	50.8	11		49.7	7	
RFC - 1 - (RCC - 46)	51.7	47.3	35.7	53.6	69.2	51.5	9		49.5	8	
TSFC - 17 – 3	58.6	57.1	47.6	48.4	71.2	56.6	4	2.4	45.7	10	
C – 150	45.2	81.1	35.7	76.4	47.5	57.2	3	3.4	50.6	5	
HFC - 16 – 3	57.9	58.8	28.8	68.9	73.2	57.5	2	4.0	51.0	3	
Bundel Lobia - 1 (NC)	47.8	58.5	45.9	55.1	69.3	55.3	7		49.4	9	
UPC - 5286 (NC)	49.3	49.0	32.9	59.0	66.9	51.4	10		53.7	2	
MFC - 09 - 1 (ZC-SZ)	61.3	52.2	37.9	59.4	69.8	56.1	5				
Mean	**51.7**	**58.2**	**39.0**	**57.6**	**68.8**	**55.0**			**50.6**		
CD at 5%	**1.8**	**10.4**	**8.0**	**8.9**	**4.4**						
CV%	**2.1**	**10.4**	**12.2**	**9.0**	**3.7**						

Table 6.3 IVTC: Initial Varietal Trial in Forage Cowpea (New): Green Forage Yield (q/ha/day)

Entries	Sri-nagar	Ludh-iana	His-ar	Pant-nagar	Bika-ner	Faiza-bad	Kal-yani	Bhuban-eswar	Jor-hat	Ran-chi	Pu-sa
UPC - 1801	2.44	3.20	6.14	2.45	2.97	4.31	3.56	4.95	1.92	4.53	3.45
MFC - 16 - 1	2.47	2.80	6.55	2.59	3.13	4.31	3.48	3.96	2.48	3.61	3.32
RFC - 2 - (RCC - 48)	2.20	2.60	6.81	2.39	3.25	5.53	3.85	5.30	3.27	5.03	2.92
PFC 31	2.31	3.10	6.68	1.88	3.28	3.51	3.54	4.05	3.51	3.36	3.06
RFC - 1 - (RCC - 46)	2.32	2.70	6.68	1.78	4.00	3.28	3.48	3.33	3.62	5.18	2.98
TSFC - 17 - 3	2.16	2.50	6.71	1.77	2.44	3.17	3.71	3.72	2.88	5.27	3.49
C - 150	2.84	3.00	6.55	1.74	2.68	2.72	3.66	2.96	2.57	3.70	3.28
HFC - 16 - 3	2.82	2.80	5.89	2.05	3.42	3.63	3.31	4.50	3.52	4.16	3.43
Bundel Lobia - 1 (NC)	2.55	2.90	5.49	1.67	3.49	5.50	3.55	3.62	2.81	6.81	3.12
UPC - 5286 (NC)	3.70	3.40	5.65	3.38	2.56	5.27	3.48	4.40	2.26	5.10	3.24
UPC - 622 (ZC-HZ)	3.60										
Bundel Lobia - 2 (ZC-NWZ)		2.90	6.42	2.37	3.28						
UPC - 628 (ZC-NEZ)						3.24	3.60	3.86	3.75	6.40	3.17
Mean	**2.67**	**2.90**	**6.32**	**2.19**	**3.14**	**4.04**	**3.57**	**4.06**	**2.96**	**4.83**	**3.22**

Table 6.3 IVTC: Initial Varietal Trial in Forage Cowpea (New): Green Forage Yield (q/ha/day)

Entries	Ana-nd	Jha-nsi	Rah-uri	Urulikan-chan	Rai-pur	Coimb-atore	Man-dya	Hydera-bad	Dhar-wad	Vella-yani	Aver-age	Ra-nk
UPC - 1801	3.67	5.94	4.07	4.47	2.87	4.24	3.55	3.68	4.26	6.27	3.95	5
MFC - 16 - 1	3.53	4.86	3.95	4.85	3.88	4.33	4.87	3.39	4.11	6.13	3.93	6
RFC - 2 - (RCC - 48)	2.87	6.10	7.23	8.62		3.65	3.50	4.51	3.85	6.99	4.52	1
PFC 31	1.95	5.85	3.04	7.96		2.99	3.59	4.48	3.66	6.07	3.89	7
RFC - 1 - (RCC - 46)	3.16	5.92	5.69	7.30		4.26	3.39	4.05	4.11	6.06	4.16	2
TSFC - 17 - 3	1.50	5.45	4.57	6.17	2.12	4.55	3.77	4.40	3.77	6.27	3.83	8
C - 150	3.11	5.60	4.95	5.32	2.95	3.45	5.23	4.24	5.82	6.18	3.93	6
HFC - 16 - 3	3.90	4.18	3.81	4.45	2.87	4.63	3.95	3.40	5.38	6.48	3.93	6
Bundel Lobia - 1 (NC)	2.76	5.71	4.78	7.86	1.08	3.73	4.17	4.25	4.22	6.07	4.10	3
UPC - 5286 (NC)	3.27	5.22	3.67	5.15	3.07	3.64	3.65	3.40	4.48	5.86	3.99	4
UPC - 9202 (ZC-CZ)	3.65	5.90	3.31	4.17	3.26							
MFC - 09 - 1 (ZC-SZ)						4.59	3.34	3.39	4.70	6.17		
Mean	**3.03**	**5.52**	**4.46**	**6.03**	**2.76**	**4.01**	**3.91**	**3.93**	**4.40**	**6.23**	**4.03**	

Table 6.4 IVTC: Initial Varietal Trial in Forage Cowpea (New): Dry Matter Yield (q/ha/day)

Entries	Sri-nagar	Ludh-iana	His-ar	Pant-nagar	Bika-ner	Faiza-bad	Kal-yani	Bhuban-eswar	Jor-hat	Ran-chi
UPC - 1801	0.43	0.60	1.05	0.42	0.42	1.18	0.71	1.17	0.34	0.91
MFC - 16 - 1	0.42	0.50	1.10	0.53	0.46	1.11	0.72	0.96	0.49	0.78
RFC - 2 - (RCC - 48)	0.39	0.50	1.24	0.48	0.52	1.63	0.79	1.26	0.65	0.94
PFC 31	0.42	0.60	1.21	0.51	0.54	0.92	0.71	1.00	0.69	0.65
RFC - 1 - (RCC - 46)	0.40	0.50	1.20	0.35	0.65	0.84	0.68	0.79	0.74	0.97
TSFC - 17 - 3	0.39	0.50	1.16	0.36	0.41	0.82	0.73	0.78	0.57	0.94
C - 150	0.48	0.60	1.32	0.41	0.47	0.76	0.71	0.73	0.45	0.87
HFC - 16 - 3	0.47	0.50	1.17	0.41	0.54	0.95	0.63	0.99	0.66	0.80
Bundel Lobia - 1 (NC)	0.44	0.50	1.04	0.38	0.58	1.73	0.70	0.87	0.52	1.18
UPC - 5286 (NC)	0.54	0.60	1.08	0.80	0.39	1.50	0.68	1.06	0.45	1.10
UPC - 622 (ZC-HZ)	0.54									
Bundel Lobia - 2 (ZC-NWZ)		0.50	1.27	0.56	0.53					
UPC - 628 (ZC-NEZ)						1.01	0.71	0.85	0.74	1.45
Mean	**0.45**	**0.54**	**1.17**	**0.47**	**0.50**	**1.13**	**0.71**	**0.95**	**0.57**	**0.96**

Table 6.4 IVTC: Initial Varietal Trial in Forage Cowpea (New): Dry Matter Yield (q/ha/day)

Entries	Ana-nd	Jha-nsi	Rah-uri	Urulikan-chan	Rai-pur	Coimb-atore	Man-dya	Hydera-bad	Dhar-wad	Aver-age	Ra-nk
UPC - 1801	0.62	0.20	0.58	0.68	0.57	0.89	0.97	0.70	0.97	0.71	5
MFC - 16 - 1	0.64	0.17	0.57	0.76	0.71	0.93	1.39	0.77	0.91	0.73	4
RFC - 2 - (RCC - 48)	0.56	0.21	0.99	1.23		0.78	0.98	0.80	0.82	0.82	1
PFC 31	0.37	0.20	0.46	1.07		0.65	1.00	0.90	0.73	0.70	6
RFC - 1 - (RCC - 46)	0.56	0.20	0.83	1.06		0.92	0.85	0.71	0.87	0.73	4
TSFC - 17 - 3	0.30	0.19	0.68	0.78	0.40	0.96	1.05	0.87	0.78	0.67	7
C - 150	0.63	0.19	0.80	0.85	0.63	0.74	1.51	0.71	1.23	0.74	3
HFC - 16 - 3	0.72	0.14	0.59	0.67	0.58	0.95	1.09	0.55	1.11	0.71	5
Bundel Lobia - 1 (NC)	0.56	0.20	0.67	0.93	0.20	0.81	1.07	0.86	0.89	0.74	3
UPC - 5286 (NC)	0.63	0.18	0.56	0.86	0.54	0.78	0.90	0.60	0.95	0.75	2
UPC - 9202 (ZC-CZ)	0.68	0.20	0.60	0.56	0.59						
MFC - 09 - 1 (ZC-SZ)						0.99	0.96	0.78	0.96		
Mean	**0.57**	**0.19**	**0.67**	**0.86**	**0.53**	**0.86**	**1.07**	**0.75**	**0.93**	**0.73**	

Table 6.5 IVTC: Initial Varietal Trial in Forage Cowpea (New): Crude Protein Yield (q/ha)

Entries	Palampur	Ludhiana	Bikaner	Faizabad	Kalyani	Bhubaneswar	Jorhat	Ranchi	Imphal
UPC - 1801	6.2	7.2	4.2	14.1	12.4	11.9	3.4	9.6	7.9
MFC - 16 - 1	4.4	5.6	4.9	12.9	11.1	9.8	4.8	9.9	5.3
RFC - 2 - (RCC - 48)		5.1	5.4	20.8	13.3	12.3	5.4	6.9	7.3
PFC 31		5.7	5.6	11.3	9.2	9.3	6.2	6.8	7.6
RFC - 1 - (RCC - 46)		5.2	6.8	10.1	12.5	7.4	5.9	7.7	7.4
TSFC - 17 - 3	3.0	4.2	5.3	10.1	13.3	9.1	5.4	5.4	7.2
C - 150	4.7	5.3	5.5	9.2	10.8	6.9	4.1	8.8	7.3
HFC - 16 - 3	5.2	5.3	5.7	11.4	11.0	10.0	6.1	9.5	5.5
Bundel Lobia - 1 (NC)	3.2	6.0	5.1	23.2	10.3	8.2	4.6	10.5	7.5
UPC - 5286 (NC)	6.2	7.2	4.8	18.6	11.9	9.7	4.3	14.4	4.9
UPC - 622 (ZC-HZ)	6.1								
Bundel Lobia - 2 (ZC-NWZ)		5.1	5.0						
UPC - 628 (ZC-NEZ)				12.2	11.4	9.5	6.7	10.0	7.5
Mean	**4.9**	**5.6**	**5.3**	**14.0**	**11.6**	**9.5**	**5.2**	**9.0**	**6.9**

Table 6.5 IVTC: Initial Varietal Trial in Forage Cowpea (New): Crude Protein Yield (q/ha)

Entries	Anand	Rahuri	Urulikanchan	Raipur	Coimbatore	Mandya	Hyderabad	Average	Rank
UPC - 1801	5.6	5.4	9.5	5.3	5.8	3.8	4.2	7.3	4
MFC - 16 - 1	5.6	5.3	9.9	6.4	6.1	6.4	6.3	7.2	5
RFC - 2 - (RCC - 48)	4.7	5.2	10.3		6.0	4.6	6.9	8.2	1
PFC 31	3.2	3.6	10.1		6.8	2.4	7.1	6.8	7
RFC - 1 - (RCC - 46)	5.2	5.4	11.1		8.2	3.3	5.9	7.3	4
TSFC - 17 - 3	2.8	4.3	7.1	3.7	9.9	4.1	8.3	6.4	8
C - 150	5.6	7.1	11.7	5.1	7.3	10.2	4.5	7.1	6
HFC - 16 - 3	6.4	4.3	9.2	4.6	8.6	6.6	4.8	7.1	6
Bundel Lobia - 1 (NC)	5.4	5.1	8.5	1.5	6.5	7.9	8.1	7.6	3
UPC - 5286 (NC)	6.1	5.5	12.5	4.8	4.7	4.7	5.3	7.8	2
UPC - 9202 (ZC-CZ)	6.6	6.0	7.8	5.2					
MFC - 09 - 1 (ZC-SZ)					5.6	4.2	6.3		
Mean	**5.2**	**5.2**	**9.8**	**4.6**	**6.9**	**5.3**	**6.2**	**7.3**	

Table 6.6 IVTC: Initial Varietal Trial in Forage Cowpea (New): Crude Protein (%)

Entries	Palam-pur	Ludh-iana	Bika-ner	Faiza-bad	Kal-yani	Bhuban-eswar	Jor-hat	Ran-chi	Imp-hal
UPC - 1801	17.1	15.2	14.6	16.8	16.8	14.4	13.6	15.5	14.9
MFC - 16 - 1	18.4	12.9	15.7	16.5	14.9	14.0	14.3	13.8	13.2
RFC - 2 - (RCC - 48)		12.6	15.4	17.5	16.3	14.4	13.0	13.1	12.0
PFC 31		12.1	15.2	16.9	12.6	13.8	14.3	10.7	12.8
RFC - 1 - (RCC - 46)		12.8	15.4	16.7	17.8	14.3	13.6	13.6	13.1
TSFC - 17 - 3	19.8	10.7	18.8	17.0	17.8	16.3	12.8	10.1	13.1
C - 150	16.5	11.2	17.4	16.6	14.8	13.9	12.6	10.7	13.8
HFC - 16 - 3	20.1	12.1	15.5	16.0	16.9	15.6	13.8	12.7	12.1
Bundel Lobia - 1 (NC)	19.3	13.0	12.9	17.8	14.2	14.2	12.9	15.7	12.0
UPC - 5286 (NC)	18.4	13.3	17.8	17.2	17.0	14.2	13.4	16.0	12.2
UPC - 622 (ZC-HZ)	19.8								
Bundel Lobia - 2 (ZC-NWZ)		11.7	13.8						
UPC - 628 (ZC-NEZ)				16.4	15.5	15.4	14.5	11.8	12.2
Mean	**18.7**	**12.5**	**15.7**	**16.9**	**15.9**	**14.6**	**13.5**	**13.1**	**12.9**

Table 6.6 IVTC: Initial Varietal Trial in Forage Cowpea (New): Crude Protein (%)

Entries	Ana-nd	Rah-uri	Urulikan-chan	Rai-pur	Coimb-atore	Man-dya	Hydera-bad	Aver-age	Ra-nk
UPC - 1801	14.1	15.3	16.2	16.0	10.9	6.2	10.9	14.3	4
MFC - 16 - 1	13.4	16.0	15.2	15.5	10.5	8.6	15.8	14.3	4
RFC - 2 - (RCC - 48)	13.3	12.9	14.3		13.1	5.1	17.1	13.6	6
PFC 31	13.5	14.0	16.0		16.9	4.7	15.3	13.5	7
RFC - 1 - (RCC - 46)	14.0	15.5	17.7		15.8	5.0	16.6	14.4	3
TSFC - 17 - 3	13.7	12.7	15.4	15.8	16.9	5.7	17.5	14.6	1
C - 150	13.6	15.1	16.2	14.0	16.1	10.5	12.7	14.1	5
HFC - 16 - 3	12.9	12.3	16.2	13.5	14.9	9.7	16.6	14.4	3
Bundel Lobia - 1 (NC)	14.5	16.6	15.5	13.3	13.6	8.8	17.7	14.5	3
UPC - 5286 (NC)	13.7	16.2	17.4	15.1	9.6	5.4	16.2	14.6	2
UPC - 9202 (ZC-CZ)	13.6	14.7	16.0	15.0					
MFC - 09 - 1 (ZC-SZ)					9.2	5.6	16.6		
Mean	**13.7**	**14.7**	**16.0**	**14.8**	**13.4**	**6.8**	**15.7**	**14.2**	

Table 6.7 IVTC: Initial Varietal Trial in Forage Cowpea (New): Plant Height (CM)

Entries	Palam-pur	Sri-nagar	Raj-ouri	Ludh-iana	His-ar	Pant-nagar	Bika-ner	Udai-pur	Jal-ore	Faiza bad	Kal-yani	Bhuban-eswar	Jor-hat	Ran-chi	Imp-hal	Pu-sa
UPC - 1801	81.3	70.0	78.6	250.0	172.8	166.5	118.0	118.4	140.2	162.0	141.0	191.5	116.3	138.1	241.6	203.3
MFC - 16 - 1	81.7	76.8	80.6	230.0	227.8	145.4	141.0	119.4	136.6	164.0	141.2	181.3	110.8	162.8	218.6	184.0
RFC - 2 - (RCC - 48)		73.9	104.1	230.0	222.1	167.7	148.0	78.3	136.8	169.0	141.1	194.6	110.2	148.8	164.9	158.0
PFC 31		67.8	82.5	182.0	208.8	175.4	154.0	79.7	131.1	167.5	140.9	165.3	119.7	160.4	159.3	178.0
RFC - 1 - (RCC - 46)		102.8	96.0	182.0	215.7	153.9	120.0	71.7	144.3	165.0	140.5	149.2	121.3	115.9	170.2	187.7
TSFC - 17 - 3	134.0	75.8	135.0	172.0	220.8	111.9	138.0	81.4	134.2	158.0	140.1	161.2	114.5	164.9	166.0	138.7
C - 150	92.3	92.5	88.1	135.0	212.1	132.5	130.0	109.3	144.7	145.0	140.1	145.3	102.5	184.9	156.3	192.0
HFC - 16 - 3	125.3	93.5	124.2	178.0	225.9	140.2	109.0	110.4	153.1	170.0	139.6	185.6	104.6	189.2	199.9	141.0
Bundel Lobia - 1 (NC)	85.3	90.3	121.7	240.0	221.4	181.3	148.0	76.7	134.7	170.5	140.8	154.3	104.9	194.3	180.2	158.7
UPC - 5286 (NC)	102.3	115.2	111.6	135.0	216.0	171.1	120.0	107.4	153.0	167.0	140.2	174.6	107.8	172.0	117.9	134.0
UPC - 622 (ZC-HZ)	161.7	87.0	156.6													
Bundel Lobia - 2 (ZC-NWZ)				210.0	218.7	153.2	174.0	118.8	138.5							
UPC - 628 (ZC-NEZ)										139.0	140.6	170.2	111.5	166.8	264.9	139.3
Mean	**108.0**	**86.0**	**107.2**	**194.9**	**214.7**	**154.4**	**136.4**	**97.4**	**140.7**	**161.5**	**140.6**	**170.3**	**111.3**	**163.5**	**185.4**	**165.0**

Table 6.7 IVTC: Initial Varietal Trial in Forage Cowpea (New): Plant Height (CM)

Entries	Ana-nd	Jha-nsi	Rah-uri	Urulikan-chan	Rai-pur	Coimb-atore	Man-dya	Hydera-bad	Vella-yani	Rai-chur	Aver-age	Ra-nk
UPC - 1801	122.9	212.9	92.2	183.5	189.9	115.2	57.6	120.4	110.0	44.1	139.9	2
MFC - 16 - 1	108.3	166.8	105.0	182.9	175.1	90.4	59.9	76.1	113.0	44.7	135.5	4
RFC - 2 - (RCC - 48)	110.9	83.6	138.4	190.9		92.0	58.0	115.7	137.0	45.0	134.1	5
PFC 31	73.0	228.3	77.1	173.1		95.4	57.0	112.7	103.0	32.6	130.2	7
RFC - 1 - (RCC - 46)	108.7	153.6	82.9	172.5		96.9	60.5	107.4	112.0	42.1	128.0	9
TSFC - 17 - 3	84.3	164.2	66.1	116.9	190.9	114.6	58.6	115.3	113.0	36.4	127.2	10
C - 150	90.3	194.3	125.8	212.0	193.4	114.9	59.5	92.4	143.0	37.8	133.3	6
HFC - 16 - 3	125.7	227.0	104.0	196.3	187.6	103.5	62.4	89.2	107.0	50.3	140.1	1
Bundel Lobia - 1 (NC)	89.6	182.8	126.4	159.3	184.2	102.0	61.6	118.0	117.0	47.3	138.1	3
UPC - 5286 (NC)	106.3	177.5	92.3	197.6	175.2	96.9	59.3	81.0	97.0	37.9	129.5	8
UPC - 9202 (ZC-CZ)	114.7	176.9	93.9	215.7	188.2							
MFC - 09 - 1 (ZC-SZ)						110.3	58.3	80.9	108.0	40.1		
Mean	**103.2**	**178.9**	**100.4**	**181.9**	**185.5**	**102.9**	**59.3**	**100.8**	**114.5**	**41.7**	**133.6**	

Table 6.8 IVTC: Initial Varietal Trial in Forage Cowpea (New): Leaf Stem Ratio

Entries	Palam-pur	Ludh-iana	His-ar	Pant-nagar	Bika-ner	Jal-ore	Faiza-bad	Kal-yani	Bhuban-eswar	Jor-hat	Ran-chi	Imp-hal	Pu-sa
UPC - 1801	0.55	0.63	0.34	1.33	0.92	0.48	0.70	0.78	1.29	1.39	0.69	0.44	0.48
MFC - 16 - 1	0.50	0.71	0.49	1.28	0.95	0.46	0.67	0.84	1.35	0.81	0.55	0.59	0.50
RFC - 2 - (RCC - 48)		0.82	0.49	0.63	0.75	0.46	0.75	0.83	1.26	1.09	0.55	0.47	0.38
PFC 31		0.63	0.37	1.05	0.83	0.45	0.68	0.81	0.96	0.89	0.38	0.36	0.41
RFC - 1 - (RCC - 46)		0.85	0.48	1.02	0.80	0.44	0.66	0.87	0.91	0.65	0.60	0.61	0.36
TSFC - 17 – 3	0.54	0.65	0.47	1.30	0.89	0.43	0.63	0.86	0.87	0.98	0.54	0.96	0.52
C – 150	0.37	0.55	0.49	0.87	1.23	0.38	0.62	0.84	1.19	1.04	0.37	0.59	0.54
HFC - 16 – 3	0.46	0.72	0.79	1.36	0.88	0.45	0.65	0.82	0.84	0.91	0.49	0.48	0.55
Bundel Lobia - 1 (NC)	0.45	0.80	0.42	1.57	0.77	0.46	0.72	0.79	1.08	0.78	0.68	0.66	0.55
UPC - 5286 (NC)	0.35	0.65	0.45	0.88	0.80	0.41	0.71	0.86	0.94	0.66	0.73	0.48	0.57
UPC - 622 (ZC-HZ)	0.52												
Bundel Lobia - 2 (ZC-NWZ)		0.52	0.37	1.07	0.83	0.43							
UPC - 628 (ZC-NEZ)							0.65	0.82	1.30	0.77	0.44	0.61	0.44
Mean	**0.47**	**0.68**	**0.47**	**1.12**	**0.88**	**0.44**	**0.68**	**0.83**	**1.09**	**0.91**	**0.55**	**0.57**	**0.48**

Table 6.8 IVTC: Initial Varietal Trial in Forage Cowpea (New): Leaf Stem Ratio

Entries	Jha-nsi	Rah-uri	Urulikan-chan	Rai-pur	Coimb-atore	Man-dya	Hydera-bad	Vella-yani	Aver-age	Ra nk
UPC - 1801	0.43	0.60	1.10	0.31	0.41	0.61	0.96	1.25	0.75	1
MFC - 16 - 1	0.36	0.54	0.73	0.29	0.39	0.72	0.88	1.33	0.71	3
RFC - 2 - (RCC - 48)	0.37	0.46	0.74		0.40	0.70	0.65	0.97	0.67	5
PFC 31	0.45	0.65	1.15		0.37	0.58	0.70	1.08	0.67	5
RFC - 1 - (RCC - 46)	0.42	0.47	0.93		0.37	0.77	0.72	1.27	0.70	4
TSFC - 17 - 3	0.31	0.59	1.13	0.27	0.41	0.63	1.05	1.28	0.73	2
C - 150	0.41	0.48	0.75	0.25	0.38	0.80	1.00	0.92	0.67	5
HFC - 16 - 3	0.41	0.60	0.99	0.27	0.40	0.63	0.81	1.50	0.71	3
Bundel Lobia - 1 (NC)	0.36	0.58	1.09	0.60	0.38	0.67	0.82	1.12	0.73	2
UPC - 5286 (NC)	0.35	0.72	0.99	0.44	0.39	0.60	1.28	1.50	0.70	4
UPC - 9202 (ZC-CZ)	0.45	0.65	1.03	0.49						
MFC - 09 - 1 (ZC-SZ)					0.40	0.57	1.07	1.50		
Mean	**0.39**	**0.58**	**0.97**	**0.37**	**0.39**	**0.66**	**0.90**	**1.25**	**0.70**	

Table 6.9 IVTC: Initial Varietal Trial in Forage Cowpea (New): ADF (%), NDF (%) &IVDMD (%)

Entries	ADF (%)		NDF (%)		IVDMD (%)	
	Ludhiana	Rank	Ludhiana	Rank	Ludhiana	Rank
UPC - 1801	33.7	1	46.7	1	66.4	1
MFC - 16 - 1	35.1	5	48.4	4	62.4	4
RFC - 2 - (RCC - 48)	35.5	6	49.3	5	60.8	6
PFC 31	36.0	7	54.6	7	61.3	5
RFC - 1 - (RCC - 46)	35.0	4	61.3	11	60.4	7
TSFC - 17 - 3	37.4	11	56.7	10	57.0	11
C - 150	36.2	9	55.4	8	57.4	10
HFC - 16 - 3	36.4	10	50.5	6	58.9	9
Bundel Lobia - 1 (NC)	34.0	2	47.4	2	63.4	3
UPC - 5286 (NC)	34.5	3	47.9	3	64.0	2
Bundel Lobia - 2 (ZC-NWZ)	36.1	8	55.8	9	60.1	8
Mean	**35.4**		**52.2**		**61.1**	

Table 7.1: AVTC-1: First Advanced Varietal Trial in Cowpea: Green Forage Yield (q/ha)

Entries	Hill Zone						
	Palam-pur	Sri-nagar	Rajo-uri	Alm-ora	Aver-age	Ra-nk	Super-iority
PFC - 12		176.8	85.1	111.1	124.4	8	
C - 217	157.4	222.5	155.0	170.4	176.3	3	
MFC - 16 - 3	117.2	168.9	120.7	172.8	144.9	6	
TSFC - 16 - 1		233.6	113.8	137.0	161.5	4	
MFC - 16 - 4	159.2	188.3	157.9	219.8	181.3	1	22.7
HFC - 16 - 1		211.2	81.4	76.5	123.1	9	
Bundel Lobia - 1 (NC)	114.8	158.3	114.9	137.0	131.3	7	
UPC - 5286 (NC)	132.1	149.8	130.2	179.0	147.8	5	
UPC 622 (ZC-HZ)	150.6	163.4	147.9	244.4	176.6	2	
Mean	**138.5**	**185.9**	**123.0**	**160.9**	**151.9**		
CD at 5%	**NS**	**16.4**	**27.1**	**60.5**			
CV%	**13.9**	**9.8**	**12.9**	**21.5**			

Table 7.1: AVTC-1: First Advanced Varietal Trial in Cowpea: Green Forage Yield (q/ha)

Entries	South Zone								All India	
	Coimb-atore	Vella-yani	Man-dya	Hydera-bad	Dhar-wad	Rai-chur	Aver-age	Ra-nk	Aver-age	Ra-nk
PFC - 12	136.1	253.0	256.2	209.4	227.8	240.7	220.5	7	188.5	6
C - 217	127.8	265.0	264.0	186.9	319.4	203.7	227.8	4	207.2	3
MFC - 16 - 3	187.5	244.0	289.1	216.3	272.2	245.4	242.4	2	203.4	5
TSFC - 16 - 1	197.2	222.0	255.8	249.3	222.2	291.7	239.7	3	213.6	2
MFC - 16 - 4	213.9	236.0	245.9	211.3	216.7	222.2	224.3	5	207.1	4
HFC - 16 - 1	166.7	228.0	227.8	208.5	230.6				178.8	8
Bundel Lobia - 1 (NC)	191.7	214.0	235.4	205.8	205.6	291.7	224.0	6	186.9	7
UPC - 5286 (NC)	266.7	231.0	278.7	198.3	311.1	324.1	268.3	1	220.1	1
MFC - 8 - 14 (ZC-SZ)	127.8	219.0	242.7	208.3	219.4	259.3	212.7	8		
Mean	**179.5**	**234.7**	**255.1**	**210.5**	**247.2**	**259.8**	**232.5**		**200.7**	
CD at 5%	**0.7**	**7.0**	**37.0**	**12.1**	**41.0**	**60.7**				
CV%	**1.9**	**1.7**	**8.4**	**3.5**	**9.6**	**13.3**				

Table 7.2: AVTC-1: First Advanced Varietal Trial in Cowpea: Dry Matter Yield (q/ha)

Entries	Hill Zone						South Zone							All India		
	Palam-pur	Sri-nagar	Raj-ouri	Alm-ora	Aver-age	Ra-nk	Coimb-atore	Vella-yani	Man-dya	Hydera-bad	Dhar-wad	Aver-age	Ra-nk	Aver-age	Ra-nk	Super-iority
PFC – 12		32.2	15.4	16.9	21.5	9	29.1	63.5	66.5	41.8	45.1	49.2	6	38.8	6	
C - 217	30.1	39.8	29.9	30.0	32.5	2	26.8	65.4	66.5	39.2	74.3	54.4	3	44.7	1	0.68
MFC - 16 - 3	22.2	32.8	24.3	29.7	27.2	4	40.2	60.3	81.3	43.3	56.8	56.4	2	43.4	3	
TSFC - 16 – 1		42.2	20.7	17.8	26.9	5	40.3	56.3	60.7	53.9	48.6	52.0	4	42.6	4	
MFC - 16 – 4	30.1	34.3	30.0	32.7	31.8	3	45.5	59.0	58.9	40.8	44.1	49.7	5	41.7	5	
HFC - 16 - 1		39.4	15.2	12.8	22.5	8	35.0	57.0	57.5	43.6	47.6	48.1	7	38.5	7	
Bundel Lobia - 1 (NC)	21.7	29.8	20.6	22.6	23.7	7	40.2	53.7	61.3	40.3	40.2	47.1	8	36.7	8	
UPC - 5286 (NC)	23.3	28.6	22.8	27.4	25.5	6	56.7	57.8	77.6	40.4	65.5	59.6	1	44.4	2	
UPC 622 (ZC-HZ)	26.6	30.4	25.8	47.6	32.6	1										
MFC - 8 - 14 (ZC-SZ)							26.8	54.1	58.4	43.8	46.3	45.9	9			
Mean	**25.7**	**34.4**	**22.7**	**26.4**	**27.1**		**37.8**	**58.5**	**65.4**	**43.0**	**52.1**	**51.4**		**41.4**		
CD at 5%	**NS**	**2.1**	**4.0**	**10.1**			**0.3**	**2.8**	**9.3**	**5.5**	**9.3**					
CV%	**15.6**	**5.2**	**10.1**	**22.0**			**3.2**	**2.8**	**8.2**	**7.3**	**10.3**					

Table 7.3: AVTC-1: First Advanced Varietal Trial in Cowpea: Green Forage Yield (q/ha/day)

Entries	Srinagar	Coimbatore	Vellayani	Mandya	Hyderabad	Dharwad	Average	Rank
PFC – 12	2.35	2.35	5.62	5.30	4.19	3.67	3.91	6
C - 217	3.03	2.17	5.89	4.80	3.80	5.15	4.14	4
MFC - 16 - 3	2.31	3.29	5.43	5.50	4.31	4.39	4.20	2
TSFC - 16 – 1	3.16	3.40	4.94	4.80	5.12	3.58	4.17	3
MFC - 16 – 4	2.54	3.56	5.24	4.50	4.23	3.49	3.93	5
HFC - 16 - 1	2.82	2.78	5.07	4.50	3.88	3.72	3.79	7
Bundel Lobia - 1 (NC)	2.14	3.25	4.76	4.50	3.91	3.32	3.65	8
UPC - 5286 (NC)	2.17	4.52	5.13	4.90	3.58	5.02	4.22	1
UPC 622 (ZC-HZ)	2.31							
MFC - 8 - 14 (ZC-SZ)		2.24	4.87	4.40	3.91	3.54		
Mean	**2.54**	**3.06**	**5.22**	**4.80**	**4.10**	**3.99**	**4.00**	

Table 7.4: AVTC-1: First Advanced Varietal Trial in Cowpea: Dry Matter Yield (q/ha/day)

Entries	Srinagar	Coimbatore	Mandya	Hyderabad	Dharwad	Average	Rank
PFC – 12	0.40	0.50	1.40	0.84	0.73	0.77	4
C - 217	0.54	0.45	1.20	0.79	1.20	0.84	3
MFC - 16 - 3	0.46	0.70	1.50	0.86	0.92	0.89	2
TSFC - 16 – 1	0.53	0.69	1.10	1.11	0.78	0.84	3
MFC - 16 – 4	0.45	0.76	1.10	0.82	0.71	0.77	4
HFC - 16 - 1	0.51	0.58	1.10	0.81	0.77	0.75	5
Bundel Lobia - 1 (NC)	0.41	0.68	1.20	0.77	0.65	0.74	6
UPC - 5286 (NC)	0.41	0.96	1.40	0.73	1.06	0.91	1
UPC 622 (ZC-HZ)	0.41						
MFC - 8 - 14 (ZC-SZ)		0.47	1.10	0.82	0.75		
Mean	**0.46**	**0.65**	**1.23**	**0.84**	**0.84**	**0.81**	

Table 7.5: AVTC-1: First Advanced Varietal Trial in Cowpea: Crude Protein Yield (q/ha) & Crude Protein (%)

Entries	Crude Protein Yield (q/ha)						Crude Protein (%)					
	Palam-pur	Coimb-atore	Man-dya	Hydera-bad	Aver-age	Ra-nk	Palam-pur	Coimb-atore	Man-dya	Hydera-bad	Aver-age	Ra-nk
PFC – 12		3.7	7.9	6.8	6.1	5		12.7	11.8	16.2	13.6	6
C - 217	6.0	4.0	4.2	6.8	5.2	7	19.8	14.9	9.2	17.5	15.4	3
MFC - 16 - 3	4.1	4.4	8.4	7.0	6.0	6	18.4	10.9	14.9	16.2	15.1	4
TSFC - 16 - 1		6.6	7.6	9.3	7.8	1		16.5	12.6	17.2	15.4	3
MFC - 16 – 4	5.9	7.4	5.3	6.8	6.3	3	19.5	16.2	9.2	16.6	15.4	3
HFC - 16 - 1		4.3	6.4	7.2	6.0	6		12.3	12.3	16.6	13.7	5
Bundel Lobia - 1 (NC)	4.2	6.5	8.1	6.0	6.2	4	19.5	16.3	14.0	14.9	16.2	1
UPC - 5286 (NC)	4.0	9.2	6.4	7.0	6.7	2	17.4	16.2	12.3	17.5	15.8	2
UPC 622 (ZC-HZ)	5.0						19.0					
MFC - 8 - 14 (ZC-SZ)		3.9	4.1	6.9				14.4	7.4	15.8		
Mean	**4.9**	**5.6**	**6.5**	**7.1**	**6.3**		**18.9**	**14.5**	**11.5**	**16.5**	**15.1**	

Table 7.6: AVTC-1: First Advanced Varietal Trial in Cowpea: Plant Height (CM)

Entries	Palampur	Srinagar	Rajouri	Coimbatore	Vellayani	Mandya	Hyderabad	Raichur	Average	Rank
PFC – 12		73.3	81.3	68.0	70.0	49.6	80.4	45.9	66.9	8
C - 217	95.7	88.3	94.4	93.2	103.0	62.0	92.6	56.2	85.7	4
MFC - 16 - 3	126.3	68.5	124.6	104.0	88.0	71.7	98.4	74.4	94.5	1
TSFC - 16 – 1		91.5	102.2	66.1	92.0	67.5	132.2	47.4	85.6	5
MFC - 16 – 4	122.3	67.1	120.4	103.3	80.0	51.2	104.3	84.2	91.6	2
HFC - 16 - 1		78.8	117.6	66.4	66.0	58.7	83.2		78.4	7
Bundel Lobia - 1 (NC)	107.0	67.4	120.0	102.2	82.0	61.7	76.3	73.7	86.3	3
UPC - 5286 (NC)	96.0	72.6	94.1	78.3	65.0	62.1	107.3	64.6	80.0	6
UPC 622 (ZC-HZ)	97.7	63.5	96.1							
MFC - 8 - 14 (ZC-SZ)				97.0	104.0	67.1	85.1	58.3		
Mean	**107.5**	**74.5**	**105.6**	**86.5**	**83.3**	**61.3**	**95.5**	**63.1**	**83.6**	

Table 7.7: AVTC-1: First Advanced Varietal Trial in Cowpea: Leaf Stem Ratio

Entries	Palampur	Coimbatore	Vellayani	Mandya	Hyderabad	Average	Rank
PFC - 12		0.40	1.50	0.72	0.97	0.90	2
C - 217	0.47	0.36	1.67	0.73	0.89	0.82	5
MFC - 16 - 3	0.42	0.34	1.00	0.86	0.87	0.70	7
TSFC - 16 – 1		0.45	1.39	0.78	0.81	0.86	4
MFC - 16 – 4	0.42	0.32	1.50	0.80	0.87	0.78	6
HFC - 16 - 1		0.39	1.72	0.63	0.88	0.91	1
Bundel Lobia - 1 (NC)	0.30	0.37	1.17	0.70	0.86	0.68	8
UPC - 5286 (NC)	0.52	0.37	1.56	0.87	1.11	0.89	3
UPC 622 (ZC-HZ)	0.45						
MFC - 8 - 14 (ZC-SZ)		0.41	2.00	0.80	1.18		
Mean	**0.43**	**0.38**	**1.50**	**0.77**	**0.94**	**0.82**	

Table 7.8: AVTC-1: First Advanced Varietal Trial in Cowpea: ADF (%) & NDF (%)

Entries	ADF (%)		NDF (%)	
	Palampur	Rank	Palampur	Rank
PFC - 12				
C - 217	49.4	1	59.4	1
MFC - 16 – 3	52.2	5	63.0	6
TSFC - 16 – 1				
MFC - 16 – 4	50.0	2	60.6	3
HFC - 16 - 1				
Bundel Lobia - 1 (NC)	51.0	4	60.0	2
UPC - 5286 (NC)	50.4	3	62.2	5
UPC 622 (ZC-HZ)	50.0	2	62.0	4
Mean	**50.5**		**61.2**	

8. IVT + AVT-2 RICE BEAN: INITIAL VARIETAL TRIAL and ADVANCED VARIETAL TRIAL-2 IN FORAGE RICE BEAN

(Reference Tables: 8.1 to 8.7)

An initial varietal trial and advanced varietal trial-2 in forage rice bean with five entries [4 entries for IVT- JOR-18-1, JOR -18-2, JRBJ-08-4, KRB-11 for IVT and 1 entry for AVT-2 - JRBJ-07-4 promoted from AVT-1] along with two national checks *i.e.* Bidhan-1 and Bidhan-2 was conducted at 7 locations across the country.

In AVT-2, single entry JRBJ-07-4 was evaluated.

For green forage yield (q/ha), single entry JRBJ-07-4 (275.5q) was slightly below par to best national check Bidhan Ricebean 1 (278.9 q). For dry matter yield (q/ha) also, it was slightly inferior to best check Bidhan Rice bean 1. For per day productivity (q/ha/day) JRBJ-07-4 was better than best national check for both green and dry matter (3.09 and 0.64 q/ha/day) in comparison to best check (Bidhan Rice bean 1 (3.03 and 0.62 q/ha/day) respectively. For plant height, JRBJ-07-4 (150.4 cm) was better than best check (147.1 cm). For leafiness it was inferior to best check. For crude protein yield, JRBJ-07-4 was at par with best national check (8.4q/ha), whereas for crude protein %, it was slightly better than best check. For other quality parameters, it was almost at par with national check for ADF, NDF and IVDMD.

For IVT four entries were evaluated.

None of the entries could show appreciable superiority over the best check for green fodder yield and dry matter yield. For fodder production potential (q/ha/day), entry KRB-11 ranked first with yield of 3.14q/ha/day for green forage and entry JOR-18-1 for dry matter with yield of 0.69q/ha/day. For plant height, entry KRB-11 ranked first whereas for leaf stem ratio, national check Bidhan-2 ranked first.

For crude protein yield (q/ha), entry JOR-18-1 ranked first (9.3 q/ha) followed by KRB-11 (8.7q/ha) in comparison to best check Bidhan Ricebean 1 (8.4 q/ha). For crude protein per cent, entry JOR-18-1 performed best (14.2%) followed by best check Bidhan-1 (13.4%). For other quality parameters, entry JRBJ-08-4 ranked first for ADF, NDF whereas for IVDMD entry JOR-18-1 ranked first.

9. IVT + AVT-2 RICE BEAN (seed): INITIAL VARIETAL TRIAL and ADVANCED VARIETAL TRIAL-2 IN FORAGE RICE BEAN

(Reference Tables: 9.1)

An initial varietal trial and advanced varietal trial -2 in forage rice bean with five entries [4 entries for IVT- JOR-18-1, JOR -18-2, JRBJ-08-4, KRB-11 for IVT and 1 entry for AVT-2 - JRBJ-07-4 promoted from AVT-1] along with two national checks *i.e.* Bidhan-1 and Bidhan-2 was conducted at 5 locations across the country.

For AVT-2 single entry JRBJ-07-4 (6.7q) was inferior to best check Bidhan -2 (8.9q).

For IVT entries, entry KRB-11 was 9.0% superior to the best check Bidhan -2 (8.9q).

Table 8.1 IVT +AVT-2 (Rice bean): Initial Varietal Trial + Advanced Varietal Trial -2 in Rice bean: Green Forage Yield (q/ha)

Entries	Kalyani	Ranchi	Jorhat	Pusa	Vellayani	Jabalpur	Imphal	Average	Rank	Superiority%
JRBJ 07 – 4*	**276.0**	**377.6**	**261.0**	**258.3**	**108.0**	**336.2**	**311.8**	**275.5**		AVT-2
JOR - 18 - 1	269.6	405.0	308.8	241.3	83.0	276.9	330.2	273.5	3	
JOR - 18 – 2	268.8	326.5	298.9	195.0	70.0	197.8	363.2	245.7	6	
KRB - 11	337.3	380.0	266.5	259.3	136.0	263.3	333.2	282.2	1	1.2
JRBJ 08 – 4	261.2	356.7	239.8	250.0	125.0	315.6	326.3	267.8	4	
K-1 (Bidhan-1) (NC)	284.6	426.5	251.4	267.7	125.0	264.4	332.8	278.9	2	
Bidhan- 2 (NC)	296.1	394.9	242.5	249.3	100.0	208.2	350.9	263.1	5	
Mean	**284.8**	**381.0**	**267.0**	**245.8**	**106.7**	**266.1**	**335.5**	**269.6**		
CD at 5%	5.0	27.7	5.7	8.5	6.6	57.4	16.2			
CV%	3.5	4.0	7.4	5.3	3.3	12.1	2.7			

Note: * Entry JRBJ 07-4 belongs to AVT-2; others are IVT entries.

Table 8.2 IVT +AVT-2 (Rice bean): Initial Varietal Trial + Advanced Varietal Trial -2 in Rice bean: Dry Matter Yield (q/ha)

Entries	Kalyani	Ranchi	Jorhat	Pusa	Vellayani	Jabalpur	Imphal	Average	Rank	Superiority%
JRBJ 07 – 4*	**49.9**	**89.4**	**48.8**	**52.6**	**26.8**	**65.9**	**61.3**	**56.4**		AVT-2
JOR - 18 - 1	49.5	96.5	63.9	49.4	20.1	56.6	73.8	58.5	1	0.5
JOR - 18 – 2	48.6	90.3	58.3	39.0	27.3	36.3	71.5	53.0	6	
KRB - 11	64.2	81.1	51.2	52.7	34.2	50.8	64.1	56.9	3	
JRBJ 08 – 4	47.3	88.0	48.4	50.9	31.3	58.5	62.9	55.3	4	
K-1 (Bidhan-1) (NC)	52.1	98.8	48.6	54.4	30.9	50.9	71.5	58.2	2	
Bidhan - 2 (NC)	55.8	92.8	45.5	50.8	25.0	38.5	73.0	54.5	5	
Mean	**52.5**	**91.0**	**52.1**	**50.0**	**27.9**	**51.1**	**68.3**	**56.1**		
CD at 5%	**3.4**	**5.2**	**3.3**	**1.9**	**2.4**	**11.9**	6.8			
CV%	**4.1**	**5.8**	**9.7**	**5.3**	**4.9**	**13.2**	5.6			

Note: * Entry JRBJ 07-4 belongs to AVT-2; others are IVT entries.

Table 8.3 IVT +AVT-2 (Rice bean): Initial Varietal Trial + Advanced Varietal Trial -2 in Rice bean: Green Forage Yield (q/ha/day) and Dry Matter Yield (q/ha/day)

Entries	GFY (q/ha/day)								DMY (q/ha/day)					
	Ran-chi	Kal-yani	Jor-hat	Jabal-pur	Pu-sa	Vella-yani	Aver-age	Ra-nk	Ran-chi	Kal-yani	Jor-hat	Jabal-pur	Aver-age	Ra-nk
JRBJ 07 – 4*	**2.90**	**2.42**	**3.78**	**3.73**	**3.31**	**2.40**	**3.09**	AVT-2	**0.69**	**0.44**	**0.71**	**0.73**	**0.64**	AVT-2
JOR - 18 - 1	3.39	2.36	4.48	2.91	2.94	1.84	2.99	4	0.81	0.43	0.93	0.59	0.69	1
JOR - 18 – 2	2.72	2.36	4.33	2.01	2.30	2.39	2.69	6	0.75	0.43	0.84	0.37	0.60	4
KRB - 11	2.94	2.96	3.86	3.06	3.02	3.02	3.14	1	0.63	0.56	0.74	0.59	0.63	2
JRBJ 08 – 4	2.94	2.29	3.48	3.71	2.86	2.78	3.01	3	0.73	0.41	0.70	0.68	0.63	2
K-1 (Bidhan-1) (NC)	3.23	2.50	3.64	3.00	3.02	2.78	3.03	2	0.75	0.46	0.70	0.57	0.62	3
Bidhan - 2 (NC)	3.07	2.60	3.51	2.31	2.96	2.22	2.78	5	0.72	0.49	0.66	0.42	0.57	5
Mean	**3.03**	**2.50**	**3.87**	**2.96**	**2.92**	**2.49**	**2.96**		**0.72**	**0.46**	**0.76**	**0.56**	**0.63**	

Note: * Entry JRBJ 07-4 belongs to AVT-2; others are IVT entries.

Table 8.4 IVT +AVT-2 (Rice bean): Initial Varietal Trial + Advanced Varietal Trial -2 in Rice bean: Crude Protein Yield (q/ha) and Crude Protein (%)

Entries	Crude Protein Yield (q/ha)							Crude Protein (%)						
	Jabal-pur	Kal-yani	Jor-hat	Ran-chi	Imp-hal	Aver-age	Ra-nk	Jabal-pur	Kal-yani	Jor-hat	Ran-chi	Imp-hal	Aver-age	Ra-nk
JRBJ 07 – 4*	**10.0**	**7.0**	**6.7**	**9.2**	**8.8**	**8.4**	AVT-2	**15.2**	**14.0**	**13.9**	**10.3**	**14.4**	**13.6**	AVT-2
JOR - 18 - 1	8.0	8.6	8.8	12.8	8.4	9.3	1	15.1	17.4	13.9	13.3	11.4	14.2	1
JOR - 18 – 2	5.2	7.9	7.3	10.7	8.3	7.9	5	14.4	16.3	12.7	11.8	11.5	13.3	4
KRB - 11	7.6	12.1	6.3	7.8	9.7	8.7	2	15.1	18.8	12.5	9.6	15.1	14.2	1
JRBJ 08 – 4	9.2	7.2	6.0	9.1	9.5	8.2	4	15.1	15.3	12.5	10.3	15.0	13.6	2
K - 1 (Bidhan - 1) (NC)	7.6	8.5	6.0	11.3	8.3	8.4	3	15.1	16.3	12.5	11.4	11.7	13.4	3
Bidhan - 2 (NC)	5.7	6.7	6.7	8.4	9.9	7.5	6	15.1	12.0	14.9	9.0	13.5	12.9	5
Mean	**7.6**	**8.3**	**6.8**	**9.9**	**9.0**	**8.3**		**15.0**	**15.7**	**13.3**	**10.8**	**13.2**	**13.6**	

Note: * Entry JRBJ 07-4 belongs to AVT-2; others are IVT entries.

Table 8.5 IVT +AVT-2 (Rice bean): Initial Varietal Trial + Advanced Varietal Trial -2 in Rice bean: Plant Height (cm)

Entries	Kalyani	Ranchi	Jorhat	Imphal	Jabalpur	Pusa	Vellayani	Average	Rank
JRBJ 07 – 4*	**135.1**	**213.3**	**120.3**	**187.9**	**198.0**	**135.0**	**63.0**	**150.4**	AVT-2
JOR - 18 - 1	134.8	219.9	160.7	179.0	177.7	129.7	57.0	151.3	3
JOR - 18 – 2	136.4	191.6	162.7	167.1	156.0	118.7	92.0	146.4	5
KRB - 11	149.7	266.4	157.1	174.7	165.8	121.7	65.0	157.2	1
JRBJ 08 – 4	135.2	266.3	137.1	156.8	185.3	115.0	82.0	153.9	2
K - 1 (Bidhan - 1) (NC)	138.6	211.1	142.5	143.6	176.5	144.3	73.0	147.1	4
Bidhan - 2 (NC)	140.7	162.3	144.3	150.9	161.1	136.3	65.0	137.2	6
Mean	**138.6**	**218.7**	**146.4**	**165.7**	**174.3**	**128.7**	**71.0**	**149.1**	

Note: * Entry JRBJ 07-4 belongs to AVT-2; others are IVT entries.

Table 8.6 IVT +AVT-2 (Rice bean): Initial Varietal Trial + Advanced Varietal Trial -2 in Rice bean: Leaf Stem Ratio

Entries	Kalyani	Ranchi	Jorhat	Imphal	Jabalpur	Pusa	Vellayani	Average	Rank
JRBJ 07 – 4*	**0.86**	**0.51**	**0.71**	**0.58**	**0.88**	**0.53**	**1.33**	**0.77**	AVT-2
JOR - 18 - 1	0.94	0.54	0.76	0.42	0.82	0.47	`1.00	0.66	4
JOR - 18 – 2	0.91	0.46	0.98	0.47	0.70	0.39	1.67	0.80	2
KRB - 11	0.99	0.39	0.72	0.47	0.76	0.52	1.83	0.81	1
JRBJ 08 – 4	0.91	0.43	0.68	0.54	0.88	0.49	1.08	0.71	3
K - 1 (Bidhan - 1) (NC)	0.93	0.47	0.67	0.56	0.78	0.49	1.67	0.80	2
Bidhan - 2 (NC)	0.99	0.58	0.57	0.57	0.77	0.49	1.67	0.81	1
Mean	**0.93**	**0.48**	**0.73**	**0.52**	**0.80**	**0.48**	**1.54**	**0.76**	

Note: * Entry JRBJ 07-4 belongs to AVT-2; others are IVT entries.

Table 8.7 IVT +AVT-2 (Rice bean): Initial Varietal Trial + Advanced Varietal Trial -2 in Rice bean: ADF (%), NDF (%) & IVDMD (%)

Entries	ADF (%)		NDF (%)		IVDMD (%)	
	Ranchi	Rank	Ranchi	Rank	Ranchi	Rank
JRBJ 07 – 4*	**45.1**	AVT-2	**61.3**	AVT-2	**55.3**	AVT-2
JOR - 18 - 1	44.4	2	59.7	2	56.0	1
JOR - 18 – 2	45.3	5	62.3	4	54.2	4
KRB - 11	48.7	6	65.7	6	52.5	6
JRBJ 08 – 4	43.3	1	56.9	1	55.7	3
K - 1 (Bidhan - 1) (NC)	44.5	3	61.7	3	55.8	2
Bidhan - 2 (NC)	44.8	4	63.7	5	53.5	5
Mean	**45.2**		**61.6**		**54.7**	

Note: * Entry JRBJ 07-4 belongs to AVT-2; others are IVT entries.

Table 9.1 IVT Rice Bean+ AVT-2 Rice Bean (Seed): Seed Yield (q/ha)

Entries	Jorhat	Jabalpur	Ranchi	Imphal	Kalyani	Average	Rank	Superiority%
JRBJ 07 – 4*	**4.3**	**4.3**	**2.9**	**10.5**	**11.4**	**6.7**	AVT-2	
JOR - 18 - 1	5.7	3.4	3.0	10.6	12.3	7.0	4	
JOR - 18 - 2	5.1	4.0	3.1	11.6	11.2	7.0	4	
KRB - 11	3.0	3.4	4.5	16.2	21.3	9.7	1	9.0
JRBJ 08 - 4	3.4	4.7	3.5	10.8	11.2	6.7	5	
K - 1 (Bidhan - 1) (NC)	3.4	6.4	2.9	14.2	16.3	8.6	3	
Bidhan - 2 (NC)	3.6	4.8	4.3	14.6	17.2	8.9	2	
Mean	**4.1**	**4.4**	**3.5**	**12.6**	**14.4**	**7.8**		
CD at 5%	0.4	0.8	1.0	0.8	1.3			
CV%	4.0	10.4	15.5	0.6	8.4			

Note: * Entry JRBJ 07-4 belongs to AVT-2; others are IVT entries

10. VT *Cenchrus ciliaris*-2015 (4th YEAR): VARIETAL TRIAL IN *Cenchrus ciliaris* (PERENNIAL)

(Reference Tables: 10.1 to 10.8)

The trial was established in 2015 with 6 entries along with 3 checks (CAZRI-75, IGFRI 3108, IGFRI 727) in three zones. Data in fourth year has been received from 13 centres, five each in NW and central zones and 3 in south zone.

For green fodder yield, entry IG-67-365 (290.1q/ha) ranked first in central zone showing 7.8% superiority over the best check. In south zone, entries IG-67-365 and IGFRI-96-79 ranked first and second showing superiority of 13.0% and 9.3% respectively over the best check. At NW zone and combining three zones, all the entries were inferior to national check.

For dry matter yield, entries IG-67-365 and RCCB-04-3 showed superiority of 8.1% and 6.3% respectively over the best check in central zone. Entries IGFRI-96-79 and IG-67-365 showed superiority of 10.0% and 6.8% respectively over the best check in south zone. In NW zone and combining three zones entries were either at par or inferior to checks.

For per day productivity potential, IG-67-365 ranked first (1.91 q/ha/day) followed by IGFRI-96-79 (1.85 q/ha/day) as against best check IGFRI 3108 (1.70 q/ha/day). For dry matter IG-67-365 ranked first (0.62 q/ha/day) followed by IGFRI-96-79 (0.61 q/ha/day). For crude protein yield, IGFRI-96-79 (4.7 q) and for crude protein content IG-67-365 (6.9 %) ranked first. For plant height, IG-67-365 (94.1 cm) and for leafiness IGFRI-96-79 (1.34) ranked first. For NDF, ADF and IVDMD, IGFRI-67-75 ranked first.

[The trial is complete].

Table 10.1 VT *Cenchrus ciliaris*-2015 (4th Year): Varietal Trial in *Cenchrus ciliaris* (Perennial): Green Forage Yield (q/ha)

Entries	North West Zone							Central Zone							
	Ludh-iana	Jodh-pur	His-ar	Bika-ner	Avika-nagar	Aver-age	Ra-nk	Ana-nd	Rah-uri	Urulikan-chan	Jabal-pur	Jha-nsi	Aver-age	Ra-nk	Superi-ority%
RCCB-03-23	202.0	107.1	607.4	194.5	115.3	245.2	4	261.1	106.7	470.0	110.8	144.5	218.6	7	
IGFRI-67-75	194.3	116.0	625.3	149.2	147.9	246.5	3	237.2	140.1	423.4	97.4	180.8	215.8	8	
RCCB-04-3	149.3	134.2	370.3	82.9	103.9	168.1	9	176.7	83.6	598.1	102.4	309.6	254.1	4	
IGFRI-96-79	230.7	66.1	556.3	123.6	172.0	229.7	5	235.0	175.4	365.6	90.0	417.5	256.7	3	
CAZRI-231	211.0	119.4	445.3	129.9	114.5	204.0	8	179.4	104.1	442.0	162.4	304.1	238.4	5	
IG-67-365	258.0	106.4	496.4	90.2	133.8	217.0	6	227.2	183.1	364.2	172.4	503.4	290.1	1	7.8
CAZRI 75 (NC)	233.3	108.1	714.2	184.6	131.8	274.4	1	231.1	212.8	483.4	100.0	318.7	269.2	2	
IGFRI 3108 (NC)	176.0	139.6	500.3	96.3	133.4	209.1	7	267.2	103.2	496.2	81.6	223.9	234.4	6	
IGFRI 727 (NC)			428.7	85.4		257.1	2				83.3	339.4	211.3	9	
Mean	**206.8**	**112.1**	**527.1**	**126.3**	**131.6**	**227.9**		**226.9**	**138.6**	**455.3**	**111.1**	**304.6**	**243.2**		
CD at 5%	**54.8**	**NS**	**45.3**	**29.4**	**10.7**			**49.6**	**35.8**	**72.0**	**28.3**	**9.5**			
CV%	**11.0**	**24.1**	**12.2**	**13.4**	**4.8**			**12.5**	**14.7**	**9.0**	**14.7**	**18.0**			

Table 10.1 VT *Cenchrus ciliaris*-2015 (4th Year): Varietal Trial in *Cenchrus ciliaris* (Perennial): Green Forage Yield (q/ha)

Entries	South Zone						All India		
	Coimbatore	Mandya	Hyderabad	Average	Rank	Superiority%	Average	Rank	Superiority%
RCCB-03-23	996.1	142.1	201.3	446.5	5		281.4	4	
IGFRI-67-75	914.1	121.9	144.4	393.5	8		268.6	5	
RCCB-04-3	905.2	154.2	141.1	400.2	7		254.7	7	
IGFRI-96-79	1068.6	300.7	217.1	528.8	2	9.3	309.1	3	
CAZRI-231	894.4	197.1	138.0	409.8	6		264.7	6	
IG-67-365	1125.5	357.8	157.2	546.9	1	13.0	321.2	1	0.2
CAZRI 75 (NC)	1066.6	232.1	152.7	483.8	3		320.7	2	
IGFRI 3108 (NC)	1011.3	189.5	240.2	480.3	4		281.4	4	
IGFRI 727 (NC)							234.2	8	
Mean	**997.7**	**211.9**	**174.0**	**461.2**			**281.8**		
CD at 5%	**26.4**	**13.8**	**16.4**						
CV%	**1.5**	**6.5**	**5.3**						

Table 10.2 VT *Cenchrus ciliaris*-2015 (4th Year): Varietal Trial in *Cenchrus ciliaris* (Perennial): Dry Matter Yield (q/ha)

Entries	North West Zone							Central Zone							
	Ludh-iana	Jodh-pur	His-ar	Bika ner	Avika-nagar	Aver-age	Ra-nk	Ana-nd	Rah-uri	Urulikan-chan	Jabal-pur	Jha-nsi	Aver-age	Ra-nk	Super-iority%
RCCB-03-23	36.4	22.3	66.3	87.6	27.5	48.0	7	69.1	36.2	204.4	19.5	59.0	77.6	8	
IGFRI-67-75	40.8	31.2	70.5	63.0	35.3	48.2	6	63.7	40.4	178.4	17.0	89.4	77.8	7	
RCCB-04-3	28.1	27.7	92.0	40.3	21.6	41.9	9	44.3	27.0	268.9	18.2	171.5	106.0	2	6.3
IGFRI-96-79	49.8	14.4	97.0	57.1	44.9	52.6	4	65.3	67.5	150.8	15.5	209.2	101.7	3	2.0
CAZRI-231	41.6	31.8	78.9	55.3	24.3	46.4	8	46.9	31.8	208.2	29.5	134.2	90.1	5	
IG-67-365	56.0	27.1	108.9	44.0	30.4	53.3	3	61.7	65.8	147.4	31.5	232.8	107.8	1	8.1
CAZRI 75 (NC)	47.8	28.5	100.8	87.0	34.9	59.8	2	64.0	65.9	191.7	17.8	159.2	99.7	4	
IGFRI 3108 (NC)	34.8	31.0	106.0	44.6	31.2	49.5	5	69.6	29.3	216.7	14.8	109.1	87.9	6	
IGFRI 727 (NC)			99.8	39.1		69.4	1				14.3	137.6	76.0	9	
Mean	**41.9**	**26.7**	**91.1**	**57.6**	**31.3**	**52.1**		**60.6**	**45.5**	**195.8**	**19.8**	**144.7**	**91.6**		
CD at 5%	**16.7**	**NS**	**16.5**	**17.0**	**3.6**			**13.9**	**11.9**	**31.6**	**5.2**	**7.1**			
CV%	**9.8**	**27.8**	**12.9**	**17.0**	**7.0**			**13.1**	**15.0**	**9.1**	**15.2**	**20.3**			

Table 10.2 VT *Cenchrus ciliaris*-2015 (4th Year): Varietal Trial in *Cenchrus ciliaris* (Perennial): Dry Matter Yield (q/ha)

Entries	South Zone						All India		
	Coimbatore	Mandya	Hyderabad	Average	Rank	Superiority%	Average	Rank	Superiority%
RCCB-03-23	231.9	46.9	44.9	107.9	5		73.2	7	
IGFRI-67-75	213.0	39.0	32.3	94.8	8		70.3	9	
RCCB-04-3	208.7	51.8	33.8	98.1	7		79.5	5	
IGFRI-96-79	252.8	92.0	50.7	131.8	1	10.0	89.8	2	0.9
CAZRI-231	210.8	65.5	33.1	103.1	6		76.3	6	
IG-67-365	267.4	80.7	35.6	127.9	2	6.8	91.5	1	2.8
CAZRI 75 (NC)	251.2	73.4	34.7	119.8	3		89.0	3	
IGFRI 3108 (NC)	234.2	65.1	54.6	118.0	4		80.1	4	
IGFRI 727 (NC)							72.7	8	
Mean	**233.8**	**64.3**	**40.0**	**112.7**			**80.3**		
CD at 5%	**6.6**	**9.4**	**6.2**						
CV%	**1.6**	**14.5**	**8.7**						

Table 10.3 VT *Cenchrus ciliaris*-2015 (4th Year): Varietal Trial in *Cenchrus ciliaris* (Perennial): Green ForageYield (q/ha/day)

Entries	Ludhiana	Jodhpur	Bikaner	Avikanagar	Anand	Jabalpur	Jhansi	Hyderabad	Average	Rank
RCCB-03-23	2.10	2.34	2.32	1.89	0.75	0.30	1.45	1.68	1.60	6
IGFRI-67-75	2.00	2.03	1.78	2.69	0.68	0.26	1.83	1.20	1.56	8
RCCB-04-3	1.50	3.12	0.99	1.62	0.51	0.28	2.98	1.18	1.52	9
IGFRI-96-79	2.40	1.40	1.47	2.82	0.68	0.24	3.98	1.81	1.85	2
CAZRI-231	2.20	2.17	1.55	1.82	0.52	0.44	3.01	1.15	1.61	5
IG-67-365	2.70	2.04	1.07	2.09	0.65	0.47	4.98	1.31	1.91	1
CAZRI 75 (NC)	2.40	1.39	2.20	2.13	0.67	0.27	3.18	1.27	1.69	4
IGFRI 3108 (NC)	1.80	3.08	1.15	2.30	0.77	0.22	2.26	2.00	1.70	3
IGFRI 727 (NC)			1.02			0.22	3.48		1.57	7
Mean	**2.14**	**2.20**	**1.50**	**2.17**	**0.65**	**0.30**	**3.02**	**1.45**	**1.67**	

Table 10.4 VT *Cenchrus ciliaris*-2015 (4th Year): Varietal Trial in *Cenchrus ciliaris* (Perennial): Dry Matter Yield (q/ha/day)

Entries	Ludhiana	Jodhpur	Bikaner	Avikanagar	Anand	Jabalpur	Jhansi	Hyderabad	Average	Rank
RCCB-03-23	0.40	0.48	1.04	0.45	0.20	0.05	0.59	0.37	0.45	8
IGFRI-67-75	0.40	0.55	0.75	0.64	0.18	0.05	0.91	0.27	0.47	7
RCCB-04-3	0.30	0.64	0.48	0.34	0.13	0.05	1.66	0.28	0.48	6
IGFRI-96-79	0.50	0.30	0.68	0.74	0.19	0.04	1.99	0.42	0.61	3
CAZRI-231	0.40	0.58	0.66	0.39	0.14	0.08	1.33	0.28	0.48	6
IG-67-365	0.60	0.50	0.52	0.48	0.18	0.09	2.31	0.30	0.62	2
CAZRI 75 (NC)	0.50	0.36	1.04	0.56	0.18	0.05	1.59	0.29	0.57	4
IGFRI 3108 (NC)	0.40	0.68	0.53	0.54	0.20	0.04	1.10	0.46	0.49	5
IGFRI 727 (NC)			0.47			0.04	1.41		0.64	1
Mean	**0.44**	**0.51**	**0.69**	**0.52**	**0.18**	**0.05**	**1.43**	**0.33**	**0.53**	

Table 10.5 VT *Cenchrus ciliaris*-2015 (4th Year): Varietal Trial in *Cenchrus ciliaris* (Perennial): Crude Protein Yield (q/ha)

Entries	Avikanagar	Bikaner	Anand	Rahuri	Urulikanchan	Jabalpur	Mandya	Average	Rank
RCCB-03-23	2.2	4.9	5.2	2.5	11.5	1.3	2.5	4.3	4
IGFRI-67-75	3.0	2.4	4.6	2.6	11.5	1.1	2.1	3.9	7
RCCB-04-3	1.6	1.2	3.1	1.9	19.0	1.3	3.1	4.5	3
IGFRI-96-79	3.9	2.4	4.5	4.4	10.8	1.1	5.7	4.7	1
CAZRI-231	1.8	2.1	3.0	2.2	12.7	2.2	4.6	4.1	5
IG-67-365	2.6	3.0	3.9	4.7	10.5	2.3	4.1	4.5	3
CAZRI 75 (NC)	2.9	3.2	4.3	4.0	12.3	1.2	4.3	4.6	2
IGFRI 3108 (NC)	2.5	1.9	4.8	1.9	12.3	0.9	3.7	4.0	6
IGFRI 727 (NC)		1.5				0.9		1.2	8
Mean	**2.6**	**2.5**	**4.2**	**3.0**	**12.6**	**1.3**	**3.8**	**4.0**	

Table 10.6 VT *Cenchrus ciliaris*-2015 (4th Year): Varietal Trial in *Cenchrus ciliaris* (Perennial): Crude Protein (%)

Entries	Bikaner	Avikanagar	Anand	Rahuri	Urulikanchan	Jabalpur	Mandya	Average	Rank
RCCB-03-23	5.6	8.0	7.5	7.0	5.6	6.7	5.3	6.5	3
IGFRI-67-75	3.8	8.5	7.2	6.3	6.5	6.6	5.3	6.3	5
RCCB-04-3	2.9	7.5	7.0	7.2	7.1	7.0	6.0	6.4	4
IGFRI-96-79	4.2	8.6	7.0	6.6	7.2	6.9	6.1	6.6	2
CAZRI-231	3.8	7.5	6.3	6.8	6.1	7.4	7.0	6.4	4
IG-67-365	6.8	8.4	6.4	7.2	7.2	7.4	5.1	6.9	1
CAZRI 75 (NC)	3.7	8.2	6.6	6.1	6.4	6.8	5.8	6.2	6
IGFRI 3108 (NC)	4.2	7.9	6.9	6.3	5.7	6.5	5.6	6.2	6
IGFRI 727 (NC)	3.9					6.7		5.3	7
Mean	**4.3**	**8.1**	**6.9**	**6.7**	**6.5**	**6.9**	**5.8**	**6.3**	

Table 10.7 VT *Cenchrus ciliaris*-2015 (4th Year): Varietal Trial in *Cenchrus ciliaris* (Perennial): Plant Height (cm)

Entries	Ludh-iana	Jodh-pur	His-ar	Bika-ner	Avika-nagar	Ana-nd	Rah-uri	Urulikan-chan	Jabal-pur	Jha-nsi	Man-dya	Aver-age	Ra-nk
RCCB-03-23	120.2	104.4	88.3	76.0	92.6	136.6	61.6	46.0	60.0	86.2	53.4	84.1	7
IGFRI-67-75	102.8	119.7	93.5	86.0	102.3	129.5	67.2	49.7	51.7	122.2	56.2	89.2	4
RCCB-04-3	84.8	96.5	80.3	72.0	97.9	101.3	45.6	42.4	57.9	89.5	60.7	75.4	9
IGFRI-96-79	118.6	105.4	109.8	74.0	106.6	143.5	77.9	56.8	56.5	108.4	66.2	93.1	3
CAZRI-231	102.3	118.6	92.5	74.0	97.1	130.3	67.2	57.4	69.2	100.8	67.3	88.8	5
IG-67-365	130.1	102.9	109.0	50.0	105.3	146.1	76.3	69.7	68.8	100.6	76.3	94.1	1
CAZRI 75 (NC)	118.4	103.9	114.9	67.0	107.2	138.9	81.6	60.7	58.8	106.5	69.6	93.4	2
IGFRI 3108 (NC)	110.1	110.1	96.0	82.0	99.3	117.0	61.8	49.9	51.0	92.8	59.2	84.5	6
IGFRI 727 (NC)			96.7	50.0					60.3	101.2		77.1	8
Mean	**110.9**	**107.7**	**97.9**	**70.1**	**101.0**	**130.4**	**67.4**	**54.1**	**59.4**	**100.9**	**63.6**	**86.6**	

Table 10.8 VT *Cenchrus ciliaris*-2015 (4th Year): Varietal Trial in *Cenchrus ciliaris* (Perennial): Leaf Stem Ratio

Entries	Jodhpur	Hisar	Bikaner	Avikanagar	Anand	Rahuri	Urulikanchan	Jabalpur	Mandya	Average	Rank
RCCB-03-23	2.23	0.67	1.36	1.41	0.89	1.13	0.54	0.50	0.68	1.05	7
IGFRI-67-75	2.51	0.64	1.29	1.31	1.51	1.61	0.53	0.44	0.70	1.17	5
RCCB-04-3	3.01	0.60	0.87	1.66	1.46	1.82	0.62	0.50	0.58	1.24	3
IGFRI-96-79	3.52	0.65	1.64	1.96	1.44	1.00	0.83	0.46	0.59	1.34	1
CAZRI-231	2.08	0.52	0.92	1.84	1.71	1.16	0.59	0.55	0.55	1.10	6
IG-67-365	2.54	0.57	1.30	1.96	1.37	1.44	0.72	0.57	0.71	1.24	3
CAZRI 75 (NC)	1.98	0.56	1.57	1.57	1.07	1.85	0.80	0.48	0.77	1.18	4
IGFRI 3108 (NC)	3.17	0.70	0.94	1.53	1.69	1.73	0.72	0.38	0.62	1.28	2
IGFRI 727 (NC)		0.57	0.86					0.45		0.63	8
Mean	**2.63**	**0.61**	**1.19**	**1.66**	**1.39**	**1.47**	**0.67**	**0.48**	**0.65**	**1.14**	

Table 10.9 VT *Cenchrus ciliaris*-2015 (4th Year): Varietal Trial in *Cenchrus ciliaris* (Perennial): ADF (%), NDF (%) & IVDMD (%)

Entries	ADF (%)				NDF (%)				IVDMD (%)	
	Rahuri	Avikanagar	Average	Rank	Rahuri	Avikanagar	Average	Rank	Rahuri	Rank
RCCB-03-23	42.5	42.7	42.6	3	63.7	75.4	69.5	2	54.3	6
IGFRI-67-75	42.2	42.3	42.2	1	62.7	75.4	69.0	1	56.3	1
RCCB-04-3	42.7	43.8	43.3	5	64.1	76.2	70.1	4	55.5	4
IGFRI-96-79	44.4	42.6	43.5	6	66.4	75.0	70.7	6	55.4	5
CAZRI-231	43.2	41.5	42.4	2	65.7	75.5	70.6	5	55.7	3
IG-67-365	45.2	41.1	43.2	4	67.3	75.5	71.4	7	54.1	7
CAZRI 75 (NC)	47.2	42.6	44.9	7	68.5	78.3	73.4	8	51.8	8
IGFRI 3108 (NC)	42.8	41.6	42.2	1	64.8	74.9	69.8	3	55.8	2
IGFRI 727 (NC)										
Mean	**43.8**	**42.3**	**43.0**		**65.4**	**75.8**	**70.6**		**54.8**	

11. VT *Cenchrus setigerus* -2015 (4th YEAR): VARIETAL TRIAL IN *Cenchrus setigerus* (PERENNIAL)

(Reference Tables: 11.1 to 11.8)

The trial was established in 2015 with 8 entries and one national check (CAZRI 76). Data in 4th year has been reported from 10 locations in 3 zones, *viz.*, North West (3 locations), Central zone (4 locations) and south zone (3 locations).

For green fodder yield (q/ha), entries RCSB-02-7 (31.1%), IGFRI-96-706 (29.5%), TNCS-265 (26.3%), IGFRI-97-395 (14.4%), IGFRI-96-593 (11.4%) were superior over the check (108.3 q) in north-west zone. Entries TNCS-265 (38.0%), IGFRI-96-706 (20.9%), IGFRI-96-593 (7.3%) were superior over the best check (405.5 q) in south zone. In central zone check CAZRI-76 was best. Combining all 3 zones, entries TNCS-265 and IGFRI-96-706 were superior by margin of 16.3% and 8.8% respectively over the national check.

For dry matter yield (q/ha), entries TNCS-265 (37.5%), RCSB-02-7 (52.5%), IGFRI-96-706 (21.0%), IGFRI-97-395 (7.3%) were superior over the national check (38.1 q) in north-west zone. In south zone, entries TNCS-265 (41.0%), IGFRI-96-706 (21.6%) and IGFRI-96-593 (8.1%) were superior over the national check (94.9q) in south zone. In central zone and combining all 3 zones, all entries were inferior or at par with check.

For green fodder per day productivity, entry IGFRI-96-706 ranked first with yield of 1.69q/ha/day. For dry matter productivity, national check ranked first (0.66 q/ha/day). For plant height, CAZRI-2397 and for leafiness IGFRI-96-593 were best performers.

For crude protein yield (q/ha), entry TNCS-265 (3.1q) followed by IGFRI-96-706 performed well as compared to national check (2.7q/ha). For crude protein content, RCSB-02-60 (7.1%) ranked first followed by IGFRI-97-395 (6.9%) as compared to national check (6.3%). For other quality parameters, RCSB-02-60 ranked first for ADF (%), NDF (%), and IVDMD (%).

[The trial is complete].

Table 11.1 VT *Cenchrus setigerus*-2015 (4th Year): Varietal Trial in *Cenchrus setigerus* (Perennial): Green Forage Yield (q/ha)

Entries	North West Zone						Central Zone						
	*Jodh-pur	Bika-ner	Avika-nagar	Aver-age	Ra-nk	Superi-ority%	Ana-nd	Rah-uri	Dha-ri	Jha-nsi	Aver-age	Ra-nk	Superi-ority%
TNCS-265	59.8	159.6	114.1	136.8	3	26.3	253.3	146.7	35.8	223.8	164.9	7	
RCSB-02-7	110.9	189.3	94.6	142.0	1	31.1	166.7	113.3	12.6	179.5	118.0	9	
IGFRI-96-706	36.1	118.4	162.3	140.3	2	29.5	233.9	104.6	30.3	324.2	173.2	4	
CAZRI 2397 (CAZRI-76-1)	88.6	100.6	82.9	91.8	9		171.1	134.3	41.0	367.6	178.5	3	
RCSB-02-58	101.4	105.3	101.9	103.6	8		183.3	104.8	16.4	362.0	166.6	6	
IGFRI-97-395	89.7	94.2	153.5	123.9	4	14.4	228.9	116.7	22.7	357.5	181.4	2	
IGFRI-96-593	33.6	90.7	150.5	120.6	5	11.4	251.1	139.0	48.8	234.4	168.3	5	
RCSB-02-60	91.5	119.8	95.7	107.7	7		283.3	111.1	14.1	224.1	158.1	8	
CAZRI-76 (NC)	37.2	89.6	127.1	108.3	6		159.4	132.0	33.9	487.3	203.2	1	
Mean	**72.1**	**118.6**	**120.3**	**119.4**			**214.6**	**122.5**	**28.4**	**306.7**	**168.0**		
CD at 5%	**43.4**	**29.2**	**10.5**				**61.3**	**29.0**		**16.4**			
CV%	**34.8**	**14.2**	**5.0**				**16.5**	**13.7**		**18.1**			

Note: * Not included in zonal and all India average due to CV≥ 30

Table 11.1 VT *Cenchrus setigerus*-2015 (4th Year): Varietal Trial in *Cenchrus setigerus* (Perennial): Green Forage Yield (q/ha)

Entries	South Zone						All India		
	Coimbatore	Mandya	Hyderabad	Average	Rank	Superiority%	Average	Rank	Superiority%
TNCS-265	1099.7	322.0	256.6	559.4	1	38.0	290.2	1	16.3
RCSB-02-7	761.4	139.6	159.7	353.6	8		201.9	9	
IGFRI-96-706	931.2	289.2	249.9	490.1	2	20.9	271.5	2	8.8
CAZRI 2397 (CAZRI-76-1)	698.9	194.5	199.9	364.4	7		221.2	6	
RCSB-02-58	786.9	58.2	194.6	346.6	9		212.6	8	
IGFRI-97-395	848.9	166.7	134.7	383.4	5		236.0	5	
IGFRI-96-593	947.2	217.8	140.2	435.1	3	7.3	246.6	4	
RCSB-02-60	889.7	51.6	182.7	374.7	6		219.1	7	
CAZRI-76 (NC)	808.6	260.7	147.2	405.5	4		249.5	3	
Mean	**863.6**	**188.9**	**185.1**	**412.5**			**238.7**		
CD at 5%	**28.7**	**20.1**	**13.3**						
CV%	**1.9**	**6.2**	**4.2**						

Table 11.2 VT *Cenchrus setigerus*-2015 (4th Year): Varietal Trial in *Cenchrus setigerus* (Perennial): Dry Matter Yield (q/ha)

Entries	North West Zone						Central Zone					
	*Jodh-pur	Bika-ner	Avika-nagar	Aver-age	Ra-nk	Superi-ority%	Ana-nd	Rah-uri	Dha-ri	Jha-nsi	Aver-age	Ra-nk
TNCS-265	13.3	72.9	31.8	52.4	2	37.5	69.6	39.9	28.9	59.0	49.3	6
RCSB-02-7	24.6	92.7	23.5	58.1	1	52.5	41.0	30.8	8.1	37.0	29.2	9
IGFRI-96-706	9.7	49.0	43.2	46.1	3	21.0	60.8	36.5	18.5	92.1	52.0	4
CAZRI 2397 (CAZRI-76-1)	22.4	39.6	21.3	30.4	9		41.2	46.0	27.8	136.7	62.9	2
RCSB-02-58	24.6	41.3	25.5	33.4	8		47.1	31.6	13.5	143.0	58.8	3
IGFRI-97-395	20.1	44.1	37.8	40.9	4	7.3	58.4	30.6	14.8	99.8	50.9	5
IGFRI-96-593	8.0	36.7	37.6	37.2	7		63.5	42.7	31.5	55.8	48.4	7
RCSB-02-60	22.1	54.6	22.4	38.5	5	1.0	70.1	31.5	8.4	52.5	40.6	8
CAZRI-76 (NC)	9.2	43.5	32.7	38.1	6		42.1	48.5	24.8	226.1	85.4	1
Mean	**17.1**	**52.7**	**30.6**	**41.7**			**54.9**	**37.6**	**19.6**	**100.2**	**53.1**	
CD at 5%	**10.6**	**14.3**	**3.2**				15.9	9.1		9.3		
CV%	**35.8**	**15.7**	**6.0**				16.7	14.0		15.5		

Note: * Not included in zonal and all India average due to CV≥ 30

Table 11.2 VT *Cenchrus setigerus*-2015 (4th Year): Varietal Trial in *Cenchrus setigerus* (Perennial): Dry Matter Yield (q/ha)

Entries	South Zone						All India		
	Coimbatore	Mandya	Hyderabad	Average	Rank	Superiority%	Average	Rank	Superiority%
TNCS-265	250.5	85.4	65.6	133.8	1	41.0	78.2	1	0.13
RCSB-02-7	171.6	38.8	39.4	83.3	8		53.7	9	
IGFRI-96-706	208.4	76.5	61.4	115.4	2	21.6	71.8	3	
CAZRI 2397 (CAZRI-76-1)	158.4	62.6	50.6	90.5	5		64.9	4	
RCSB-02-58	177.3	16.7	42.3	78.8	9		59.8	7	
IGFRI-97-395	192.8	41.8	29.8	88.1	6		61.1	6	
IGFRI-96-593	214.5	57.2	36.1	102.6	3	8.1	64.0	5	
RCSB-02-60	202.0	13.1	38.4	84.5	7		54.8	8	
CAZRI-76 (NC)	185.4	61.9	37.5	94.9	4		78.1	2	
Mean	**195.7**	**50.5**	**44.6**	**96.9**			**65.1**		
CD at 5%	7.7	14.6	3.6						
CV%	2.3	16.7	4.7						

Table 11.3 VT *Cenchrus setigerus*-2015 (4th Year): Varietal Trial in *Cenchrus setigerus* (Perennial): Green Forage Yield (q/ha/day)

Entries	Jodhpur	Bikaner	Avikanagar	Anand	Dhari	Jhansi	Hyderabad	Average	Rank
TNCS-265	0.92	1.90	1.93	0.73	0.44	2.27	2.14	1.48	6
RCSB-02-7	1.61	2.25	1.66	0.48	0.18	1.83	1.33	1.33	9
IGFRI-96-706	0.67	1.41	3.18	0.67	0.34	3.45	2.08	1.69	1
CAZRI 2397 (CAZRI-76-1)	1.64	1.20	1.43	0.49	0.48	3.75	1.67	1.52	5
RCSB-02-58	1.88	1.25	1.62	0.53	0.25	3.80	1.62	1.56	4
IGFRI-97-395	1.30	1.12	3.27	0.66	0.35	3.74	1.12	1.65	3
IGFRI-96-593	0.57	1.08	3.07	0.72	0.55	2.62	1.17	1.40	8
RCSB-02-60	1.83	1.43	1.68	0.81	0.21	2.48	1.52	1.42	7
CAZRI-76 (NC)	0.69	1.07	2.40	0.46	0.39	5.53	1.23	1.68	2
Mean	**1.23**	**1.41**	**2.25**	**0.62**	**0.35**	**3.27**	**1.54**	**1.53**	

Table 11.4 VT *Cenchrus setigerus*-2015 (4th Year): Varietal Trial in *Cenchrus setigerus* (Perennial): Dry Matter Yield (q/ha/day)

Entries	Jodhpur	Bikaner	Avikanagar	Anand	Dhari	Jhansi	Hyderabad	Average	Rank
TNCS-265	0.20	0.87	0.54	0.20	0.36	0.60	0.55	0.47	4
RCSB-02-7	0.36	1.10	0.41	0.12	0.12	0.38	0.33	0.40	5
IGFRI-96-706	0.18	0.58	0.85	0.17	0.21	0.98	0.51	0.50	3
CAZRI 2397 (CAZRI-76-1)	0.41	0.47	0.37	0.12	0.33	1.39	0.42	0.50	3
RCSB-02-58	0.46	0.49	0.40	0.14	0.21	1.50	0.35	0.51	2
IGFRI-97-395	0.29	0.52	0.80	0.17	0.22	1.04	0.25	0.47	4
IGFRI-96-593	0.14	0.44	0.77	0.18	0.35	0.62	0.30	0.40	5
RCSB-02-60	0.44	0.65	0.39	0.20	0.13	0.58	0.32	0.39	6
CAZRI-76 (NC)	0.17	0.52	0.62	0.12	0.28	2.59	0.31	0.66	1
Mean	**0.29**	**0.63**	**0.57**	**0.16**	**0.25**	**1.08**	**0.37**	**0.48**	

Table 11.5 VT *Cenchrus Setigerus*-2015 (4th Year): Varietal Trial in *Cenchrus setigerus* (Perennial): Crude Protein Yield (q/ha) & Crude Protein (%)

Entries	Crude Protein Yield (q/ha)						Crude Protein (%)					
	Avika-nagar	Bika-ner	Ana-nd	Rah-uri	Aver-age	Ra-nk	Avika-nagar	Bika-ner	Ana-nd	Rah-uri	Aver-age	Ra-nk
TNCS-265	2.1	3.0	3.2	4.0	3.1	1	6.7	4.1	4.6	10.1	6.4	4
RCSB-02-7	1.6	4.2	2.1	2.9	2.7	5	6.7	4.6	5.1	9.4	6.4	4
IGFRI-96-706	3.4	2.1	3.2	3.3	3.0	2	7.8	4.3	5.3	9.0	6.6	3
CAZRI 2397 (CAZRI-76-1)	1.4	1.5	2.1	2.8	2.0	7	6.7	3.9	5.1	6.1	5.4	6
RCSB-02-58	2.1	1.7	2.6	2.5	2.2	6	8.1	0.2	5.5	7.8	5.4	6
IGFRI-97-395	2.6	2.4	3.3	2.9	2.8	4	6.8	5.5	5.7	9.4	6.9	2
IGFRI-96-593	2.8	1.4	3.4	3.7	2.8	4	7.5	3.8	5.4	8.8	6.4	4
RCSB-02-60	1.8	3.2	4.0	2.8	2.9	3	7.9	5.9	5.7	9.0	7.1	1
CAZRI-76 (NC)	2.3	2.2	2.0	4.0	2.7	5	7.1	5.1	4.8	8.3	6.3	5
Mean	**2.2**	**2.4**	**2.9**	**3.2**	**2.7**		**7.3**	**4.1**	**5.2**	**8.6**	**6.3**	

Table 11.6 VT *Cenchrus setigerus*-2015 (4th Year): Varietal Trial *in Cenchrus setigerus* (Perennial): Plant Height (cm)

Entries	Jodhpur	Bikaner	Avikanagar	Anand	Rahuri	Dhari	Jhansi	Mandya	Average	Rank
TNCS-265	88.4	55.0	102.6	131.2	66.3	88.3	90.7	36.0	82.3	6
RCSB-02-7	88.3	64.0	77.1	109.5	46.9	59.8	107.4	36.1	73.6	8
IGFRI-96-706	80.4	78.0	90.9	129.2	52.8	108.0	86.7	44.5	83.8	5
CAZRI 2397 (CAZRI-76-1)	89.5	79.0	97.0	122.3	52.8	111.3	100.0	58.5	88.8	1
RCSB-02-58	87.7	74.0	75.7	105.3	47.8	62.6	108.7	23.7	73.2	7
IGFRI-97-395	98.9	66.0	86.8	124.5	50.3	103.1	101.7	53.5	85.6	4
IGFRI-96-593	91.3	50.0	102.5	122.8	63.6	116.6	105.7	55.9	88.5	2
RCSB-02-60	91.0	50.0	82.4	103.4	31.2	71.3	96.3	30.7	69.5	9
CAZRI-76 (NC)	75.4	91.0	87.6	118.0	61.9	105.0	105.0	50.6	86.8	3
Mean	**87.9**	**67.4**	**89.2**	**118.5**	**52.6**	**91.8**	**100.2**	**43.3**	**81.4**	

Table 11.7 VT *Cenchrus setigerus*-2015 (4th Year): Varietal Trial in *Cenchrus setigerus* (Perennial): Leaf Stem Ratio

Entries	Jodhpur	Bikaner	Avikanagar	Anand	Rahuri	Mandya	Average	Rank
TNCS-265	3.57	1.33	1.47	1.16	1.42	0.59	1.59	6
RCSB-02-7	2.63	1.63	1.86	1.69	1.38	0.51	1.62	4
IGFRI-96-706	2.90	1.27	1.82	2.08	1.58	0.49	1.69	2
CAZRI 2397 (CAZRI-76-1)	3.32	1.00	1.39	1.78	1.25	0.61	1.56	8
RCSB-02-58	2.36	1.63	1.86	1.84	1.46	0.46	1.60	5
IGFRI-97-395	2.81	1.50	1.82	1.56	1.58	0.58	1.64	3
IGFRI-96-593	3.14	1.44	2.17	1.72	1.65	0.63	1.79	1
RCSB-02-60	2.72	1.17	1.59	2.09	1.21	0.57	1.56	8
CAZRI-76 (NC)	3.43	1.11	1.14	1.93	1.42	0.47	1.58	7
Mean	**2.99**	**1.34**	**1.68**	**1.76**	**1.44**	**0.55**	**1.63**	

Table 11.8 VT *Cenchrus setigerus*-2015 (4th Year): Varietal Trial in *Cenchrus setigerus* (Perennial): ADF (%), NDF (%) & IVDMD (%)

Entries	ADF (%)				NDF (%)				IVDMD (%)	
	Rah-uri	Avika-nagar	Aver-age	Ra-nk	Rah-uri	Avika-nagar	Aver-age	Ra-nk	Rah-uri	Ra-nk
TNCS-265	43.0	43.0	43.0	6	64.8	73.3	69.0	4	56.2	5
RCSB-02-7	46.8	39.7	43.2	7	68.4	71.3	69.9	5	53.4	8
IGFRI-96-706	44.1	41.7	42.9	5	66.2	73.6	69.9	5	55.4	6
CAZRI 2397 (CAZRI-76-1)	45.9	42.9	44.4	8	68.1	73.2	70.7	6	54.0	7
RCSB-02-58	41.5	39.3	40.4	4	64.2	71.5	67.9	3	57.4	4
IGFRI-97-395	40.2	39.6	39.9	2	66.1	72.0	69.0	4	58.3	3
IGFRI-96-593	39.7	40.8	40.3	3	61.8	73.1	67.4	2	58.7	2
RCSB-02-60	38.5	38.2	38.3	1	61.1	70.2	65.6	1	59.6	1
CAZRI-76 (NC)	47.7	41.7	44.7	9	69.4	75.4	72.4	7	52.6	9
Mean	**43.0**	**40.8**	**41.9**		**65.6**	**72.6**	**69.1**		**56.2**	

12. VTBN-2015 (4th YEAR): VARIETAL TRIAL IN BAJRA NAPIER HYBRID (PERENNIAL)

(Reference Table: 12.1 to 12.9)

The trial was established in 2015 with six entries and three national checks (CO-BN-5, NB- 21, CO-3). Data in 4th year has been reported from 17 locations spread across five zones of the country. It included 2 each in hill and north-west zones, 3 in north east zone and 5 each in central and south zones.

For green fodder yield (q/ha), BNH-14 was highest yielder in hill zone. TNCN-1280 was highest yielder in NW zone showing 11.1% superiority over the best check (815.1q/ha). In NE zone, check CO-3 was best. In central zone, entries BNH-11 (39.7%), BNH-12 (17.4%), TNCN-1280 (14.0%), PBN-351 (9.3%) were superior to best check CO-3 (836.5 q/ha). In south zone, BNH-14 (16.9%), BNH-11 (7.3%), BNH-22 (5.6%) were superior to best check CO-(BN)-5 (1298.3 q/ha). Combining all zones, entries BNH-11 (15.4%), BNH-14 (11.3%), TNCN-1280 (8.2%), BNH-12 (5.4%), PBN-351 (5.3%) were superior over the best check.

For dry matter yield (q/ha), BNH-14 was best performer in hill zone. BNH-12 (12.2%), TNCN-1280 (9.8%), BNH-14 (7.3%) performed better than check CO-BN-5 (148.6q/ha). In north east zone, check CO-3 was best. In central zone, BNH-11 (47.3%), PBN-351 (33.1%), BNH-14 (13.0%), BHN-12 (12.6%) were superior over the best check CO-3 (171.7 q/ha). In south zone, entries BNH-14 (15.4%), BNH-11 (7.3%), BNH-22 (5.4%) were superior to the best check CO-(BN)-5 (313.6 q/ha). At all India level, combining all zones, entries BNH-11 (15.9%), BNH-14 (12.2%), PBN-351 (9.7%) were superior over best check CO-3 (207.4 q/ha).

For green forage per day productivity (q/ha/day), BNH-14 was best performer with yield of 13.06 q/ha/day followed by BNH-12 (12.03 q/ha/day). For dry forage per day productivity (q/ha/day), entry BNH-11 was best with dry fodder yield of 3.06 q/ha/day followed by BNH-22 (3.02 q/ha/day). For plant height, entry BNH-11 ranked first (152.5 cm), for leafiness national check NB-21 (1.01) was best performer.

For crude protein yield, BNH-11 (12.8 q) followed by PBN 351 (12.3 q) were best performers. For crude protein content, national checks were best performers. For other quality parameters, national checks were best performers for ADF, NDF and IVDMD.

[The trial is complete].

13. VT *SETARIA* GRASS -2015 (4th YEAR): VARIETAL TRIAL IN *SETARIA ANCEPS* UNDER COOL SUB-TROPICAL AND SUB-TEMPERATE HIMALAYAN RANGE LANDS (PERENNIAL)

(Reference Table: 13.1 to 13.4)

The trial was established in 2015 with three entries S-4, S-6 and S-25 along with three checks PSS-1, S-92 and S-18. Data has been reported from 4 locations.

Entry S-25 was top performer for green fodder yield (653.9q) showing superiority of 2.2% against best check. For dry fodder yield, check PSS-1 was best. For crude protein yield, S-25 ranked first (8.2q/ha) as compared to best check PSS-1 (8.1q/ha). For crude protein content, S-6 ranked first (7.5%) followed by checks (7.2%). For plant height and leafiness, checks were best. For other quality parameters like ADF and NDF, checks ranked best.

[The trial is complete].

Table 12.1 VTBN-2015 (4th Year) Varietal Trial in Bajra X Napier hybrid (Perennial): Green Forage Yield (q/ha)

Entries	Hill Zone			North West Zone				
	**Almora	Palampur	Rank	Ludhiana	Hisar	Average	Rank	Superiority (%)
TNCN 1280	278.9	406.7	8	1100.3	711.0	905.7	1	11.1
BNH-14	247.7	650.0	1	1102.5	578.2	840.4	3	3.1
BNH-22		345.3	9	941.4	465.3	703.4	9	
PBN 351		626.7	2	998.3	581.3	789.8	5	
BNH-12	294.4	414.7	7	1175.3	507.3	841.3	2	3.2
BNH-11	340.7	557.3	4	967.8	506.2	737.0	6	
CO-3 (NC)		502.0	6	943.5	492.9	718.2	8	
CO (BN) 5 (NC)		568.7	3	1041.7	588.5	815.1	4	
NB-21 (NC)	480.0	505.3	5	911.7	529.6	720.7	7	
Mean	**328.4**	**508.5**		**1020.3**	**551.1**	**785.7**		
CD at 5%	**51.1**	111.6		**128.2**	**11.2**			
CV%	**10.0**	12.7		**14.6**	**14.65**			

Note: ** Not include in average as many entries did not survive

Table 12.1 VTBN-2015 (4th Year) Varietal Trial in Bajra X Napier hybrid (Perennial): Green Forage Yield (q/ha)

Entries	North East Zone					Central Zone							
	Bhuban-eswar	Ran-chi	Jor-hat	Aver-age	Ra-nk	Ana-nd	Rah-uri	Urulikan-chan	Jabal-pur	Rai-pur	Aver-age	Ra-nk	Super-iority(%)
TNCN 1280	337.3	498.5	746.5	527.4	2	577.8	933.8	1909.3	975.6	372.2	953.8	3	14.0
BNH-14	235.2	468.5	700.5	468.1	8	708.3	796.7	1646.7	829.6	288.9	854.0	5	2.1
BNH-22	202.3	609.9	727.5	513.3	4	516.9	314.5	1635.9	769.7	266.7	700.7	7	
PBN 351	318.0	642.9	548.8	503.2	6	626.7	794.1	1875.5	916.3	361.1	914.7	4	9.3
BNH-12	225.4	556.6	669.2	483.7	7	482.8	705.1	2370.4	876.3	475.0	981.9	2	17.4
BNH-11	276.4	505.9	557.3	446.5	9	761.7	1245.0	2844.5	771.3	219.1	1168.3	1	39.7
CO-3 (NC)	293.8	612.2	714.3	540.1	1	907.8	905.0	1306.2	716.3	347.2	836.5	6	
CO (BN) 5 (NC)	375.6	544.4	633.6	517.9	3	539.4	181.0	1645.1	702.2	400.0	693.5	8	
NB-21 (NC)	366.3	572.5	581.9	506.9	5	564.2	322.1	1165.0	643.9	332.8	605.6	9	
Mean	**292.3**	**556.8**	**653.3**	**500.8**		**631.7**	**688.6**	**1822.1**	**800.1**	**340.3**	**856.6**		
CD at 5%		41.0	17.3			72.5	174.9	197.5	144.8	96.3			
CV%		4.2	13.1			6.6	14.7	6.2	11.4	16.6			

Table 12.1 VTBN-2015 (4th Year) Varietal Trial in Bajra X Napier hybrid (Perennial): Green Forage Yield (q/ha)

Entries	South Zone								All India		
	Coimb-atore	Man-dya	Vella-yani	Hydera-bad	Dhar-wad	Aver-age	Ra-nk	Superi-ority(%)	Aver-age	Ra-nk	Superi-ority(%)
TNCN 1280	1983.0	741.7	2209.8	977.4	681.5	1318.7	4	1.6	947.6	3	8.2
BNH-14	1833.5	778.4	3073.5	1171.8	733.3	1518.1	1	16.9	974.7	2	11.3
BNH-22	1839.9	586.3	2781.2	852.4	792.6	1370.5	3	5.6	853.0	8	
PBN 351	1734.9	554.6	2334.0	1074.6	767.6	1293.2	6		922.2	5	5.3
BNH-12	1585.5	568.5	2623.9	804.7	730.6	1262.6	7		923.2	4	5.4
BNH-11	1979.9	620.4	2665.9	838.6	861.1	1393.2	2	7.3	1011.2	1	15.4
CO-3 (NC)	1749.4	754.5	2145.7	819.1	806.5	1255.0	8		876.0	6	
CO (BN) 5 (NC)	1722.7	723.0	2299.0	1024.6	722.2	1298.3	5		857.0	7	
NB-21 (NC)	1277.4	612.5	1766.6	769.1	752.8	1035.7	9		729.6	9	
Mean	**1745.1**	**660.0**	**2433.3**	**925.8**	**760.9**	**1305.0**			**899.4**		
CD at 5%	**51.3**	**86.3**	**53.6**	149.4	**62.8**						
CV%	**1.7**	**7.6**	**1.3**	9.2	**4.8**						

Table 12.2 VTBN-2015 (4th Year) Varietal Trial in Bajra X Napier hybrid (Perennial) : Dry Matter Yield (q/ha)

Entries	Hill Zone			North West Zone				
	**Alm-ora	Palam-pur	Rank	Ludh-iana	His-ar	Aver-age	Ra-nk	Superi-ority(%)
TNCN 1280	62.8	74.6	8	210.2	116.0	163.1	2	9.8
BNH-14	55.0	126.4	1	210.6	108.2	159.4	3	7.3
BNH-22		72.7	9	179.8	78.4	129.1	9	
PBN 351		124.9	2	190.7	112.0	151.4	4	1.9
BNH-12	67.0	76.6	7	224.5	108.9	166.7	1	12.2
BNH-11	78.4	102.5	5	184.8	115.4	150.1	5	1.0
CO-3 (NC)		98.1	6	180.2	106.0	143.1	7	
CO (BN) 5 (NC)		117.4	3	199.0	98.1	148.6	6	
NB-21 (NC)	109.1	105.3	4	174.1	92.7	133.4	8	
Mean	**74.4**	**99.8**		**194.9**	**104.0**	**149.4**		
CD at 5%	**11.3**	**22.0**		**61.8**	**5.8**			
CV%	**9.7**	**12.7**		**10.7**	**10.8**			

Note: ** Not include in average as many entries did not survive

Table 12.2 VTBN-2015 (4th Year) Varietal Trial in Bajra X Napier hybrid (Perennial): Dry Matter Yield (q/ha)

Entries	North East Zone				Central Zone							
	Ran-chi	Jor-hat	Aver-age	Ra-nk	Ana-nd	Rah-uri	Urulikan-chan	Jabal-pur	Rai-pur	Aver-age	Ra-nk	Superi-ority(%)
TNCN 1280	121.3	170.3	145.8	4	115.5	187.3	376.5	68.9	57.3	161.1	6	
BNH-14	96.0	168.3	132.2	8	169.9	213.7	377.1	162.4	47.1	194.0	3	13.0
BNH-22	159.6	172.0	165.8	2	121.2	77.5	350.9	150.0	45.4	149.0	7	
PBN 351	151.1	137.7	144.4	5	156.5	221.8	528.7	180.0	55.9	228.6	2	33.1
BNH-12	144.7	155.2	150.0	3	100.3	142.2	487.4	171.6	64.8	193.3	4	12.6
BNH-11	122.3	134.6	128.4	9	152.5	278.1	615.0	150.0	68.7	252.9	1	47.3
CO-3 (NC)	152.0	181.0	166.5	1	215.3	216.2	248.7	138.2	40.2	171.7	5	
CO (BN) 5 (NC)	136.1	145.8	141.0	6	126.0	36.4	360.1	134.1	46.5	140.6	8	
NB-21 (NC)	123.1	146.5	134.8	7	138.3	81.3	288.3	120.7	61.1	138.0	9	
Mean	**134.0**	**156.8**	**145.4**		**143.9**	**161.6**	**403.6**	**141.8**	**54.1**	**181.0**		
CD at 5%	3.8	8.2			16.9	40.4	45.8	28.5	**10.9**			
CV%	4.1	12.6			6.8	14.5	6.5	11.1	**11.9**			

Table 12.2 VTBN-2015 (4th Year) Varietal Trial in Bajra X Napier hybrid (Perennial): Dry Matter Yield (q/ha)

Entries	South Zone								All India		
	Coimb-atore	Man-dya	Vella-yani	Hydera-bad	Dhar-wad	Aver-age	Ra-nk	Superi-ority(%)	Aver-age	Ra-nk	Superi-ority(%)
TNCN 1280	415.9	124.6	544.8	202.1	197.7	297.0	8		198.9	7	
BNH-14	375.9	184.9	758.0	243.7	247.5	362.0	1	15.4	232.6	2	12.2
BNH-22	374.0	122.2	700.7	193.5	262.7	330.6	3	5.4	2040	6	
PBN 351	362.8	105.4	594.8	225.9	265.8	310.9	5		227.6	3	9.7
BNH-12	327.7	117.6	659.1	174.8	247.7	305.4	7		213.5	4	2.9
BNH-11	409.9	116.5	676.3	192.8	286.8	336.5	2	7.3	240.4	1	15.9
CO-3 (NC)	361.8	163.4	538.4	193.9	277.8	307.0	6		207.4	5	
CO (BN) 5 (NC)	359.8	147.4	576.0	224.1	260.8	313.6	4		197.8	8	
NB-21 (NC)	255.7	124.9	449.6	169.5	256.5	251.3	9		172.5	9	
Mean	**360.4**	**134.1**	**610.8**	**202.3**	**255.9**	**312.7**			**210.5**		
CD at 5%	**16.0**	**18.1**	**10.7**	**22.5**	**26.3**						
CV%	**2.6**	**7.8**	**1.0**	**6.4**	**5.9**						

Table 12.3 VTBN-2015 (4th Year) Varietal Trial in Bajra X Napier hybrid (Perennial): Green Forage Yield (q/ha/day)

Entries	Ludhiana	Ranchi	Anand	Jabalpur	Raipur	Vellayani	Hyderabad	Dharwad	Average	Rank
TNCN 1280	5.80	1.37	1.45	1.02	6.65	49.10	6.52	11.75	10.46	8
BNH-14	5.80	1.28	1.77	2.27	4.66	68.27	7.81	12.64	13.06	1
BNH-22	5.00	1.67	1.29	2.10	4.17	61.79	5.68	13.67	11.92	3
PBN 351	5.30	1.76	1.57	2.51	6.94	51.86	7.16	13.23	11.29	5
BNH-12	6.20	1.52	1.21	2.40	8.64	58.30	5.36	12.60	12.03	2
BNH-11	5.10	1.39	1.91	2.11	3.53	59.23	5.59	14.85	11.71	4
CO-3 (NC)	5.00	1.68	2.27	1.96	6.55	47.68	5.46	13.90	10.56	7
CO (BN) 5 (NC)	5.50	1.49	1.35	1.92	6.15	51.08	6.83	12.45	10.85	6
NB-21 (NC)	4.80	1.57	1.41	1.76	5.46	39.25	5.13	12.98	9.04	9
Mean	**5.39**	**1.53**	**1.58**	**2.01**	**5.86**	**54.06**	**6.17**	**13.12**	**11.21**	

Table 12.4 VTBN-2015 (4th Year) Varietal Trial in Bajra X Napier hybrid (Perennial) : Dry Matter Yield (q/ha/day)

Entries	Ludhiana	Ranchi	Anand	Jabalpur	Raipur	Vellayani	Hyderabad	Dharwad	Average	Rank
TNCN 1280	1.10	0.33	0.29	0.18	1.02	12.1	1.35	3.41	2.47	8
BNH-14	1.10	0.26	0.42	0.44	0.76	15.0	1.62	4.27	2.98	3
BNH-22	0.90	0.44	0.30	0.41	0.71	15.6	1.29	4.53	3.02	2
PBN 351	1.00	0.41	0.39	0.49	1.08	13.2	1.51	4.58	2.83	5
BNH-12	1.20	0.40	0.25	0.47	1.18	14.6	1.17	4.27	2.95	4
BNH-11	1.00	0.33	0.38	0.41	1.11	15.0	1.29	4.94	3.06	1
CO-3 (NC)	0.90	0.42	0.54	0.37	0.76	12.0	1.29	4.79	2.63	7
CO (BN) 5 (NC)	1.00	0.37	0.32	0.36	0.71	12.8	1.49	4.50	2.69	6
NB-21 (NC)	0.90	0.34	0.35	0.33	1.00	10.0	1.13	4.42	2.31	9
Mean	**1.01**	**0.37**	**0.36**	**0.38**	**0.93**	**13.36**	**1.35**	**4.41**	**2.77**	

Table 12.5 VTBN-2015 (4th Year) Varietal Trial in Bajra X Napier hybrid (Perennial): Crude Protein Yield (q/ha)

Entries	Palam-pur	Jor-hat	Ran-chi	Ludh-iana	Ana-nd	Rah-uri	Urulikan-chan	Jabal-pur	Rai-pur	Man-dya	Aver-age	Ra-nk
TNCN 1280	6.3	4.3	7.2	12.6	12.3	13.5	25.7	5.0	4.2	3.9	9.5	6
BNH-14	11.4	3.5	5.3	14.7	16.3	17.8	24.1	13.0	3.7	1.7	11.1	3
BNH-22	5.7	3.5	10.1	13.8	10.6	5.9	21.4	11.7	3.5	2.9	8.9	8
PBN 351	8.4	2.8	8.6	14.1	13.9	15.0	35.5	14.0	4.3	6.3	12.3	2
BNH-12	6.3	3.2	8.2	13.7	10.4	10.3	32.7	10.6	4.7	3.5	10.4	5
BNH-11	9.0	2.4	7.5	12.2	13.7	23.7	39.7	11.7	4.8	3.8	12.8	1
CO-3 (NC)	7.7	2.8	10.6	15.1	19.7	17.0	16.9	10.5	2.5	4.5	10.7	4
CO (BN) 5 (NC)	8.9	3.4	8.3	17.1	11.2	2.9	21.2	10.2	3.2	2.4	8.9	8
NB-21 (NC)	9.6	3.1	10.5	11.0	13.4	7.1	18.4	9.0	4.0	4.9	9.1	7
Mean	**8.1**	**3.2**	**8.5**	**13.8**	**13.5**	**12.6**	**26.2**	**10.6**	**3.9**	**3.8**	**10.4**	

Table 12.6 VTBN-2015 (4th Year) Varietal Trial in Bajra X Napier hybrid (Perennial): Crude Protein (%)

Entries	Palam-pur	Ludh-iana	Ran-chi	Jor-hat	Ana-nd	Rah-uri	Urulikan-chan	Rai-pur	Jabal-pur	Man-dya	Aver-age	Ra-nk
TNCN 1280	8.5	6.0	5.9	4.9	9.6	7.2	6.8	7.4	7.4	4.8	6.8	3
BNH-14	9.0	7.0	5.5	3.9	9.1	8.3	6.4	7.8	8.0	3.1	6.8	3
BNH-22	7.9	7.7	6.3	4.0	8.5	7.7	6.1	7.8	7.9	3.5	6.7	4
PBN 351	6.7	7.4	5.7	4.6	8.2	6.8	6.7	7.7	8.1	6.6	6.8	3
BNH-12	8.2	6.1	5.7	5.0	9.8	7.2	6.7	7.2	8.0	3.9	6.8	3
BNH-11	8.8	6.6	6.1	3.9	8.8	8.5	6.5	7.0	7.9	4.4	6.8	3
CO-3 (NC)	7.9	8.4	7.0	3.6	8.8	7.9	6.8	6.2	7.7	7.4	7.2	2
CO (BN) 5 (NC)	7.6	8.6	6.1	3.9	8.8	8.1	5.9	6.9	7.6	3.5	6.7	4
NB-21 (NC)	9.0	6.3	8.5	4.7	9.2	8.8	6.4	6.5	7.5	6.1	7.3	1
Mean	**8.2**	**7.1**	**6.3**	**4.3**	**9.0**	**7.8**	**6.5**	**7.2**	**7.8**	**4.8**	**6.9**	

Table 12.7 VTBN-2015 (4th Year) Varietal Trial in Bajra X Napier hybrid (Perennial): Plant Height (cm)

Entries	Palam-pur	Ludh-iana	His-ar	Ran-chi	Jor-hat	Ana-nd	Rah-uri	Urulikan-chan	Jabal-pur	Rai-pur	Man-dya	Vella-yani	Aver-age	Ra-nk
TNCN 1280	105.3	112.0	156.6	187.3	166.9	162.1	102.0	120.0	54.5	180.0	98.9	162.0	134.0	6
BNH-14	116.3	125.4	174.5	185.1	184.4	170.8	109.3	134.5	74.5	175.5	82.0	210.0	145.2	3
BNH-22	104.0	147.2	139.1	179.7	138.2	149.5	72.4	148.7	72.0	143.5	53.7	163.0	125.9	8
PBN 351	125.3	162.8	150.3	186.5	161.4	165.4	104.2	135.3	87.8	164.2	53.7	194.0	140.9	4
BNH-12	122.7	147.1	147.2	183.9	185.2	147.8	92.5	123.8	79.4	290.2	96.0	205.0	151.7	2
BNH-11	135.7	139.2	151.7	188.5	217.1	157.7	124.2	127.6	66.4	241.5	59.9	221.0	152.5	1
CO-3 (NC)	110.0	121.1	148.7	175.9	176.2	166.6	99.5	160.4	68.6	119.1	111.2	151.0	134.0	6
CO (BN) 5 (NC)	116.3	95.2	159.5	236.2	154.5	143.6	75.8	111.1	65.8	202.1	40.3	223.0	135.3	5
NB-21 (NC)	120.0	154.1	140.1	172.9	148.2	131.5	72.8	145.2	65.7	222.3	31.0	144.0	129.0	7
Mean	**117.3**	**133.8**	**152.0**	**188.5**	**170.2**	**155.0**	**94.8**	**134.1**	**70.5**	**193.2**	**69.6**	**185.9**	**138.7**	

Table 12.8 VTBN-2015 4th Year) Varietal Trial in Bajra X Napier hybrid (Perennial): Leaf Stem Ratio

Entries	Palam-pur	Ludh-iana	His-ar	Ran-chi	Jor-hat	Urulikan-chan	Rah-uri	Jabal-pur	Rai-pur	Man-dya	Vella-yani	Aver-age	Ra-nk
TNCN 1280	0.65	0.67	0.48	0.67	0.89	0.56	0.84	0.66	1.05	0.62	0.80	0.72	9
BNH-14	0.54	0.70	0.49	0.75	0.88	0.55	1.36	0.86	0.88	0.80	0.92	0.79	5
BNH-22	0.60	1.10	0.58	0.89	0.89	0.53	0.59	0.86	1.05	0.69	0.80	0.78	6
PBN 351	0.57	0.93	0.56	1.03	0.95	0.51	0.94	0.94	0.83	0.67	1.53	0.86	3
BNH-12	0.42	0.88	0.48	1.03	0.90	0.65	0.65	0.88	1.02	0.62	0.56	0.74	8
BNH-11	0.50	1.12	0.45	0.97	0.81	0.55	0.55	0.81	1.05	0.74	0.74	0.75	7
CO-3 (NC)	0.39	0.80	0.50	1.05	0.90	0.53	0.91	0.76	1.08	0.73	1.91	0.87	2
CO (BN) 5 (NC)	0.55	0.85	0.54	0.67	0.88	0.71	1.29	0.78	0.85	0.78	0.98	0.81	4
NB-21 (NC)	0.44	0.93	0.56	1.55	0.94	0.50	1.95	0.88	0.87	0.67	1.80	1.01	1
Mean	**0.52**	**0.89**	**0.52**	**0.96**	**0.89**	**0.57**	**1.01**	**0.83**	**0.96**	**0.70**	**1.12**	**0.81**	

Table 12.9 VTBN-2015 (4th Year) Varietal Trial in Bajra X Napier hybrid (Perennial): ADF (%), NDF (%) & IVDMD (%)

Entries	ADF (%)						NDF (%)						IVDMD (%)				
	Rah-uri	Palam-pur	Ludh-iana	Ran-chi	Aver-age	Ra-nk	Rah-uri	Palam-pur	Ludh-iana	Ran-chi	Aver-age	Ra-nk	Rah-uri	Ludh-iana	Ran-chi	Aver-age	Rank
TNCN 1280	43.5	53.4	43.6	45.1	46.4	6	61.2	64.8	71.6	69.3	66.7	5	59.4	45.2	54.6	53.1	7
BNH-14	45.2	54.0	41.7	43.2	46.0	5	66.7	65.4	70.2	64.5	66.7	5	58.7	46.4	55.7	53.6	5
BNH-22	47.5	54.6	39.6	44.8	46.6	7	67.6	65.0	71.2	65.7	67.4	7	57.4	48.6	52.7	52.9	8
PBN 351	47.7	53.4	38.9	40.6	45.2	2	68.9	66.0	69.6	66.7	67.8	8	57.1	48.1	55.1	53.4	6
BNH-12	43.4	55.8	41.9	39.9	45.2	2	57.0	65.4	72.3	61.8	64.1	2	60.6	47.4	57.1	55.0	2
BNH-11	40.9	53.8	43.2	44.6	45.6	3	55.0	65.4	71.3	66.7	64.6	3	62.6	45.4	52.8	53.6	5
CO-3 (NC)	44.3	53.0	38.0	45.1	45.1	1	63.4	65.5	68.9	70.3	67.0	6	59.1	49.4	54.1	54.2	4
CO (BN) 5 (NC)	45.7	56.2	37.7	40.9	45.1	1	63.8	67.0	68.9	62.8	65.6	4	58.3	49.9	57.1	55.1	1
NB-21 (NC)	42.3	55.6	42.9	42.1	45.7	4	54.8	67.4	71.6	62.3	64.0	1	60.8	46.9	55.3	54.3	3
Mean	**44.5**	**54.4**	**40.8**	**42.9**	**45.7**		**62.0**	**65.8**	**70.6**	**65.6**	**66.0**		**59.3**	**47.5**	**54.9**	**53.9**	

Table 13.1 VT Setaria grass-2015 (4th Year): Varietal Trial in *Seteria ancep* under cool sub-tropical and sub-temperate Himalayan range lands (Perennial): GFY (q/ha) & DMY (q/ha)

Entries	GFY (q/ha)							DMY (q/ha)					
	Palam-pur	Baja-ura	Alm-ora	Jor-hat	Aver-age	Ra-nk	Superi ority%	Palam pur	Baja-ura	Alm-ora	Jor-hat	Aver-age	Ra-nk
S-4	748.9	854.6	271.7	589.0	616.0	3		135.1	166.2	29.5	141.7	118.1	3
S-25	881.2	816.2	379.6	538.6	653.9	1	2.2	153.4	163.7	39.4	125.3	120.5	2
S-6	517.2	590.5	181.7	506.3	448.9	6		95.2	113.5	34.2	120.1	90.8	5
PSS-1 (NC)	835.4	715.7	317.9	691.1	640.0	2		155.2	135.9	34.2	170.3	123.9	1
S-92 (NC)	671.4	299.6	311.5	562.7	461.3	5		120.5	49.9	34.3	141.2	86.5	6
S-18 (NC)	543.2	744.0	209.2	686.7	545.8	4		100.2	154.3	23.1	172.7	112.6	4
Mean	**699.5**	**670.1**	**278.6**	**595.7**	**561.0**			**126.6**	**130.6**	**32.4**	**145.2**	**108.7**	
CD at 5%	**148.7**	**83.2**	**99.2**	**8.5**				**29.7**	**12.2**	**8.1**	**4.4**		
CV%	**14.1**	**6.8**	**23.4**	**9.5**				**15.6**	**5.1**	**16.4**	**10.0**		

Table 13.2 VT Setaria grass-2015 (4th Year): Varietal trial in *Seteria ancep* under cool sub-tropical and sub-temperate Himalayan range lands (Perennial): Crude Protein Yield (q/ha) & Crude Protein (%)

Entries	Crude Protein Yield (q/ha)				Crude Protein (%)			
	Palampur	Jorhat	Average	Rank	Palampur	Jorhat	Average	Rank
S-4	12.1	2.9	7.5	3	9.0	4.4	6.7	4
S-25	13.4	2.9	8.2	1	8.8	5.1	6.9	3
S-6	8.8	3.2	6.0	6	9.2	5.7	7.5	1
PSS-1 (NC)	12.2	4.0	8.1	2	7.9	5.1	6.5	5
S-92 (NC)	10.8	3.6	7.2	4	9.0	5.3	7.2	2
S-18 (NC)	8.8	4.5	6.6	5	8.8	5.6	7.2	2
Mean	**11.0**	**3.5**	**7.3**		**8.8**	**5.2**	**7.0**	

Table 13.3 VT Setaria grass-2015 (4th Year): Varietal trial in *Seteria ancep* under cool sub-tropical and sub-temperate Himalayan range lands (Perennial): Plant Height (cm) & Leaf Stem Ratio

Entries	Plant Height (cm)					Leaf Stem Ratio			
	Palampur	Bajaura	Jorhat	Average	Rank	Palampur	Jorhat	Average	Rank
S-4	84.4	86.6	119.6	96.9	3	0.64	0.87	0.75	2
S-25	90.5	80.8	120.6	97.3	2	0.61	0.88	0.75	2
S-6	86.3	78.8	104.8	90.0	5	0.57	0.87	0.72	4
PSS-1 (NC)	88.0	80.6	124.0	97.6	1	0.51	0.88	0.70	5
S-92 (NC)	71.1	59.9	102.0	77.7	6	0.59	0.89	0.74	3
S-18 (NC)	71.6	79.2	125.3	92.0	4	0.68	0.87	0.77	1
Mean	**82.0**	**77.7**	**116.1**	**91.9**		**0.60**	**0.88**	**0.74**	

Table 13.4 VT Setaria grass-2015 (4th Year): Varietal trial in *Seteria ancep* under cool sub-tropical and sub-temperate Himalayan range lands (Perennial): ADF (%), NDF (%)

Entries	ADF (%)		NDF (%)	
	Palampur	Rank	Palampur	Rank
S-4	55.0	3	68.0	4
S-25	55.8	4	67.4	3
S-6	54.2	2	68.0	4
PSS-1 (NC)	53.4	1	67.0	2
S-92 (NC)	54.2	2	66.6	1
S-18 (NC)	56.6	5	68.2	5
Mean	**54.9**		**67.5**	

14. VT PENNISETUM HYBRIDS – 2015 (4th YEAR): *(P. glaucum x P. squamulatum)* (PERENNIAL)

(Reference Table: 14.1 to 14.6)

The trial was established in 2015. Data has been reported for 7 entries and 3 other grasses from 5 locations of which 3 are effective. For green and dry fodder yield, entry IGPISH-1 ranked first with 433.8q and 129.3q respectively. It was followed by IGPISH-5 with 342.4 q/ha and 114.1 q/ha green and dry fodder yield respectively.

For crude protein yield, entry IGPISH-1 was best followed by IGPISH-5. For crude protein content, entry IGPISH-7 was best (7.2%) followed closely by IGPISH-5 (7.0%). For plant height, entry IGPISH-6 ranked first. For leaf stem ratio, entry IGPISH-1 was best followed by IGPISH-7.

[The trial is complete].

15. VT *Desmanthus* - 2016 (3rd YEAR): VARIETAL TRIAL IN *DESMANTHUS* (PERENNIAL)

(Reference Tables: 15.1 to 15.9)

The trial was established in 2016. Results were reported from 11 locations in 4 zones for 5 entries and one check Desmanthus CO-1. It included 4 locations each in south and central zones and 1 in north east and 2 in north-west zones.

For GFY, entry TND-1308 ranked first in NW, NE, central, south and at all India level for green fodder yield (q/ha) producing 625.2, 392.6, 813.4, 704.9 and 701.5 q/ha respectively. It showed superiority of 20.1%, 23.3%, 4.6%, 14.7% and 11.4% respectively for NW, NE, central, south and at all India level. Entry TND-1309 also showed superiority of 10.6% in south zone over the check.

For dry matter yield (q/ha), entry TND-1308 in NWZ (23.3%), in NE zone (19.27%), in central zone (7.3%), in south zone (23.7%) and on all India basis (19.1%) ranked first. In central zone, entries TND-1309 (6.1%) and TSHL-1 (5.1%) were also better than the check.

For green and dry per day productivity, entry TND-1308 was best for green fodder (4.34q/ha/day) and dry fodder (0.77q/ha/day) as compared to 3.81 and 0.67 q/ha/day in check. For plant height, check CO-1 (129.5 cm) and for leafiness entry TSHL-1 was best.

For crude protein yield, TND-1308 was best (16.6 q) as compared to 14.3 q in check, while for CP content, entry TND-1309 was best (15.7 %) as compared to 14.3 % in check Desmanthus CO-1. For ADF, NDF and IVDMD entry TND-1309 ranked first.

[The trial is complete].

Table 14.1 VT Pennisetum hybrids- 2015 (4th Year): (*P. glaucum* x *P. squamulatum*) (Perennial): Green Forage Yield (q/ha)

Entries	Hisar	Urulikanchan	Jhansi	**Anand	**Rahuri	Average	Rank
IGPISH-7	350.7	162.2	398.5	189.7	8.2	303.8	3
IGPISH-1	453.0	423.4	425.0		9.0	433.8	1
IGPISH-5	354.2	293.9	379.2			342.4	2
IGPISH-2	132.8	113.1	175.0		0.0	140.3	7
IGPISH-4	265.2	85.0	244.4		0.0	198.2	6
IGPISH-6	471.4	96.4	343.1	78.3	0.0	303.6	4
IGPISH-3	361.0	192.2	354.2		10.5	302.5	5
Cenchrus	423.5	311.8	570.8	425.0	193.2		
Heteropogon		83.3	125.0	351.7	118.0		
Chrysopogon	381.1	171.2	392.4	251.7	0.0		
Mean	**354.8**	**193.3**	**340.8**	**259.3**	**37.7**	**289.2**	
CD at 5%	**14.6**	**47.0**	**90.1**	**77.5**	**20.0**		
CV%	**13.4**	**14.1**	**14.9**	**15.9**	**19.1**		

Note: ** Is not included in average due to failure of most of the entries

Table 14.2 VT Pennisetum hybrids- 2015 (4th Year): (*P. glaucum* x *P. squamulatum*) (Perennial): Dry Matter Yield (q/ha)

Entries	Hisar	Urulikanchan	Jhansi	**Anand	**Rahuri	Average	Rank
IGPISH-7	86.5	56.2	172.5	68.6	2.4	105.1	3
IGPISH-1	112.0	126.5	149.3		3.1	129.3	1
IGPISH-5	85.9	97.6	158.8		0.0	114.1	2
IGPISH-2	58.5	30.3	53.4		0.0	47.4	7
IGPISH-4	77.0	25.6	94.3		0.0	65.6	6
IGPISH-6	107.0	31.4	138.6	36.2	0.0	92.3	4
IGPISH-3	101.0	59.4	116.0		3.1	92.1	5
Cenchrus	96.0	102.2	267.4	162.2	67.2		
Heteropogon		29.0	78.2	108.5	40.7		
Chrysopogon	97.0	58.8	156.2	80.5	0.0		
Mean	**91.2**	**61.7**	**138.5**	**91.2**	**11.6**		
CD at 5%	**11.5**	**14.8**	**51.8**	**27.4**	**6.9**		
CV%	**16.2**	**13.9**	**21.0**				

Note: ** Is not included in average due to failure of most of the entries

Table 14.3 VT Pennisetum hybrids- 2015 (4th Year): (*P. glaucum* x *P. squamulatum*) (Perennial): GFY (q/ha/day) & DMY (q/ha/day)

Entries	GFY (q/ha/day)		DMY (q/ha/day)	
	Anand	Rank	Anand	Rank
IGPISH-7	0.54		0.20	
IGPISH-1				
IGPISH-5				
IGPISH-2				
IGPISH-4				
IGPISH-6	0.22		0.10	
IGPISH-3				
Cenchrus	1.21		0.46	
Heteropogon	1.00		0.31	
Chrysopogon	0.72		0.23	
Mean	**0.74**		**0.26**	

Note: ** Is not included in average due to failure of most of the entries

Table 14.4 VT Pennisetum hybrids- 2015 (4th Year): (*P. glaucum* x *P. squamulatum*) (Perennial): Crude Protein Yield (q/ha) & Crude Protein (%)

Entries	Crude Potein Yield (q/ha)				Crude Protein (%)			
	**Anand	**Rahuri	Urulikanchan	Rank	**Anand	**Rahuri	Urulikanchan	Rank
IGPISH-7	4.5	0.2	4.0	3	7.2	8.5	7.2	1
IGPISH-1		0.3	8.7	1		8.3	6.9	3
IGPISH-5		0.0	6.8	2		0.0	7.0	2
IGPISH-2		0.0	2.0	5		0.0	6.6	6
IGPISH-4		0.0	1.7	6		0.0	6.7	5
IGPISH-6	1.8	0.0	2.2	4	5.2	0.0	6.9	4
IGPISH-3		0.2	4.0	3		7.7	6.7	5
Cenchrus	8.8	6.9	6.9		5.7	10.3	6.8	
Heteropogon	5.3	2.9	1.9		4.8	7.2	6.6	
Chrysopogon	4.1	0.0	4.2		5.1	0.0	7.1	
Mean	**4.9**	**1.1**	**4.2**		**5.6**	**4.2**	**6.8**	

Note: ** Is not included in average due to failure of most of the entries

Table 14.5 VT Pennisetum hybrids- 2015 (4th Year): (*P. glaucum* x *P. squamulatum*) (Perennial): Plant Height (CM) & Leaf Stem Ratio

Entries	Plant Height (CM)						Leaf Stem ratio				
	Hisar	Urulikanchan	**Anand	**Rahuri	Average	Rank	Hisar	Urulikanchan	**Rahuri	Average	Rank
IGPISH-7	139.6	26.6	100.9	45.5	83.1	3	0.64	0.62	1.40	063	2
IGPISH-1	139.4	31.1		73.3	85.3	2	0.54	0.58	1.59	0.56	4
IGPISH-5	129.4	24.4		0.0	76.9	4	0.55	0.84	0.00	0.70	1
IGPISH-2	91.3	34.0		0.0	62.7	6	0.48	0.67	0.00	0.58	3
IGPISH-4	108.1	28.1		0.0	68.1	5	0.54	0.55	0.00	0.55	5
IGPISH-6	138.6	34.4	117.9	0.0	86.5	1	0.50	0.75	0.00	0.63	2
IGPISH-3	141.8	28.9		83.0	85.3	2	0.47	0.59	1.48	0.53	6
Cenchrus	132.3	27.5	122.7	100.0			0.50	0.88	1.34		
Heteropogon		31.1	129.7	70.8			-	0.66	0.86		
Chrysopogon	103.7	37.1	119.0	0.0			0.98	0.68	0.00		
Mean	**124.9**	**30.3**	**118.0**	**37.3**			**0.58**	**0.68**	**0.67**	**0.59**	

Note: ** Is not included in average due to failure of most of the entries

Table 14.9 VT Pennisetum hybrids- 2015 (4th Year): (*P. glaucum* x *P. squamulatum*) (Perennial): ADF (%), NDF (%) & IVDMD (%)

Entries	ADF (%)	NDF (%)	IVDMD (%)
	Rahuri	Rahuri	Rahuri
IGPISH-7	49.4	70.1	51.7
IGPISH-1	42.7	64.3	58.2
IGPISH-5			
IGPISH-2			
IGPISH-4			
IGPISH-6			
IGPISH-3	45.8	66.7	54.4
Cenchrus	46.3	67.8	53.3
Heteropogon	44.2	65.3	57.3
Chrysopogon			
Mean	**45.7**	**66.8**	**55.0**

Note: ** Is not included in average due to failure of most of the entries

Table 15.1 VT Desmanthus-2016 (3rd Year): Varietal Trial in *Desmanthus* (Perennial): Green Forage Yield (q/ha)

Entries	North West Zone					North East Zone		Central Zone						
	Ludh-iana	Bika-ner	Aver-age	Ra-nk	Superi-ority%	Kal-yani	Ra-nk	Rah-uri	Urulikan-chan	Ana-nd	Jha-nsi	Aver-age	Ra-nk	Superi-ority%
BAIF Dashrath -1	398.6	505.8	452.2	6		325.6	4	229.1	512.2	106.7	447.9	324.0	6	
RHDV-2014-1	422.6	542.2	482.4	5		356.7	3	334.6	649.4	117.1	493.8	398.7	5	
TND-1309	553.2	509.2	531.2	2	2.1	298.8	6	351.5	662.0	125.4	645.3	446.1	4	
TSHL-1	416.4	573.8	495.1	4		369.7	2	340.2	652.9	135.8	1096.9	556.4	2	10.4
TND-1308	507.5	742.9	625.2	1	20.1	392.6	1	334.9	672.9	157.9	1083.3	562.3	1	11.5
Desmanthus CO-1 (Check)	493.2	547.5	520.4	3		318.5	5	364.6	625.7	119.2	907.3	504.2	3	
Mean	**465.3**	**570.2**	**517.7**			**343.7**		**245.5**	**629.2**	**127.0**	**779.1**	**465.3**		
CD at 5%	**72.1**	**150.3**				**10.2**		**56.0**	**69.0**	**14.2**	**13.1**			
CV (%)	**14.8**	**17.5**				**8.2**		**15.1**	**7.2**	**7.4**	**19.6**			

Table 15.1 VT Desmanthus-2016 (3rd Year): Varietal Trial in *Desmanthus* (Perennial): Green Forage Yield (q/ha)

Entries	South Zone							All India		
	Hyderabad	Coimbatore	Mandya	Vellayani	Average	Rank	Superiority%	Average	Rank	Superiority%
BAIF Dashrath -1	391.5	1102.0	359.0	386.8	559.8	6		433.2	6	
RHDV-2014-1	393.6	1042.0	625.0	346.8	601.9	4		484.0	5	
TND-1309	424.2	1095.6	871.6	326.3	679.4	2	10.6	533.0	3	0.5
TSHL-1	415.3	961.0	579.8	328.3	571.1	5		533.7	2	0.6
TND-1308	421.3	1319.3	702.0	377.0	704.9	1	14.7	610.2	1	15.1
Desmanthus CO-1 (Check)	368.4	1202.9	530.3	356.0	614.4	3		530.3	4	
Mean	**402.4**	**1120.5**	**611.3**	**353.5**	**621.9**			**520.7**		
CD at 5%	31.2	**22.6**	**28.0**	**11.4**						
CV (%)	5.1	**1.3**	**9.1**	**2.1**						

Table 15.2 VT Desmanthus-2016 (3rd Year): Varietal Trial in *Desmanthus* (Perennial): Dry Matter Yield (q/ha)

Entries	North West Zone					North East Zone		Central Zone						
	Ludh-iana	Bika-ner	Aver-age	Ra-nk	Superi-ority%	Kal-yani	Ra-nk	Rah-uri	Urulikan-chan	Ana-nd	Jha-nsi	Aver-age	Ra-nk	Super-iority%
BAIF Dashrath -1	66.2	183.7	125.0	6		87.8	5	83.1	112.1	38.9	19.5	63.4	6	
RHDV-2014-1	68.0	199.2	133.6	5		95.7	3	123.9	152.6	44.1	20.4	85.3	4	3.5
TND-1309	97.4	187.0	142.2	2	2.2	78.6	6	124.8	149.5	47.4	28.1	87.4	2	6.1
TSHL-1	67.0	200.6	133.8	4		98.7	2	119.2	129.5	52.6	45.2	86.6	3	5.1
TND-1308	83.7	259.8	171.7	1	23.3	105.2	1	117.8	136.6	51.7	47.6	88.4	1	7.3
Desmanthus CO-1 (Check)	84.8	193.6	139.2	3		88.2	4	123.3	127.6	43.7	35.1	82.4	5	
Mean	**77.9**	**204.0**	**140.9**			**92.4**		**115.4**	**134.6**	**46.4**	**32.6**	**82.3**		
CD at 5%	**29.7**	**54.5**				**7.9**		**19.3**	**14.5**	**5.2**	**11.1**			
CV (%)	**13.5**	**17.7**				**6.2**		**11.1**	**7.1**	**7.4**	**22.5**			

Table 15.2 VT Desmanthus-2016 (3rd Year): Varietal Trial in *Desmanthus* (Perennial): Dry Matter Yield (q/ha)

Entries	South Zone							All India		
	Hyderabad	Coimbatore	Mandya	Vellayani	Average	Rank	Superiority%	Average	Rank	Superiority%
BAIF Dashrath -1	104.7	317.4	93.3	97.2	153.2	6		109.4	6	
RHDV-2014-1	102.5	292.1	227.4	88.5	177.6	3	8.5	128.6	3	4.6
TND-1309	113.4	319.1	219.0	81.9	183.3	2	12.0	131.5	2	7.2
TSHL-1	102.6	275.3	174.4	95.4	161.9	5		123.7	4	0.5
TND-1308	109.2	397.4	209.1	94.3	202.5	1	23.7	146.6	1	19.1
Desmanthus CO-1 (Check)	90.8	342.6	130.6	91.0	163.7	4		122.9	5	
Mean	**103.9**	**324.0**	**175.6**	**91.4**	**173.7**			**127.1**		
CD at 5%	12.2	**10.0**	**10.2**	**4.2**						
CV (%)	7.7	**2.1**	**11.5**	**3.1**						

Table 15.3 VT Desmanthus-2016 (3rd Year): Varietal Trial in *Desmanthus* (Perennial): Green Forage Yield (q/ha/day)

Entries	Ludhiana	Bikaner	Kalyani	Anand	Jhansi	Hyderabad	Vellayani	Average	Rank
BAIF Dashrath -1	2.20	1.58	2.21	0.37	5.29	1.96	8.59	3.17	5
RHDV-2014-1	2.40	1.69	2.42	0.41	5.48	1.97	7.71	3.15	6
TND-1309	3.10	1.59	2.03	0.44	7.88	2.12	7.25	3.49	4
TSHL-1	2.30	1.79	2.51	0.47	11.98	2.08	7.30	4.06	2
TND-1308	2.90	2.31	2.67	0.55	11.49	2.11	8.38	4.34	1
Desmanthus CO-1 (Checks)	2.80	1.71	2.16	0.42	9.84	1.84	7.91	3.81	3
Mean	**2.62**	**1.78**	**2.33**	**0.44**	**8.66**	**2.01**	**7.86**	**3.67**	

Table 15.4 VT Desmanthus-2016 (3rd Year): Varietal Trial in *Desmanthus* (Perennial): Dry Matter Yield (q/ha/day)

Entries	Ludhiana	Bikaner	Kalyani	Anand	Jhansi	Hyderabad	Vellayani	Average	Rank
BAIF Dashrath -1	0.40	0.57	0.59	0.14	0.23	0.52	2.16	0.66	5
RHDV-2014-1	0.40	0.62	0.66	0.15	0.23	0.51	2.51	0.73	2
TND-1309	0.50	0.58	0.53	0.17	0.34	0.57	1.82	0.64	6
TSHL-1	0.40	0.62	0.67	0.18	0.50	0.51	2.12	0.71	3
TND-1308	0.50	0.81	0.72	0.18	0.51	0.55	2.09	0.77	1
Desmanthus CO-1 (Check)	0.50	0.60	0.61	0.15	0.38	0.45	2.03	0.67	4
Mean	**0.45**	**0.64**	**0.63**	**0.16**	**0.37**	**0.52**	**2.12**	**0.70**	

Table 15.5 VT Desmanthus-2016 (3rd Year): Varietal Trial in *Desmanthus* (Perennial): Crude Protein Yield (q/ha)

Entries	Ludhiana	Bikaner	Kalyani	Rahuri	Urulikanchan	Anand	Mandya	Average	Rank
BAIF Dashrath -1	8.5	17.4	13.6	10.7	21.3	5.2	3.5	11.5	6
RHDV-2014-1	12.2	22.7	14.2	15.5	29.1	5.4	4.9	14.8	4
TND-1309	15.3	26.7	13.4	20.8	28.9	5.8	3.6	16.3	2
TSHL-1	8.0	27.0	16.5	18.2	25.7	6.6	3.8	15.1	3
TND-1308	11.6	31.8	17.4	16.5	27.2	7.9	3.8	16.6	1
Desmanthus CO-1 (Check)	13.8	23.2	15.7	15.4	24.0	5.5	2.5	14.3	5
Mean	**11.6**	**24.8**	**15.1**	**16.2**	**26.0**	**6.1**	**3.7**	**14.8**	

Table 15.6 VT Desmanthus-2016 (3rd Year): Varietal Trial in *Desmanthus* (Perennial): Crude Protein (%)

Entries	Ludhiana	Bikaner	Kalyani	Rahuri	Urulikanchan	Anand	Mandya	Average	Rank
BAIF Dashrath -1	12.9	9.5	15.5	12.9	19.0	13.6	13.6	13.8	6
RHDV-2014-1	18.0	11.4	14.8	12.5	19.0	12.3	13.6	14.5	4
TND-1309	15.7	14.3	17.1	16.6	19.3	12.3	14.3	15.7	1
TSHL-1	11.9	13.5	16.7	15.3	19.9	12.7	12.7	14.7	3
TND-1308	13.8	12.3	16.5	14.0	19.9	14.9	12.7	14.9	2
Desmanthus CO-1 (Check)	16.3	12.0	17.8	12.5	18.8	12.7	10.1	14.3	5
Mean	**14.8**	**12.1**	**16.4**	**14.0**	**19.3**	**13.1**	**12.8**	**14.6**	

Table 15.7 VT Desmanthus-2016 (3rd Year): Varietal Trial in *Desmanthus* (Perennial): Plant Height (cm)

Entries	Ludhiana	Bikaner	Rahuri	Urulikanchan	Anand	Jhansi	Mandya	Vellayani	Average	Rank
BAIF Dashrath -1	102.1	134.7	54.7	115.6	106.0	131.8	80.9	77.4	100.4	6
RHDV-2014-1	110.1	142.7	57.8	117.5	118.8	164.7	79.5	69.5	107.6	5
TND-1309	145.2	176.3	69.7	135.5	129.5	163.8	111.9	78.2	126.3	3
TSHL-1	182.7	131.7	62.6	126.8	117.7	190.8	88.4	76.0	122.1	4
TND-1308	178.2	152.7	59.8	108.5	143.2	194.5	105.3	80.2	127.8	2
Desmanthus CO-1 (Check)	132.8	193.3	61.4	136.1	137.8	190.7	93.7	90.1	129.5	1
Mean	**141.9**	**155.2**	**61.0**	**123.3**	**125.5**	**172.7**	**93.3**	**78.6**	**118.9**	

Table 15.8 VT Desmanthus-2016 (3rd Year): Varietal Trial in *Desmanthus* (Perennial): Leaf Stem Ratio

Entries	Ludhiana	Bikaner	Rahuri	Urulikanchan	Anand	Jhansi	Mandya	Vellayani	Average	Rank
BAIF Dashrath -1	0.67	1.09	0.60	0.75	1.39	0.63	0.74	0.92	0.85	6
RHDV-2014-1	0.55	1.02	1.00	0.85	1.59	0.60	0.74	0.91	0.91	4
TND-1309	0.63	1.35	1.14	0.80	1.88	0.70	0.81	1.15	1.06	2
TSHL-1	0.80	1.49	1.50	0.67	2.22	0.95	0.67	0.99	1.16	1
TND-1308	0.70	1.26	0.75	0.81	1.10	0.71	0.75	0.80	0.86	5
Desmanthus CO-1 (Check)	0.67	1.27	0.90	0.79	1.58	0.51	0.82	0.87	0.93	3
Mean	**0.67**	**1.25**	**0.98**	**0.78**	**1.63**	**0.68**	**0.76**	**0.94**	**0.96**	

Table 15.9 VT Desmanthus-2016 (3rd Year): Varietal Trial in *Desmanthus* (Perennial): ADF (%), NDF (%) & IVDMD (%)

Entries	ADF (%)				NDF (%)				IVDMD (%)			
	Rah-uri	Ludh-iana	Aver-age	Ra-nk	Rah-uri	Ludh-iana	Aver-age	Ra-nk	Ludh-iana	Rah-uri	Aver-age	Ra-nk
BAIF Dashrath -1	30.2	55.9	43.1	4	46.8	68.2	57.5	6	50.0	65.9	58.0	4
RHDV-2014-1	36.9	51.8	44.4	5	42.4	63.0	52.7	4	58.4	60.8	59.6	2
TND-1309	24.4	54.1	39.3	1	33.3	65.3	49.3	1	53.0	70.3	61.7	1
TSHL-1	28.1	54.9	41.5	2	35.4	68.3	51.9	2	49.3	67.5	58.4	3
TND-1308	29.2	55.2	42.2	3	38.1	66.7	52.4	3	50.1	66.7	58.4	3
Desmanthus CO-1 (Check)	38.5	52.3	45.4	6	48.3	63.7	56.0	5	53.4	59.6	56.5	6
Mean	**31.2**	**54.0**	**42.6**		**40.7**	**65.9**	**53.3**		**52.4**	**65.2**	**58.8**	

FORAGE CROP PRODUCTION

The programme on forage crop production was conducted at 20 locations Kharif season. In total 15 experiments were conducted, out of which 6 in coordinated, 2 AVT trials and 7 in location specific mode with the aim to generate region specific forage production technologies for different growing condition.

Research aspect consisted of de-toping of maize before physiological maturity for additional fodder availability, performance top feeds under varying planting geometry, nutrient management in genotypes of B x Napier hybrid, INM in teosinte + rice bean intercropping system, new generation herbicides for forage maize, screening of genotypes of fodder pearl millet and resource management in rice-oat cropping system under sodic soils. Besides above, development of climate resilient production technologies for food-fodder based cropping systems, carbon sequestration studies, intensive forage production through Agase based cropping system in south zone, and standardization of seed priming technique for enhancing productivity of forage maize were also studied. Exploratory trials on possibility of silage of paddy straw and sugarcane tops with different additives and suitable cutting stage and chemical spray economic seed production of fodder cowpea were conducted. From the trials, relevant technologies have been identified and relevant database generated is presented hereunder;

A. ON GOING COORDINATED TRIALS

CS-15-AST-4: Development of climate resilient production technologies on productivity and economic of food-fodder based cropping systems

[(Table Reference: CS-15-AST-4 (a) to 4(d)]

Locations: Pantnagar, Ranchi, Kalyani and Jabalpur

The field experiment was started during Kharif 2015 at Pantnagar, Ranchi, Kalyani, and Jabalpur to find out the suitable climate resilient production technology for higher profitability of grain – fodder based cropping systems. The treatments included four climate resilient technologies namely Zero tillage- (All the crops)- CRT_1, Minimum tillage single pass of cultivator + sowing with seed drill- CRT_2, Conventional tillage – CRT_3 and Zero tillage- minimum tillage- Zero tillage- CRT_4 and four Cropping systems namely rice (upland) – berseem - maize + cowpea- CS_1, maize (baby corn) – berseem – sorghum (fodder)- CS_2, Maize (baby corn) – wheat – rice bean (fodder) CS_3 and sorghum (fodder) – berseem – maize (baby corn)- CS_4. The trial was conducted in Split Plot Design with three replications. The results indicated that in second year, in terms of green forage yield, among four climate resilient technologies, Zero tillage- minimum tillage- Zero tillage- CRT_2 proved superior over other treatments on locational mean basis and recorded 9.9% higher green and 12.5% dry matter yield over Minimum tillage. The minimum tillage recorded lowest yield. In terms of DFY, minimum tillage single pass of cultivator + sowing with seed drill- CRT_2 and zero tillage- minimum tillage- zero tillage- CRT_4 remained on par with each other but significantly superior to other treatments.

Among cropping systems, maize (baby corn) – berseem – sorghum (fodder) - CS_2 (2151.7q/ha) proved superior followed by maize (baby corn) – wheat – rice bean (fodder) CS_3. It recorded 33.12, 13.21 and 25% higher green fodder yield over CS1, CS3 and CS4 cropping systems, respectively. As regards to Fodder Equivalent Yield at Jabalpur center, minimum tillage single pass of cultivator + sowing with seed drill- CRT_2 proved best followed by zero tillage - (all the crops)- CRT_1.

In economic terms, on locational mean basis, Minimum tillage single pass of cultivator + sowing with seed drill- CRT_2 and Conventional tillage – CRT_3 remained at par with each other but proved significantly to other treatments. These treatments recorded net monetary return of Rs 118484 and Rs. 111585. The highest B: C Ratio of 3.13 was recorded with Minimum tillage single pass of cultivator + sowing with seed drill- CRT_2. Among the four cropping systems, Maize (Baby corn) – Berseem – Sorghum (Fodder)- CS_2 and Maize (Baby corn) – Wheat – Rice bean (Fodder) CS_3 remained on par with each other but recorded highest net monetary return of Rs 128941 and 127854, respectively.

Table CS-15-AST-4 (a): Effect of climate resilient production technologies on productivity of cropping systems (q/ha)

Treatments	Green fodder yield				Dry matter yield				Fodder Equivalent Yield
	Pantnagar	Kalyani	Ranchi	Mean	Pantnagar	Kalyani	Ranchi	Mean	Jabalpur
Climate Resilient technology									
CRT_1	505.87	726.00	680.97	637.61	106.31	121.50	64.27	97.36	1871.80
CRT_2	589.01	839.10	674.29	700.80	125.25	144.80	58.45	109.50	1966.45
CRT_3	556.08	845.90	588.39	663.46	118.32	145.70	62.36	108.79	1828.48
CRT_4	557.64	752.00	703.08	670.91	122.68	135.70	62.58	106.99	1718.63
SE(m) ±	16.25	3.10	6.17		3.45	3.20	0.61		4.50
C.D. (P=0.05)	52.73	9.23	21.78		11.20	9.53	2.16		15.80
Cropping systems									
CS_1	623.87	680.10	367.93	557.30	137.25	102.90	38.94	93.03	1615.28
CS_2	645.51	899.00	955.52	833.34	135.91	157.40	35.52	109.61	2150.45
CS_3	526.79	436.00	951.62	638.14	111.74	89.40	35.23	78.79	1899.38
CS_4	412.44	917.70	371.67	567.27	87.67	152.20	37.97	92.6	1720.25
SE(m) ±	14.80	3.50	7.51		3.21	3.80	0.70		5.90
C.D. (P=0.05)	42.62	10.40	22.06		9.23	11.30	2.06		15.70
CV (%)		6.80				4.80			
Interaction									
SE(m) ±	NS		12.35				1.22		
C.D. (P=0.05)	NS		45.75				4.30		

CS-15-AST-4 (b): Effect of climate resilient production technologies on growth and quality parameters

Treatments	Plant height (cm)	L:S ratio	Crude Protein Yield (q/ha)			
	Kalyani	Kalyani	Pantnagar	Jabalpur	Kalyani	Mean
Climate Resilient technology						
CRT_1	141.1	0.99	13.39	8.67	14.41	12.16
CRT_2	139.2	1.03	15.26	11.47	18.57	15.10
CRT_3	137.5	1.04	13.88	10.78	19.02	14.56
CRT_4	137.9	1.01	14.84	9.87	15.51	13.41
SE(m) ±	1.2	--	0.44	0.23	0.38	
C.D. (P=0.05)	NS	--	NS	0.78	1.13	
Cropping systems						
CS_1-	107.6	1.47	2.43	8.7	12.54	7.89
CS_2	159.5	0.86	7.58	15.67	18.52	13.92
CS_3	136.9	0.90	6.18	11.67	9.84	9.23
CS_4	161.3	1.03	41.16	8.95	20.9	23.67
SE(m) ±	1.3	--	0.41	0.07	0.32	
C.D. (P=0.05)	3.8	--	1.17	0.18	0.95	
CV (%)					4.6	

CS-15-AST-4 (c): Effect of climate resilient production technologies on economic parameters

Treatments	Gross monetary return (Rs./ha)				Net monetary return (Rs./ha)					B:C ratio					Cost of Cultivation (Rs./ha)	
	Pant-nagar	Ran-chi	Jabal-pur	Mean	Pant-nagar	Ran-chi	Jabal-pur	Kal-yani	Mean	Ran-chi	Pant-nagar	Jabal-pur	Kal-yani	Mean	Pant-nagar	Jabal-pur
Climate Resilient technology																
CRT_1	126468	102144	224759	151124	91468	80319	135134	67205	93532	3.51	3.64	2.39	1.78	2.83	97066	93999
CRT_2	147251	101143	236117	161504	111626	78318	155492	128498	118484	3.28	4.58	2.47	2.17	3.13	99564	95749
CRT_3	139021	88258	219560	148946	103521	64433	141935	136450	111585	2.58	3.9	2.26	2.34	2.77	99342	97300
CRT_4	139411	105462	206378	150417	104411	83637	124753	111940	106185	3.62	4.01	2.18	2.16	2.99	97310	94749
SE(m) ±	4063	928			4063	928				0.04	0.11				481	
C.D. (P=0.05)	13183	3275			13183	3275				0.14	NS				1561	
Cropping systems																
CS_1	155967	55189	193976	135044	116592	35114	114226	-	88644	1.76	3.96	1.96	-	2.56	96498	98955
CS_2	161377	143327	228068	177591	123252	118252	145318	-	128941	4.73	4.23	2.31	-	3.76	96923	98561
CS_3	131697	142743	258197	177546	93447	117668	172447	-	127854	4.71	3.44	2.55	-	3.57	100126	101249
CS_4	103110	55750	206573	121811	77735	35675	125323	-	79578	1.79	4.07	2.09	-	2.65	98034	98933
SE(m) ±	36100	1127			3700	1127				0.05	0.1				879	
C.D. (P=0.05)	10655	3309			10655	3309				0.14	0.28				2532	
CV (%)																
Interaction																
SE(m) ±		1856				1856				0.08						
C.D. (P=0.05)		6864				6864				0.29						

CS-15-AST-4 (d): Chemical properties as influenced by treatments at Jabalpur

S. No	Treatment	Available nutrients (%) (kg/ha)		
		N	P	K
1	ZT Rice-ber-maize +cowpea	265.32	16.32	345.36
2	ZT maize (BC)-ber-Sorg (F)	274.59	16.52	355.23
3	ZT Maize (BC)- Wheat -RB(F)	264.52	16.32	356.23
4	ZT sorg.(F)-ber-Maize (BC)	263.25	16.25	358.25
5	MT Rice-ber-M +CP	261.42	16.59	354.63
6	MT M(BC) (BC)-ber-Sorg (F)	262.36	16.85	352.32
7	MT Maize (BC)-W-RB(F)	263.54	16.52	354.21
8	MT sorg.(F)-ber-M (BC)	263.56	16.44	352.45
9	CT Rice-ber-M +CP	261.31	16.52	356.32
10	CT maize (BC)-ber-Sorg (F)	261.42	15.25	358.52
11	CT Maize (BC)-W-RB(F)	261.52	15.63	356.21
12	CT sorg.(F)-ber-M (BC)	262.36	15.42	355.41
13	ZT – CT – ZT Rice-ber-M +CP	262.35	15.69	358.69
14	ZT – CT – ZT maize (BC)-ber-Sorg (F)	263.21	15.68	356.63
15	ZT – CT – ZT Maize (BC)-W-RB(F)	262.31	15.96	356.85
16	ZT – CT – ZT sorg.(F)-ber-M (BC)	263.21	15.85	355.21

M- Maize, BC- Baby corn, CP- Cowpea, W- wheat

K15- AST- 10C:- Intensive forage production through Agase based (*Sesbania grandiflora*) cropping system under protective irrigation

[(Table Reference: K-15-AST-10C (a) to 10 (c)]

Locations: Mandya and Vellayani

A field experiment was started during Kharif, 2015 at two locations i.e., Mandya & Vellayani with objective to study the effect of cropping system on fodder yield, quality economic parameters and & soil fertility. Year 2015 was the establishment year. The treatments consisted of seven Agase based cropping systems i.e., **T_1-** Agase + Congo Signal grass (2:2), **T_2-** Agase + Rhodes grass (2:2), **T_3-** Agase + Guinea grass (2:2), **T_4-** Agase + BN hybrid grass (2:1), **T_5-** Agase + setaria grass (2:2), **T_6-** Agase + Perennial fodder sorghum (2:5) and **T_7-** Agase (Sole). The treatments were replicated thrice in randomised block design. Agase were raised in the paired row method (row to row 2m and plant to plant 1 m).

The third year results indicated that, on locational mean basis, among the grasses Napier Bajra hybrid with Agase (2:1) proved superior to other grasses in terms of GFY and DFY. However, at Vellayani Agase+ setaria (2:2) was better. As regards to agase productivity, its combination with Rhodes grass was best. In terms of total productivity of the system, T4- Agase+ Napier Bajra (2:1) followed by T6- Agase+ perennial fodder sorghum (2:5) remained best combination recording significant superiority over other treatments. At Vellayani, the treatment T_{3-} Agase+ guinea grass (2:2) recorded highest CP yields of grass where as T_{2-} Agase + Rhodes grass (2:2), recorded highest CP yields of Agase and ultimately the total crude protein yields.

K15- AST- 10C (a): Biomass yields of *Agase* based intensive forage production cropping system

Treatments	Yields (q/ha)											
	GFY grasses			DFY grasses			GFY Agase			DFY Agase		
	Vellayani	Mandya	Mean	Vellayani	Mandya	Mean	Vellayani	Mandya	Mean	Vellayani	Mandya	Mean
T_1-Agase+ Congo signal (2:2)	515.7	234.3	375.0	126.6	36.46	81.55	58.33	192.5	125.40	14.17	34.58	24.38
T_2- Agase + Rhodes grass (2:2)	459.0	192.8	325.9	113.2	30.56	71.90	182.0	198.2	190.09	45.50	33.94	39.72
T_3- Agase+ guinea grass (2:2)	508.3	263.3	385.8	122.1	48.63	85.36	128.0	162.6	145.28	32.40	28.31	30.36
T_4- Agase+ Napier Bajra (2:1)	506.7	368.7	437.7	124.2	62.59	93.38	149.7	187.1	168.36	37.42	35.05	36.24
T_5- Agase+ setaria (2:2)	519.7	265.5	392.6	131.4	51.96	91.66	146.7	201.3	174.00	36.75	43.06	39.91
T_6- Agase+ perennial fodder sorghum (2:5)	498.7	372.0	435.3	122.5	77.94	100.23	139.7	155.9	147.78	35.31	33.26	34.29
T_7-Agase sole		-			-		116.0	177.0	146.50	28.67	37.41	33.04
SE(m) ±	14.62	-		5.948	-		9.63	9.69		2.35	2.93	
C.D. (P=0.05)		-			-			29.87			NS	
CV (%)												

K15- AST- 10C (b):- Biomass yields and height of grasses in *Agase* based intensive forage production

Treatments	Total GFY (q/ha)			Total DFY (q/ha)			Height of grasses (cm)
	Vellayani	Mandya	Mean	Vellayani	Mandya	Mean	Vellayani
T_1-Agase+ Congo signal (2:2)	574.0	426.8	500.4	141.0	71.1	106.0	67.33
T_2- Agase + Rhodes grass (2:2)	641.0	391.0	516.0	158.7	64.5	111.6	117.7
T_3- Agase+ guinea grass (2:2)	636.3	425.4	530.9	154.5	76.9	115.7	89.67
T_4- Agase+ Napier Bajra (2:1)	656.3	555.8	606.1	161.6	97.7	129.6	101.0
T_5- Agase+ setaria (2:2)	666.3	466.8	566.6	168.1	95.42	131.8	97.00
T_6- Agase+ perennial fodder sorghum (2:5)	638.3	527.9	583.1	157.8	111.2	134.5	142.0
T_7-Agase sole	116.0	177.0	146.5	28.67	37.41	33.04	
SE(m) ±	15.67	16.69		6.92	4.29		6.97
C.D. (P=0.05)		51.43			13.23		

K15- AST- 10 C (c):- Crude Protein Yields of *Agase* based intensive forage production

Treatments	Crude Protein Yield (q/ha)						Crude Protein (%)	
	Grass		Agase		Total		Mandya	
	Vellayani	Mandya	Vellayani	Mandya	Vellayani	Mandya	Grass	Agase
T_1-Agase+ Congo signal (2:2)	13.14	3.06	4.11	5.72	16.44	8.78	8.3	16.60
T_2- Agase + Rhodes grass (2:2)	14.25	2.30	12.40	5.98	32.66	8.28	7.7	17.53
T_3- Agase+ guinea grass (2:2)	18.55	3.76	8.54	5.20	27.89	8.96	7.8	18.43
T_4- Agase+ Napier Bajra (2:1)	15.14	4.49	10.11	6.63	27.91	11.12	7.2	18.80
T_5- Agase+ setaria (2:2)	13.37	3.81	10.13	8.10	22.68	11.91	7.3	18.63
T_6- Agase+ perennial fodder sorghum (2:5)	11.62	5.52	10.32	5.60	27.4	11.12	7.1	16.93
T_7-Agase sole			7.58	6.75	5.86	6.75		18.19
SE(m) ±	0.679		0.58	0.63	1.137	0.59		0.80
C.D. (P=0.05)				NS		1.82		NS

K-16-AST-2: Effect of different techniques of seed priming on productivity of forage maize [(Table Reference: K-16-AST-2 (a) to 2(g)]

Locations: Anand, Jabalpur, Kalyani, Urulikanchan and Bhubaneswar

A field experiment was started during Kharif 2016 at Urulikanchan, Anand, Jabalpur, Kalyani and Bhubaneswar to study the effects of seed priming methods on germination, yield and economics of forage maize. The treatments consisted of nine seed priming methods; T_1- Seed priming with water for 6 hrs, T_2- Seed priming with water for 12 hrs, T_3- Seed priming with $ZnSO_4$ @ 0.5 % for 6 hrs, T_4- Seed priming with $ZnSO_4$ @ 0.5 % for 12 hrs, T_5- Seed priming with KNO_3 @ 0.5% for 6 hrs, T_6- Seed priming with KNO_3 @ 0.5% for 12 hrs, T_7- Seed priming with KH_2PO_4 @ 0.5% for 6 hrs, T_8- Seed priming with KH_2PO_4 @ 0.5% for 12 hrs, T_9- Control (no priming). The treatments were replicated thrice in randomised block design. The maize was sown in 30 cm apart lines using 75kg seed /ha.

The results of third year on locational mean basis indicated that all the treatments improved the green and dry biomass yield significantly over control. The treatments; seed priming with $ZnSO_4$ @ 0.5 % for 12 hrs, or for 6 hrs and seed priming with KNO_3 @ 0.5% for 12 hrs or for 6 hrs proved superior to other treatments in terms of green fodder, dry matter and CP yields (582.18q, 536.8 q, 550.14q and 546.5 q green and 129.19q, 129.46 q, 129.69 q and 131.72 q dry matter/ ha, respectively). The seed priming with $ZnSO_4$ @ 0.5 % for 12 hrs recorded 32.9 % improvement over no priming and 26.6 % over seed priming with water for 6 hrs. The seed priming also significantly improved the plant height and leaf stem ratio. The seed priming with water for 12 hrs, seed priming with $ZnSO_4$ @ 0.5 % for 6 hrs, seed priming with $ZnSO_4$ @ 0.5 % for 12 hrs and seed priming with KNO_3 @ 0.5% for 12 hrs also resulted in higher germination percent. Seed priming with $ZnSO_4$ @ 0.5 % for 12 hrs proved best treatment to monetary parameters and recorded net return of Rs. 54406/ ha, whereas, seed priming with KNO_3 @ 0.5% for 12 hrs recorded maximum B:C ratio (2.01).

K-16-AST-2(a): Effect of different techniques of seed priming on productivity (q/ha) of forage Maize

Treatment	Green Forage Yield						Dry Matter Yield					
	NEZ		CZ			Mean	NEZ		CZ			Mean
	Kalyani	Bhubaneswar	Urulikanchan	Anand	Jabalpur		Kalyani	Bhubaneswar	Urulikanchan	Anand	Jabalpur	
T_1	366.6	347.51	617.86	417.89	549.49	459.87	84.7	73.76	129.13	108.05	128.16	104.76
T_2	392.7	313.64	621.74	485.29	639.35	490.54	92.2	64.98	115.33	128.09	157.98	111.72
T_3	385.4	369.91	749.27	499.18	680.20	536.79	91.3	82.11	155.17	137.27	156.43	124.46
T_4	415.3	387.62	716.59	694.85	696.54	582.18	100.9	81.03	121.68	171.60	170.76	129.19
T_5	382.6	399.09	687.10	630.31	651.61	550.14	92.2	88.88	144.02	161.09	162.27	129.69
T_6	465.2	385.02	594.86	623.77	663.86	546.54	110.2	83.92	123.49	165.72	175.26	131.72
T_7	442.6	398.04	695.88	482.03	496.38	502.99	105.3	83.34	147.32	119.94	144.70	120.12
T_8	453.7	359.49	687.30	642.16	545.40	537.61	102.9	77.98	152.17	167.90	148.38	129.87
T_9	392.8	352.20	569.45	433.01	443.28	438.15	91.1	75.27	110.30	109.78	129.55	103.20
SE(m) ±	4.48	9.51	20.99	3.15	18.10		1.85	2.21	4.28	0.81	4.57	
C.D. (P=0.05)	13.44	28.49	63.47	9.45	56.30		5.55	6.64	12.93	2.43	12.71	
CV (%)	7.52	4.47	5.51	12.27	8.10		8.54	4.85	5.56	12.19	6.78	

K-16-AST-2(b): Effect of different techniques of seed priming on quality of forage Maize

Treatment	Crude Protein Yield (q/ha)						Crude Protein (%)				
	NEZ		CZ			Mean	NEZ		CZ		Mean
	Kalyani	Bhubaneswar	Urulikanchan	Anand	Jabalpur		Bhubaneswar	Kalyani	Urulikanchan	Anand	
T_1	8.6	5.22	9.05	5.20	5.56	6.73	7.07	10.20	7.01	4.80	7.27
T_2	10.4	5.19	7.93	6.39	6.66	7.31	7.98	11.30	6.88	5.00	7.79
T_3	12.9	5.73	10.44	6.85	9.11	9.01	6.98	14.10	6.73	5.00	8.20
T_4	13.3	5.78	9.54	8.47	9.84	9.39	7.14	13.20	7.84	4.90	8.27
T_5	9.5	6.30	9.65	7.82	6.37	7.93	7.09	10.30	6.70	4.80	7.22
T_6	12.3	5.95	8.41	8.17	6.29	8.22	7.09	11.20	6.81	4.90	7.50
T_7	12.2	6.13	11.15	6.17	4.86	8.10	7.37	11.60	7.57	5.10	7.91
T_8	13.5	5.64	10.70	8.37	7.19	9.08	7.23	13.10	7.03	5.00	8.09
T_9	9.01	5.89	6.76	5.59	5.15	6.48	7.81	9.90	6.13	5.10	7.23
SE(m) ±	0.42	0.21	0.29	0.04	0.32		0.19	0.41		0.09	
C.D. (P=0.05)	1.26	0.64	0.89	0.13	0.98		0.56	1.23		0.27	
CV (%)	9.27	6.47	5.48	13.59	5.87		4.39	6.87		3.10	

K-16-AST-2(c): Effect of different techniques of seed priming on growth and quality of forage Maize

Treatment	Plant height (cm)					Plant population/ meter row length	NDF (%)
	Kalyani	Bhubaneswar	Urulikanchan	Jabalpur	Mean	Anand	Anand
T_1	229.2	168.30	259.33	229.58	221.6	7.4	92.1
T_2	250.6	158.30	255.67	237.92	225.6	7.3	89.6
T_3	253.5	178.30	257.00	240.25	232.3	7.2	89.8
T_4	262.8	174.50	270.33	243.25	237.7	8.0	92.1
T_5	242.6	192.50	244.33	238.38	229.5	7.3	90.5
T_6	246.1	185.10	244.33	241.25	229.2	7.0	89.8
T_7	245.4	188.30	247.67	233.25	228.7	7.0	87.3
T_8	257.6	172.50	253.33	237.58	230.3	7.3	90.0
T_9	222.6	164.50	225.00	210.58	205.7	7.1	87.5
SE(m) ±	1.12	3.58		4.15		0.29	1.57
C.D. (P=0.05)	3.36	10.74		10.44		NS	4.71
CV (%)	8.58	3.53		3.72		6.94	3.03

K-16-AST-2(d): Effect of different techniques of seed priming on growth parameters of forage Maize

Treatments	Leaf: Stem Ratio				Germination % at 10 DAS				No. of leaves/Plant			
	Kal-yani	Bhuban-eswar	Urulikan-chan	Mean	Ana-nd	Urulikan-chan	Kal-yani	Mean	Urulikan-chan	Kal-yani	Ana-nd	Mean
T_1	1.52	0.91	0.78	1.07	83.50	76.33	91.50	83.78	15	14.7	12.5	14.07
T_2	1.78	0.82	0.57	1.06	85.40	71.67	92.30	83.12	15	13.8	12.9	13.90
T_3	1.20	1.18	0.83	1.07	91.70	84.67	97.80	91.39	14	14.0	12.9	13.63
T_4	1.18	1.37	0.71	1.09	94.00	90.00	98.70	94.23	16	13.4	14.1	14.50
T_5	1.27	1.48	0.78	1.18	91.10	75.33	96.40	87.61	14	13.4	13.0	13.47
T_6	1.75	1.29	0.60	1.21	83.70	78.00	95.30	85.67	14	14.3	13.4	13.90
T_7	1.38	1.41	0.83	1.21	93.50	75.67	96.50	88.56	14	14.5	13.1	13.87
T_8	1.09	1.01	0.66	0.92	92.90	77.67	95.20	88.59	13	13.7	12.9	13.20
T_9	1.39	0.95	0.71	1.02	83.50	68.67	90.40	80.86	12	13.9	10.5	12.13
SE(m) ±	--	0.03			1.92	1.90	0.76			0.11	0.49	
C.D. (P=0.05)	--	0.08			5.77	5.76	2.28			0.33	1.47	
CV (%)	--	4.02			3.75	4.25	6.42			5.68	6.64	

K-16-AST-2(e): Economics of different techniques of seed priming on economics of forage Maize

Treatments	Gross Return (Rs/ha)					Total cost of cultivation (Rs/ha)				
	Kalyani	Anand	Urulikanchan	Jabalpur	Mean	Kalyani	Anand	Urulikanchan	Jabalpur	Mean
T_1	47382	62684	166821	54949	82959	18995	20361	80150	26876	36596
T_2	47857	72794	167869	63935	88114	19950	20361	80225	28567	37276
T_3	53246	74877	202303	68020	99612	21345	41503	91400	40501	48687
T_4	44608	104228	193479	69654	102992	20867	41503	91475	40501	48587
T_5	48855	94547	185516	65161	98520	20758	39418	86150	38416	46186
T_6	68324	93566	160612	66386	97222	22156	39418	86225	38416	46554
T_7	57586	72305	187888	49638	91854	21021	37833	87950	36831	45909
T_8	62330	96324	185571	54540	99691	21478	37833	88025	36831	46042
T_9	47290	64952	153751	44328	77580	20245	20361	80000	25467	36518

K-16-AST-2(f): Economics of different techniques of seed priming on net return and B:C ratio of forage Maize

Treatments	Net Return (Rs/ha)					B:C ratio				
	Kalyani	Anand	Urulikanchan	Jabalpur	Mean	Kalyani	Anand	Urulikanchan	Jabalpur	Mean
T_1	28387	42323	86671	28073	46364	2.49	2.08	2.08	2.04	2.17
T_2	27907	52433	87644	35368	50838	2.39	2.58	2.09	2.24	2.33
T_3	31901	33374	110903	27519	50924	2.49	0.80	2.21	1.68	1.80
T_4	23741	62725	102004	29153	54406	2.14	1.51	2.12	1.72	1.87
T_5	28097	55129	99366	26745	52334	2.42	1.40	2.15	1.70	1.92
T_6	46168	54148	74387	27970	50668	3.08	1.37	1.86	1.73	2.01
T_7	36565	34472	99938	12807	45946	2.60	0.91	2.14	1.35	1.75
T_8	40852	58491	97546	17709	53650	2.90	1.55	2.11	1.48	2.01
T_9	27045	44591	73751	18861	41062	2.33	2.19	1.92	1.74	2.05

K-16-AST-2(g): Effect of different techniques of seed priming on productivity of forage maize Soil fertility status completion of crop season at Urulikanchan

Treatments	pH	EC (dSm-1)	N	P	K	OC (%)
		(Kg/ha)				
T_1	7.20	0.59	176.67	31.67	220.33	0.43
T_2	7.30	0.63	169.33	30.00	227.67	0.43
T_3	7.32	0.58	165.33	37.00	240.00	0.42
T_4	7.28	0.75	169.33	34.67	251.33	0.39
T_5	7.19	0.70	174.33	42.00	241.00	0.36
T_6	7.33	0.63	165.67	33.67	224.33	0.48
T_7	7.35	0.55	155.33	34.67	225.33	0.43
T_8	7.32	0.62	164.67	36.33	216.67	0.40
T_9	7.28	0.63	165.33	31.67	236.00	0.38
Initial status	7.53	0.41	115.00	31.00	279.00	0.35

K-17-AST-1: Studies on performance top feeds under varied planting geometry with and without intercrop

[(Table Reference: K-17-AST-1(a) to 1(c)]

Location: Mandya, Coimbatore, Vellayani

A Field experiment was initiated during 2017 at three locations in South Zone to assess the performance of different plant species as top feed, standardize their plant population under sole and intercropping system for green quality forage yield. The experiment was laid out in Split – Split Plot Design with three replications. The treatments consisted of two cropping system (C_1: Sole crop, C_2: Intercrop (Bajra Napier Hybrid), three top feeds species (T_1: Agase (*Sesbania grandiflora*), T_2: Erythrina (*Erythrina indica*), T_3: Drumstick (*Moringa oleifera*) and three planting geometry (P_1:2m x 1m, P_2:2m x 0.5m, P_3: Paired system (between pairs-2m, within pairs 1m). After one year of establishment period, two harvests were taken during this study period at all the centres. The growth and yield parameters were recorded for all the cuts.

The results indicated that among the main crops sole crops produced higher fodder yield. Among the locations Coimbatore recorded highest GFY. The inter crop of BN Hybrid produced 380 q GFY on mean locational basis. In terms of total productivity, intercropping of C_2: Intercrop (Napier Bajra Hybrid grass + top feed species) proved better. It recorded 500.37q green and 73.70 q dry matter /ha. As regards to top feed species, Agase remained high yielder and recorded 457.71q green and 83.48q dry matter /ha which was 27.3 % & 45.1 % higher over *Erythrina* and Drumstick, respectively in terms of green fodder. Planting Geometry consisting of planting top feed species at 2m x 0.5m spacing proved most suitable and recorded 21.27 improvement in GFY over2m x 1m spacing and 35.1% over Paired System. Similar trends were observed in CP yields also

Table K-17-AST-1(a): Green forage yields (q/ha) of top feeds under

Treatments	Main Crop				Intercrop				Total			
	Man-dya	Vella-yani	Coimb-atore	Mean	Man-dya	Vella-yani	Coimb-atore	Mean	Man-dya	Vella-yani	Coimb-atore	Mean
Cropping Systems (CS)												
Sole crop	71.0	118.18	196	128.49	-	-			71.0	118.18	261	128.49
Inter crop	65.99	102.52	193	120.50	378.06	416.56	347.16	380.59	444.05	519.07	538	500.37
S.Em ±	1.63	0.943	0.42		-				4.40	2.958	7.07	
C.D at 5%	NS	5.817	1.54		-				26.77	18.25	30.42	
Crops (C)												
Agase	151.98	178.61	317.2	215.93	362.98	191.56	341.7	298.7	514.96	370.17	488	457.71
Erythrina	32.82	71.78	154.5	86.37	420.56	227.44	343.0	330.3	453.38	299.22	326	359.53
Drumstick	20.83	80.67	112.3	71.27	350.65	205.83	351.3	302.6	371.48	286.5	288	315.33
S.Em ±	4.65	0.715	0.52		22.06	0.768			12.61	0.695	7.59	
C.D at 5%	15.17	2.329	1.19		NS	2.501			41.14	2.265	17.52	
Planting Geometry (P)												
2m x 1m	49.84	98.67	160.2	102.90	413.49	224.56	169.3	269.1	463.33	323.22	330	372.2
2m x 0.5m	82.46	112.94	268.2	154.53	456.32	251.56	171.5	293.1	538.78	364.5	440	447.8
Paired System	73.32	119.44	155.7	116.15	264.38	148.72	177.2	196.8	337.7	268.17	333	313.0
SE(m) ±	4.75	0.995	0.44		14.86	0.556			9.48	1.134	4.92	
C.D. (P=0.05)	13.85	2.905	0.89		45.79	1.623			27.68	3.31	10.12	

Interaction	SE(m) ±	C.D. (P=0.05)	SE(m) ±	C.D. (P=0.05)		SE(m) ±	C.D. (P=0.05)	SE(m) ±	C.D. (P=0.05)		SE(m) ±	C.D. (P=0.05)	SE(m) ±	C.D. (P=0.05)	SE(m) ±	C.D. (P=0.05)
CS X C	6.58	NS	3.294	1.011		-	-	-	-		3.67	NS	0.983	3.203	11.27	34.84
CS X P	6.71	NS	4.108	1.407		-	-	-	-		2.06	6.00	1.603	4.681	10.74	24.77
C X P	8.22	23.99	5.031	1.723		6.24	19.24	0.96	2.81		2.52	7.35	1.964	5.733	6.08	12.55
CS X C X P	36.94	NS	7.11	2.437		-	-				13.55	59.43	2.777	8.108		

Table K-17-AST-1(b): Studies on performance top feeds under varied planting geometry with and without intercrop

Treatments	DMY (q/ha)														
	Main Crop				Intercrop				Total						
	Mandya		Vellayani		Mandya		Vellayani		Mandya		Vellayani		Coimbatore		Mean
Cropping Systems (CS)															
Sole crop	11.10		29.60		-		-		11.94		29.60		56.5		32.68
Inter crop	10.19		25.77		62.96		103.98		73.16		29.75		118.2		73.70
SE(m) ±	0.27		0.295		-		-		0.41		1.774		1.73		
C.D. (P=0.05)	NS		1.821		-		-		2.51		10.944		7.02		
Crops(C)															
Agase	23.46		44.92		59.20		47.85		53.07		92.77		104.6		83.48
Erythrina	5.23		17.85		70.25		56.80		41.62		74.65		70.3		62.19
Drumstick	3.24		20.29		59.43		51.31		32.95		71.6		66.1		56.88
SE(m) ±	0.71		0.289		4.92		0.260		2.59		0.342		2.32		
C.D. (P=0.05)	2.30		0.943		NS		0.848		8.45		1.115		5.42		
Planting Geometry (P)															
2m x 1m	7.46		24.70		70.84		56.15		43.15		80.86		71.9		65.30
2m x 0.5m	12.49		28.27		75.38		62.46		50.66		90.73		96.2		79.20
Paired System	11.97		30.08		42.65		37.36		33.84		67.44		72.9		58.06
SE(m) ±	0.57		0.476		2.72		0.585		1.45		0.627		1.91		
C.D. (P=0.05)	13.85		1.389		45.79		1.709		27.68		1.830		3.91		
Interaction	**S.Em ±**	**C.D at 5%**	**S.Em ±**	**C.D at 5%**	**S.Em ±**	**C.D at 5%**	**S.Em ±**	**C.D at 5%**	**S.Em ±**	**C.D at 5%**	**S.Em ±**	**C.D at 5%**	**S.Em ±**	**C.D at 5%**	
CS X C	1.0	NS	0.40	1.33	-	-	0.37	1.19	3.67	NS	0.48	1.58	2.49	7.62	
CS X P	0.80	NS	0.67	1.96	-	-	0.83	2.41	2.06	6.00	0.88	2.6	2.37	4.98	
C X P	0.98	2.87	0.82	2.40	6.24	19.24	1.01	2.96	2.52	7.35	1.08	3.2	1.31	2.67	
CS X C X P	4.71	NS	1.16	3.40	-	-	1.43	4.18	13.55	59.43	1.53	4.48			

Table K-17-AST-1(c): Studies on performance top feeds under varied planting geometry with and without intercrop

Total CPY (q/ha)					
Treatments	**Mandya**		**Coimbatore**		**Mean**
Cropping Systems (CS)					
Sole crop	1.96		11.7		13.66
Inter crop	6.53		24.5		31.03
SE(m) ±	0.04		0.42		
C.D. (P=0.05)	0.25		1.54		
Crops(C)					
Agase	6.09		21.7		27.79
Erythrina	3.75		14.5		18.25
Drumstick	2.89		13.7		16.59
SE(m) ±	0.20		0.52		
C.D. (P=0.05)	0.64		1.19		
Planting Geometry (P)					
2m x 1m	3.99		14.9		18.89
2m x 0.5m	4.95		19.9		24.85
Paired System	3.79		15.1		18.89
SE(m) ±	0.17		0.44		
C.D. (P=0.05)	0.51		0.89		
Interaction	SE(m) ±	C.D. (P=0.05)	SE(m) ±	C.D. (P=0.05)	
CS X C	0.28	NS	0.52	1.69	
CS X P	0.25	0.72	0.41	0.95	
C X P	0.30	NS	0.23	0.47	
CS X C X P	1.39	NS			

K-17-AST-3: Effect of new generation herbicides on weeds and forage yield of forage maize.

[(Table Reference: K-17-AST-3 (a) to 3(k)]

Locations:
CZ: Jabalpur, Raipur, Urulikanchan, Rahuri and Anand
NEZ: Ranchi and Faizabad

A field trial was initiated in 2017 at Jabalpur, Raipur, Urulikanchan, Rahuri and Anand in central zone and at Ranchi, and Faizabad in North east zone. The objective of the trial was to study the associated weed flora and identify suitable dose of new post emergence herbicides for optimum growth, forage yield and returns in fodder maize. The treatments consisted of ten weed control measures i.e. $\mathbf{T_1}$ Tembotrione @ 120g/ha at 20 DAS, $\mathbf{T_2}$ Topramezone @35g/ha at 20 DAS, $\mathbf{T_3}$ Tembotrione + Atrazine @120g+ 250g/ha at 20 DAS, $\mathbf{T_4}$ Topramezone + Atrazine @35g+ 250g/ha at 20 DAS , $\mathbf{T_5}$ Atrazine @1000g/ha at Pre-emergence, $\mathbf{T_6}$ Pendimethalin @ 1000 g/ha at Pre-emergence stage, $\mathbf{T_7}$ Atrazine + Pendimethalin @ 750+750 g/ha at Pre-emergence stage, $\mathbf{T_8}$ 2,4-D @ 0.5kg/ha at 20 DAS, $\mathbf{T_9}$ Two hand weeding at 20 and 40 DAS and $\mathbf{T_{10}}$ Weedy Check. The treatments were replicated thrice in randomised block design. Uniform dose of 80:40:20 (N: P_2O_5: K_2O kg/ha) was applied to crop. African tall variety was taken up.

The results indicated that in both the zones, $\mathbf{T_3}$ Tembotrione + Atrazine @120g+ 250g/ha at 20 DAS and T4 Topramezone + Atrazine @35g+ 250g/ha at 20 DAS treatments proved better. It recorded 553.9 and 567.6 q green fodder and 145.0 and 149.6 q dry matter per hectare. The treatments had no negative impact on plant population and it was on par with hand weeding. These chemicals significantly reduced the weed population and dry weight at both (30 and 60 DAS) stage.

The weed index (indicative of weed population) was least (9.25 and 5.84 % of the weedy check, respectively) in $\mathbf{T_3}$ Tembotrione + Atrazine @120g+ 250g/ha at 20 DAS and T4 Topramezone + Atrazine @35g+ 250g/ha at 20 DAS treatments. Treatments, $\mathbf{T_3}$ Tembotrione + Atrazine @120g+ 250g/ha recorded 71.8 and 60.1 % weed control efficiency in comparison to 91.3 and 72.3 % recorded with Two hand weeding at 30 and 60 DAS. The net return and B: C Ratio was significantly higher in above treatments than rest of the treatments.

K-17-AST-3 (a) Effect of new generation herbicides on yields forage maize.

Herbicide	Green forage yield (q/ha)							Dry matter yield (q/ha)						
	NEZ		CZ				Mean	NEZ		CZ				Mean
	Ran-chi	Faiza-bad	Urulikan-chan	Jabal-pur	Rah-uri	Rai-pur		Ran-chi	Faiza-bad	Urulikan-chan	Jabal-pur	Rah-uri	Rai-pur	
Tembotrione	470.0	430.6	762.8	540.8	533.7	383.0	520.1	142.0	112.8	158.2	160.8	129.2	90.2	132.2
Topramezone	446.5	442.1	785.6	541.2	521.5	403.0	523.3	140.1	116.3	171.3	161.2	117.0	94.2	133.3
Tembotrione + Atrazine	474.7	462.7	859.5	555.5	586.0	385.0	553.9	142.7	122.6	193.7	175.5	146.7	89.0	145.0
Topramezone + Atrazine	474.3	469.8	880.6	558.5	580.2	442.0	567.6	144.3	124.5	206.8	178.5	143.7	100.0	149.6
Atrazine	482.3	378.8	734.1	532.8	455.3	390.0	495.5	146.8	98.5	152.3	152.8	106.2	89.8	124.4
Pendimethalin	470.9	369.3	738.4	530.8	490.7	360.0	493.4	141.6	95.7	171.7	150.8	113.6	82.7	126.0
Atrazine + Pendimethalin	407.0	390.5	753.7	540.0	563.2	427.0	513.6	125.5	101.9	123.0	160.0	135.3	99.1	124.1
2,4-D	363.8	351.3	647.7	540.2	400.2	355.0	443.0	114.4	91.7	153.7	160.2	96.2	84.3	116.7
Hand weeding	527.1	497.7	906.7	559.8	613.0	457.0	593.5	162.4	132.4	203.8	179.8	154.8	105.1	156.4
Weedy Check	382.7	299.5	577.3	427.5	371.9	335.0	399.0	118.4	77.9	121.8	137.5	90.7	75.8	103.7
SE(m) ±	12.83	25.00	22.72	15.6	2.66	11.27		6.44	7.16	4.78	4.76	0.95	4.12	
C.D. (P=0.05)	38.43	52.53	68.02	43.8	7.89	31.24		19.28	15.05	14.33	11.32	2.83	11.42	
CV (%)	8.94		5.15		8.99	4.93		8.09		4.99		13.37	7.62	

K-17-AST-3 (b): Effect of new generation herbicides on weed population (per m^2 at 30 DAS) in forage maize

Herbicide	Weed population (per m^2 at 30 DAS)														
	Monocot					Dicot					Total				
	Ran-chi	Urulikan-chan	Rai-pur	Rah-uri	Mean	Ran-chi	Urulikan-chan	Rai-pur	Rah-uri	Mean	Ran-chi	Urulikan-chan	Rai-pur	Rah-uri	Mean
Tembotrione	25.00	53.0	12.3	31.0	30.33	17.00	12.0	11.7	20.0	15.18	42.00	65.0	24.0	51.0	45.50
Topramezone	19.33	48.0	6.3	32.0	26.41	12.00	11.0	12.7	22.0	14.43	31.33	59.0	19.0	54.0	40.83
Tembotrione + Atrazine	13.33	43.0	11.3	27.0	23.66	15.67	7.0	15.7	12.0	12.59	29.00	50.0	27.0	39.0	36.25
Topramezone + Atrazine	18.67	40.0	5.7	28.0	23.09	18.00	7.0	9.3	15.0	12.33	36.67	48.0	15.0	42.0	35.42
Atrazine	13.33	78.0	4.0	48.0	35.83	18.33	19.0	16.3	14.0	16.91	31.66	97.0	20.3	62.0	52.74
Pendimethalin	18.00	70.0	22.3	30.0	35.08	35.33	14.0	10.0	27.0	21.58	53.33	84.0	32.3	57.0	56.66
Atrazine + Pendimethalin	15.00	61.0	2.3	29.0	26.83	34.00	13.0	16.3	16.0	19.83	49.00	74.0	18.7	44.0	46.43
2,4-D	18.67	84.0	9.7	57.0	42.34	50.00	23.0	18.7	23.0	28.68	68.67	107.0	28.3	80.0	70.99
Hand weeding	5.00	34.0	2.0	0.0	10.25	9.67	7.0	8.7	0.0	6.34	14.67	42.0	10.7	0.0	16.84
Weedy Check	51.67	83.0	12.0	68.0	53.67	64.33	34.0	37.7	32.0	42.01	116.00	117.0	49.7	101.0	95.93
SE(m) ±	2.28	3.77	0.22	0.21		4.30	2.17	0.23	0.18		4.14	3.83	0.20	0.25	
C.D. (P=0.05)	6.84	11.29	0.60	0.63		12.88	6.48	0.64	0.54		12.39	11.45	0.54	0.73	
CV (%)	19.97	10.99	13.07	6.50		27.16	25.47	10.29	7.64		15.17	8.93	6.96	6.13	

K-17-AST-3 (c): Effect of new generation herbicides on weed population (per m^2 at 60 DAS) in forage maize

Herbicide	Weed population/m^2 at 60 DAS														
	Monocot					Dicot					Total				
	Ran-chi	Urulikan-chan	Rai-pur	Rah-uri	Mean	Ran-chi	Urulikan-chan	Rai-pur	Rah-uri	Mean	Ran-chi	Urulikan-chan	Rai-pur	Rah-uri	Mean
Tembotrione	21.00	27	9.67	46	25.92	22.33	21	32.67	28	26.00	39.66	48	42.33	74	51.00
Topramezone	24.00	26	13.67	35	24.67	24.00	22	10.33	35	22.83	49.66	48	24	70	47.92
Tembotrione + Atrazine	17.33	23	14.33	39	23.42	15.00	10	27.33	10	15.58	39.66	33	41.67	49	40.83
Topramezone + Atrazine	25.67	20	2.33	28	19.00	27.00	9	10.33	26	18.08	51.00	29	12.67	54	36.675
Atrazine	24.67	41	8.33	66	35.00	21.00	33	21.33	12	21.83	41.66	73	29.67	78	55.58
Pendimethalin	24.00	36	15	38	28.25	24.33	26	15.67	39	26.25	50.33	62	30.67	76	54.75
Atrazine + Pendimethalin	20.66	38	5	41	26.17	21.33	23	14.67	22	20.25	33.33	62	19.67	62	44.25
2,4-D	26.00	45	8.33	72	37.83	25.00	36	21	16	24.50	76.33	81	29.33	88	68.66
Hand weeding	12.00	22	3	0	9.25	9.00	7	6.67	0	5.67	9.00	29	9.67	0	11.92
Weedy Check	51.33	72	2.7	124	62.51	56.00	52	4.8	6.36	29.79	56.00	125	7.5	16.4	51.23
SE(m) ±	1.91	2.398	0.30	0.20		4.01	3.38	0.42	0.09		4.45	4.88	0.41	0.16	
C.D. (P=0.05)	5.72	7.17	0.82	0.61		12.09	10.12	1.17	0.26		13.32	14.61	1.14	0.48	
CV (%)	13.42	11.83	16.29	5.42		12.54	24.49	16.65	3.39		17.25	14.32	13.16	3.51	

K-17-AST-3 (d): Effect of new generation herbicides on weed parameters in forage maize

Herbicide	Total dry weight of weed/m^2 (g)										Weed index (%)				
	30 DAS					60 DAS									
	Uruli-kanchan	Ran-chi	Rai-pur	Rahuri	Mean	Ran-chi	Urulikan-chan	Rai-pur	Rahuri	Mean	Ran-chi	Uruli kanchan	Rah-uri	Rai-pur	Mean
Tembotrione	0.11	19.25	10.53	25.67	13.89	18.11	0.78	21.90	36.33	19.28	10.86	17.31	15.25	16.10	14.88
Topramezone	0.10	14.89	7.59	26.33	12.23	13.91	0.76	12.09	38.33	16.27	15.36	14.78	13.09	11.70	13.73
Tembotrione + Atrazine	0.09	11.00	8.37	21.33	10.20	10.13	0.64	12.62	24.33	11.93	9.96	6.77	4.46	15.80	9.25
Topramezone + Atrazine	0.07	16.26	5.80	22.00	11.03	15.51	0.61	5.90	25.00	11.76	10.01	4.57	5.36	3.40	5.84
Atrazine	0.12	15.94	8.81	32.67	14.39	15.85	0.96	19.30	39.00	18.78	8.50	20.34	25.37	14.70	17.23
Pendimethalin	0.12	24.19	10.27	27.00	15.40	22.13	0.91	20.35	37.33	20.18	10.67	19.89	19.78	21.20	17.89
Atrazine + Pendimethalin	0.11	17.19	5.87	24.33	11.88	28.85	0.89	7.21	30.33	16.82	22.80	18.40	7.90	6.70	13.95
2,4-D	0.14	20.65	12.90	40.67	18.59	15.38	1.04	21.54	101.33	34.82	31.00	29.86	34.75	22.40	29.50
Hand weeding	0.03	5.10	4.80	0.00	2.48	3.89	0.43	5.52	0.00	2.46	0.00	0.00	0.00	0.00	0.00
Weedy Check	0.37	43.48	28.35	74.33	36.63	43.00	1.90	55.08	145.00	61.24	27.40	37.54	39.17	26.70	32.70
SE(m) ±	0.01	2.13	0.14	2.23		2.02	0.07	0.2	3.41		2.43	2.49	4.28		
C.D. (P=0.05)	0.03	6.378	0.38	6.62		6.06	0.22	0.7	10.14		7.27	7.46	12.71		
CV (%)	14.23	10.69	7.46	13.11		8.77	14.22	10.6	12.39		8.73	25.46	44.87		

K-17-AST-3 (e): Effect of new generation herbicides on plant growth in forage maize

Herbicide	Plant population/m				Plant height (cm)						Number of leaves plant^{-1}					
	Ran-chi	Rah-uri	Rai-pur	Mean	Ran-chi	Faiza-bad	Urulikan-chan	Jabal-pur	Rah-uri	Raipur	Mean	Ran-chi	Urulikan-chan	Rai-pur	Rahuri	Mean
Tembotrione	17.3	7.0	5.8	10.0	170	194	256	221	232	262	222.6	11.3	18.0	10.4	7.1	11.7
Topramezone	17.3	7.0	5.8	10.0	175	198	268	221	232	265	226.4	11.0	18.0	10.4	7.3	11.7
Tembotrione + Atrazine	17.0	8.0	5.6	10.2	165	216	281	236	243	256	232.8	11.0	19.0	10.3	7.6	12.0
Topramezone + Atrazine	17.0	7.0	6.0	10.0	164	224	299	239	242	273	240.1	13.0	19.0	10.7	7.3	12.5
Atrazine	17.0	8.0	5.7	10.2	153	184	235	213	226	266	212.9	11.3	16.0	10.6	7.1	11.3
Pendimethalin	17.0	8.0	5.6	10.2	165	184	256	211	227	258	216.9	10.0	15.0	10.2	7.0	10.6
Atrazine + Pendimethalin	18.3	8.0	5.9	10.7	156	193	243	220	239	271	220.6	11.3	12.0	10.5	7.0	10.2
2,4-D	17.7	8.0	5.7	10.5	160	181	217	220	216	257	208.4	11.0	12.0	10.2	7.2	10.1
Hand weeding	17.0	8.0	6.0	10.3	178	229	215	243	252	288	234.0	13.0	13.0	10.8	7.5	11.1
Weedy Check	17.0	8.0	5.4	10.1	152	178	212	198	204	229	195.4	12.3	12.0	9.3	7.3	10.2
SE(m) ±	0.84	0.43	0.21		3.33	14.5	3.1	2.0	8.7	7.30		0.74	0.90	0.44	0.28	
C.D. (P=0.05)	N/A	NS	0.58		9.97	30.6	9.3	3.0	25.9	20.22		N/A	2.71	1.23	NS	
CV (%)	8.39	9.75	4.30		7.52		2.2		6.5	4.76		11.08	10.17	5.93	6.67	

K-17-AST-3 (f): Effect of new generation herbicides on plant growth in forage maize

Herbicide	L:S ratio				
	Ran-chi	Urulikan-chan	Rah-uri	Rai-pur	Mean
Tembotrione	0.12	1.02	0.24	0.41	0.45
Topramezone	0.18	0.80	0.23	0.47	0.42
Tembotrione + Atrazine	0.26	0.93	0.28	0.42	0.47
Topramezone + Atrazine	0.23	0.95	0.27	0.50	0.49
Atrazine	0.26	0.87	0.25	0.45	0.46
Pendimethalin	0.25	0.97	0.24	0.39	0.46
Atrazine + Pendimethalin	0.26	1.07	0.27	0.50	0.53
2,4-D	0.28	0.97	0.23	0.38	0.47
Hand weeding	0.18	0.86	0.30	0.51	0.46
Weedy Check	0.23	0.89	0.22	0.39	0.43
SE(m) ±	0.018	0.05	0.01	0.20	
C.D. (P=0.05)	0.05	NA	0.04	0.54	
CV (%)	14.05	9.938	9.70	10.95	

K-17-AST-3 (g): Effect of new generation herbicides on weed control efficiency in forage maize

Herbicide	Weed control efficiency (%) at 30 DAS												
	Monocot				Dicot				Total				
	Ran-chi	Rai-pur	Rah-uri	Mean	Ran-chi	Rai-pur	Rah-uri	Mean	Ran-chi	Urulikan-chan	Rai-pur	Rah-uri	Mean
Tembotrione	56.6	57.5	54.2	56.1	53.7	65.3	37.4	52.1	58.8	71.6	63.0	49.0	60.6
Topramezone	66.4	69.5	53.1	63.0	64.0	73.2	28.8	55.3	68.1	73.1	73.4	45.7	65.1
Tembotrione + Atrazine	77.2	68.5	60.4	68.7	72.0	67.4	61.5	67.0	78.4	77.1	70.5	61.1	71.8
Topramezone + Atrazine	56.9	71.7	59.5	62.7	66.0	82.7	53.3	67.3	59.1	81.1	79.3	57.8	69.3
Atrazine	56.0	64.5	30.2	50.2	69.6	67.7	54.2	63.8	58.2	66.7	68.4	38.0	57.8
Pendimethalin	45.7	61.9	56.0	54.5	45.8	60.9	13.3	40.0	46.1	68.6	63.8	42.7	55.3
Atrazine + Pendimethalin	77.4	72.2	58.1	69.2	40.1	81.1	50.5	57.2	41.9	69.5	78.8	55.9	61.5
2,4-D	71.9	59.4	16.5	49.2	30.5	42.8	28.9	34.1	71.9	62.0	54.4	20.6	52.2
Hand weeding	91.1	73.9	100.0	88.3	85.1	88.4	100.0	91.1	91.1	91.3	82.9	100.0	91.3
Weedy Check	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0
SE(m) ±	3.623		3.72		7.897		5.26		5.472	2.520		3.70	
C.D. (P=0.05)	10.847		11.06		23.644		15.63		16.384	7.54		11.00	
CV (%)	10.43		13.21		12.96		21.29		16.527	6.604		13.62	

K-17-AST-3 (h): Effect of new generation herbicides on weed control efficiency in forage maize

Herbicide	Weed control efficiency (%) at 60 DAS														
	Monocot				Dicot					Total					
	Ran-chi	Raipur	Rah-uri	Mean	Ran-chi	Rai-pur	Ran-chi	Rah-uri	Mean	Urulikan-chan	Jabal-pur	Rah-uri	Rai-pur	Faiza-bad	Mean
Tembotrione	55.8	60.1	62.8	59.6	57.8	46.3	7.8	29.9	35.4	58.9	0.7	54.8	60.2	77.1	50.4
Topramezone	66.4	79.2	71.6	72.4	67.6	60.6	67.6	12.5	52.1	60.2	0.8	57.2	77.9	78.3	54.9
Tembotrione + Atrazine	74.1	77.5	68.8	73.5	76.6	61.0	76.6	74.1	72.1	66.3	0.8	70.1	76.9	86.2	60.1
Topramezone + Atrazine	68.0	82.8	77.0	75.9	63.3	90.4	63.3	34.8	63.0	67.8	0.9	66.8	89.2	87.1	62.4
Atrazine	66.9	62.2	46.4	58.5	62.5	60.7	62.5	70.0	63.9	47.4	0.6	52.2	65.1	49.3	42.9
Pendimethalin	49.6	63.9	69.6	61.1	48.1	50.4	48.1	3.3	37.5	51.9	0.6	53.4	63.3	44.5	42.8
Atrazine + Pendimethalin	22.7	81.6	67.0	57.1	33.6	85.2	33.6	45.8	49.6	52.9	0.6	61.8	86.8	52.2	50.9
2,4-D	52.8	61.4	41.5	51.9	64.6	48.0	64.6	60.7	59.5	45.4	0.6	46.2	60.6	39.6	38.5
Hand weeding	90.3	83.5	100.0	91.3	90.9	91.1	90.9	100.0	93.2	77.5	0.9	100.0	90.0	93.4	72.3
Weedy Check	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	0.0	-	0.0
SE(m) ±	7.62		2.14		4.29		4.29	1.99		3.84		1.64		-	
C.D. (P=0.05)	22.80		6.35		12.85		12.85	5.92		11.49		4.86		-	
CV (%)	24.13		6.12		13.15		13.10	8.00		12.58		5.04			

K-17-AST-3 (i): Effect of new generation herbicides on crude protein content and yield in forage maize

Herbicide	Crude Protein Yield						Crude Protein (%)				
	Urulikan-chan	Jabal-pur	Rah-uri	Faiza-bad	Rai-pur	Mean	Ran-chi	Urulikan-chan	Rah-uri	Rai-pur	Mean
Tembotrione	12.17	11.73	11.50	8.01	7.76	10.23	6.13	7.69	8.88	8.59	7.82
Topramezone	13.98	11.83	10.40	8.37	8.10	10.54	6.56	8.16	8.86	8.60	8.05
Tembotrione + Atrazine	16.31	14.29	13.20	9.57	7.55	12.18	8.97	8.42	8.98	8.48	8.71
Topramezone + Atrazine	17.26	15.02	13.10	9.33	8.63	12.67	6.78	8.35	9.17	8.63	8.23
Atrazine	10.78	11.55	9.10	6.99	7.77	9.24	7.00	7.08	8.55	8.64	7.82
Pendimethalin	12.58	10.47	10.10	6.79	7.11	9.41	8.53	7.33	8.92	8.58	8.34
Atrazine + Pendimethalin	8.38	11.04	12.80	7.34	8.50	9.61	6.34	6.81	9.44	8.57	7.79
2,4-D	12.48	10.61	8.20	6.42	7.24	8.99	6.56	8.12	8.62	8.60	7.98
Hand weeding	14.67	15.12	14.60	9.93	9.04	12.67	8.97	7.07	9.45	8.61	8.53
Weedy Check	8.53	10.36	8.00	5.37	6.46	7.74	8.31	7.00	8.82	8.54	8.17
SE(m) ±	0.36	1.82	0.08	0.55	0.39				0.25	0.20	
C.D. (P=0.05)	1.1	2.48	0.25	1.16	1.07				NS	0.56	
CV (%)	4.88		10.99		6.42				4.82	3.14	

K-17-AST-3 (j): Effect of new generation herbicides on monetary returns in forage maize

Herbicide	Net monetary return (Rs. ha^{-1})							Gross monetary return (Rs. ha^{-1})						
	Ran-chi	Faiza-bad	Urulikan-chan	Jabal-pur	Rah-uri	Rai-pur	Mean	Ran-chi	Faiza-bad	Urulikan-chan	Jabal-pur	Rah-uri	Raipur	Mean
Tembotrione	44,500	18650	162822	26145	80553	29903	60,429	70,500	43055	205959	54083	106733	57485	89,636
Topramezone	40,468	19256	168925	25628	78074	32213	60,761	66,968	44211	212100	54116	104300	60500	90,366
Tembotrione + Atrazine	44,200	21775	188849	27524	90935	29560	67,141	71,200	46266	232076	55550	117200	57734	96,671
Topramezone + Atrazine	43,650	21942	194495	27274	89723	37789	69,146	71,150	46983	237760	55850	116033	66241	99,003
Atrazine	46,850	14322	158321	26195	66294	35111	57,849	72,350	37877	198196	53283	91067	58492	85,211
Pendimethalin	45,635	13108	158970	25719	73191	30167	57,798	70,635	36933	199370	53081	98133	53993	85,358
Atrazine + Pendimethalin	34,550	14041	163502	25461	87564	39957	60,846	61,050	39046	203489	54002	112633	63991	89,035
2,4-D	29,065	11578	134580	26928	55483	30252	47,981	54,565	35133	174880	54016	80033	53193	75,303
Hand weeding	46,570	18731	124273	21414	90904	37910	56,634	79,070	49766	180498	42750	122600	68491	90,529
Weedy Check	33,400	11791	-	19891	51170	28150	28,880	57,400	29946	-	31750	74387	50250	48,747
SE(m) ±	1,925.1	-	6,042.2	14.1	5310	1702		1,925.1	-	6,042.2	0.01	5310	1702	
C.D. (P=0.05)	5,764.1	-	18,270.4	42.3	15777	4717		5,764.1	-	18,270.4	0.03	15777	4717	
CV (%)	8.2		6.5		12.04	8.91		4.9		6.1		8.99	5.0	

K-17-AST-3 (k): Effect of new generation herbicides on monetary advantages in forage maize

Herbicide	Cost of cultivation (Rs. ha^{-1})							B:C Ratio*						
	Ran-chi	Urulikan-chan	Jabal-pur	Rah-uri	Rai-pur	Faiza-bad	Mean	Faiza-bad	Ran-chi	Urulikanchan	Jabal-pur	Rah-uri	Rai-pur	Mean
Tembotrione	26000	43137	27938	26180	27582	24405	29207	1.76	1.71	4.77	1.94	4.08	2.08	2.72
Topramezone	26500	43175	28488	26226	28287	24955	29605	1.77	1.53	4.91	1.90	3.98	2.14	2.70
Tembotrione + Atrazine	27000	43227	28026	26265	28174	24491	29531	1.89	1.64	5.37	1.98	4.46	2.05	2.90
Topramezone + Atrazine	27500	43265	28576	26311	28452	25041	29858	1.88	1.59	5.50	1.95	4.41	2.33	2.94
Atrazine	25500	39875	27088	24772	23381	23555	27362	1.61	1.84	4.97	1.97	3.68	2.50	2.76
Pendimethalin	25000	40400	27362	24942	23826	23825	27559	1.55	1.83	4.93	1.94	3.93	2.27	2.74
Atrazine + Pendimethalin	26500	39987	28541	25069	24034	25005	28189	1.56	1.30	5.09	1.89	4.44	2.66	2.82
2,4-D	25500	40300	27088	24550	22941	23555	27322	1.49	1.14	4.34	1.99	3.26	2.32	2.42
Hand weeding	32500	56225	34569	31696	30581	31035	36101	1.60	1.43	3.21	1.62	3.87	2.24	2.33
Weedy Check	24000	-	22859	23216	22100	18155	22066	1.61	1.39	-	1.39	3.20	2.27	1.97
SE(m) ±		-	0.49			-		-	0.07	0.14	3.26	0.21	0.07	
C.D. (P=0.05)		-	1.49			-		-	0.22	0.43	9.82	0.62	0.35	
CV (%)		-							8.22	5.14		9.21	5.39	

*** calculated on the basis of GMR**

K-18-AST-2: Evaluation of fodder value of maize varieties as influenced by nitrogen levels and de-toping before physiological maturity.

[(Table Reference: K-18-AST-2 (a) to 2(l)]

Location: Dharwad, Mandya, Rahuri, Raipur, Imphal, Kalyani, Hisar, Urulikanchan

The field trial was started in *kharif* 2018 at eight locations to assess the influence of nitrogen on yield parameter and yield of maize varieties and economics as well as nutritive value of de-topped maize stem. The trial failed at Rahuri centre due to damage by wild pigs. The treatments included two varieties with no-detopping /de-topping and four nitrogen levels. The treatments T_1 No de-topping (var. African tall, fodder type), De-topping 15 days after tasseling (var. African tall, fodder type), No de-topping (var. Stay green, Grain type) and De-topping 15 days after tasseling (var. Stay green, Grain type) were allocated to main plots whereas, nitrogen levels; N_0 - 0 kg N/ha, N_1 50 kg N/ha -50% basal and 50% top dressing at 30 DAS, N_2 100 kg N /ha - 50% basal and 50% top dressing at 30 DAS and N_3 150 kg N/ha -50% basal and 50% top dressing at 30 DAS were allotted to sub plots. The treatments were replicated thrice in split plot design.

The results indicated that detopping produced additionally 70.8 and 62.5 q GFY in fodder and grain type varieties. The detopping reduced the grain and straw yield of fodder type variety by 8.3 and 21.2 % in comparison to no detopping. Similarly in grain type, the magnitude of reduction was 10.2 and 19.6 % in comparison to no detopping. The detopping did not affect the No. of grain/cob, No. of row/cob, or Test weight (g) significantly except at Dharwad. As regards to monetary parameter, no de-toping proved better and recorded higher net monetary return and B:C ratio. The application of 150 kg N/ha (50% basal and 50% top dressing at 30 DAS) proved best and recorded higher Plant height at harvest, GFY, DFY, CPY, Grain and Stover yield.

K-18-AST-2 (a): Effect of nitrogen levels and de-toping on growth parameters

Treatments	Plant height at harvest (cm)						Fresh wt. /plant (g)						Dry wt. /plant (g)						
	Kal-yani	His-ar	Rai-pur	Dhar-wad	Man-dya	Mean	Kal-yani	His-ar	Imp-hal	Rai-pur	Dhar-wad	Mean	Kal-yani	His-ar	Imp-hal	Rai-pur	Dhar-wad	His-ar	Mean
Maize varieties: no-detopping and de-topping																			
T_1	185.6	183	190.3	243.4	270.9	214.6	--	--	-		-		--	--			-	--	
T_2	124.8	122.89	101.1	166.9	275.1	158.2	66.2	59.21	66.5	198.33	101.2	98.3	18.1	17.22	15.85	52.17	24.7	66	32.3
T_3	174.2	176.69	163	152.4	195.3	172.3	--	--	-		-		--	--	-		-	--	
T_4	93.6	108.28	94.3	87.8	201.1	117.0	66.2	58.38	61.9	140.1	109.1	87.1	15.6	16.7	12.95	24.92	26.6	66	27.1
SE(m) ±	6.23	4.547	2.2	2.47	1.39	3.37	0.82	--	0.41	6.28	4.19		0.53	--	0.34	1.26	1.02	--	
C.D. (P=0.05)	18.7	15.734	7.6	8.54	8.48	11.82	NS	--	1.41	21.74	NS		1.6	--	1.18	4.35	NS	--	
CV (%)			5.6	5.26						25.72	13.8					22.57	13.83		
Nitrogen levels (kg/ha)																			
N_0 - 0	112.1	140.69	118.30	130.90	181.3	136.7	60.5	48.62	62.23	55.67	51	55.60	14.6	13.97	13.37	14.33	12. 5	66	24.45
N_1 - 50	145.7	143.58	132.6	167	237.8	165.3	64.3	56.5	63.67	78.08	109.9	74.49	15.2	16.58	14.09	17.92	26.8	66	26.10
N_2 - 100	150.8	151.14	142.5	174.5	254.4	174.7	70.6	63.33	64.74	90.5	126.6	83.15	17.6	18.33	14.32	19.5	30.9	66	27.78
N_3 - 150	164.4	155.44	155.3	178	268.9	184.4	73.4	66.74	66.17	114.1	132.3	90.56	19.8	18.96	15.81	25.33	32.3	66	29.70
SE(m) ±	4.2	2.138	3.8	3.27	2.60	3.2	0.64	--	0.32	3.47	2.53		0.36	--	0.25	0.81	0.62	--	
C.D. (P=0.05)	12.6	6.241	11.1	9.55	7.58	9.4	1.92	--	0.95	10.12	7.37		1.08	--	0.76	2.37	1.80	--	
CV (%)	9.8		9.6	6.97			7.6			14.19	8.34		7.5			14.57	8.34		

K-18-AST-2 (b): Effect of nitrogen levels and de-toping on green and dry matter yields

Treatments	GFY ha^{-1} (q)								DFY ha^{-1} (q)							
	Kal-yani	His-ar	Imp-hal	Rai-pur	Dhar-wad	Urulikan-chan	Man-dya	Mean	Kal-yani	His-ar	Imp-hal	Rai-pur	Dhar-wad	Urulikan-chan	Man-dya	Mean
Maize varieties: no-detopping and de-topping																
T_1	--	--			-	-			-	-	-	-	-		-	
T_2	11.3	29.67	11.82	71.8	80.5	89.5	70.8	78.15	2.60	8.60	2.82-	17.70	17.10	19.0	11.6	15.3
T_3	--	--			-	-			--	--		-	-	-	-	
T_4	9.8	18.06	11.01	42.3	82.3	77.4	62.5	66.13	2.10	5.23	2.30-	10.70	17.90	16.4	9.9	13.15
SE(m) ±	0.34	--	0.07	3.4	1.82	1.24	2.4		0.08	--	0.06	1.1	0.39	0.28	0.5	
C.D. (P=0.05)	1.02	--	0.25	11.7	NS	8.18	NS		0.24	--	0.21	3.8	NS	1.84	NS	
CV (%)				41.2	7.74							53.7	7.75			
Nitrogen levels (kg/ha)																
N_0 - 0	6.6	18.75	11.07	18.6	49.2	70.9	52.9	61.90	1.4	5.44	2.38	4.2	10.6	15.1	6.4	6.50
N_1 - 50	9.6	20.67	11.32	27.6	86	80.0	64.0	72.00	2.1	5.99	2.51	6.9	18.6	16.6	10.1	8.97
N_2 - 100	10.9	27	11.51	31.9	93.5	88.0	71.3	79.65	2.9	7.83	2.55	7.5	20.1	19.4	11.5	10.25
N_3 - 150	14.9	29.05	11.76	36	96.8	94.9	78.4	86.65	3.1	8.42	2.81	9.7	20. 8	19.7	15.1	9.81
SE(m) ±	0.52	--	0.06	1.1	1.46	1.77	1.93		0.06	--	0.04	0.8	0.32	0.38	0.4	
C.D. (P=0.05)	1.56	--	0.17	3.3	4.25	5.53	5.95		0.18	--	0.13	2.4	0.92	1.91	1.2	
CV (%)	8.4			13.8	6.20				6.8			39.9	6.25			
C. Interaction																
Variety at Nitrogen level																
SE(m) ±			0.11				2.7				0.09				0.6	
C.D. (P=0.05)			0.35				NS				0.29				1.8	
Nitrogen at Variety																
SE(m) ±			0.08				3.4				0.06				0.7	
C.D. (P=0.05)			0.24				NS				0.19				2.2	

K-18-AST-2 (c): Effect of nitrogen levels and de-toping on crude protein yield and cop length.

Treatments	Crude Protein Yield (q/ha)							Cob length (cm)		
	Kal-yani	Imp-hal	Rai-pur	Dhar-wad	Urulik anchan	Man-dya	Mean	Rai-pur	Dhar-wad	Mean
Maize varieties: no-detopping and detopping										
T_1	--			-	-	-		12.64	13.91	13.28
T_2	0.30	0.53	1.90	1.22	1.22	0.9	1.01	11.65	13.86	12.76
T_3	--			-	-	-		13.43	13.78	13.61
T_4	0.24	0.38	1.10	1.21	1.21	0.7	0.81	12.98	13.22	13.10
SE(m) ±	0.03	0.01	0.1	0.03	0.03	0.04		0.15	0.47	
C.D. (P=0.05)	0.09	0.04	0.4	NS	NS	NS		0.53	NS	
CV (%)			55.3	8.28	8.28			4.19	11.84	
Nitrogen levels (kg/ha)										
N_0 - 0	0.13	0.39	0.4	0.59	0.59	0.4	0.42	8.49	8.49	8.49
N_1 - 50	0.23	0.42	0.7	1.21	1.21	0.4	0.70	10.81	12.95	11.88
N_2 - 100	0.36	0.45	0.9	1.47	1.47	0.9	0.93	13.79	16.45	15.12
N_3 - 150	0.4	0.56	1.1	1.6	1.6	1.3	1.09	17.6	16.88	17.24
SE(m) ±	0.04	0.01	0.1	0.02	0.02	0.03		0.23	0.58	
C.D. (P=0.05)	0.12	0.04	0.3	0.06	0.06	1.00		0.67	1.69	
CV (%)	8.7		39.9	5.98	5.98			6.29	14.64	
C. Interaction										

K-18-AST-2 (d): Effect of nitrogen levels and de-toping on days to cobs harvesting, grain and stover yield.

Treatments	Number of days for harvesting cobs					Grain yield/ha (q)							
	Kal-yani	His-ar	Dhar-wad	Urulikan-chan	Mean	Kal-yani	His-ar	Imp-hal	Rai-pur	Dhar-wad	Man-dya	Urulikan-chan	Mean
Maize varieties: no-detopping and de-topping													
T_1	104	105	130	127	117	35.7	20.74	25.72	21.4	29.48	20.2	15.6	24.1
T_2	104	105	130	127	117	29	17.41	26.99	18.3	24.97	19.53	18.5	22.1
T_3	104	105	112	115	109	38.2	30.67	33.1	37.7	36.87	41.79	30.4	35.5
T_4	104	105	112	115	109	31.7	24.04	29.35	34.1	32.56	37.82	33.5	31.9
SE(m) ±	-	-				0.7	1.925	0.34	0.5	0.66	0.46	0.73	
C.D. (P=0.05)	-	-				2.1	6.663	1.16	1.6	2.30	2.81	2.59	
CV (%)									5.8	7.42			
Nitrogen levels (kg/ha)													
N_0 - 0	104	105	121	110	110	28.0	20.6	27.6	14.6	6.3	10.9	20.2	18.3
N_1 - 50	104	105	121	115	111	34.0	21.7	28.7	22.5	33.1	24.3	23.3	26.8
N_2 - 100	104	105	121	119	112	43.0	24.8	30.1	33.8	41.0	38.4	25.8	33.8
N_3 - 150	104	105	121	123	113	46.5	25.9	30.6	40.6	43.5	45.7	28.6	37.3
SE(m) ±	--	--				0.8	1.096	0.32	0.5	0.83	1.39	0.80	
C.D. (P=0.05)	--	--				2.4	3.200	0.96	1.5	2.43	4.07	2.35	
CV (%)	--					10.6			6.3	9.30			

K-18-AST-2 (d): Effect of nitrogen levels and de-toping on days to Stover yield.

Treatments	Stover yield/ha (q)						
	Kal-yani	His-ar	Imp-hal	Rai-pur	Dhar-wad	Urulikan-chan	Mean
Maize varieties: no-detopping and de-topping							
T_1	72.2	60.74	51.91	140.5	226.2	47.4	99.8
T_2	55	44.32	67.37	108.6	171.3	25.8	78.7
T_3	63	47.98	51.85	102.3	136.3	28.9	71.7
T_4	61.7	36.24	57.35	79.1	96.8	15.1	57.7
SE(m) ±	0.64	3.643	0.41	3.9	6.5		
C.D. (P=0.05)	1.92	12.60	1.42	13.4	22.4		
CV (%)				12.5	14.2		
Nitrogen levels (kg/ha)							
N_0 - 0	56.0	43.4	55.9	81.8	104.9	22.3	60.7
N_1 - 50	59.0	46.0	56.7	108.4	148.8	26.1	74.2
N_2 - 100	66.4	49.3	56.8	113.9	173.9	31.9	82.0
N_3 - 150	71.0	50.6	59.2	126.3	202.9	36.9	91.2
SE(m) ±	0.53	1.524	0.58	4.0	2.8		
C.D. (P=0.05)	1.6	4.447	1.75	11.6	8.3		
CV (%)	9.5			12.8	6.2		

K-18-AST-2 (e): Effect of nitrogen levels and de-toping on plant growth and cob girth

Treatments	Total number of leaves/ plant							Number of leaves in the de-topped portion								Cob girth (cm)
	Kal-yani	His-ar	Imp-hal	Dhar-wad	Urulikan-chan	Man-dya	Mean	Kal-yani	His-ar	Imp-hal	Rai-pur	Dhar-wad	Urulikan-chan	Man-dya	Mean	Dhar-wad
Maize varieties: no-detopping and de-topping																
T_1	11.8	12.03	13.38	-	18.7	19.8	15.14	--	--				-	-		13.15
T_2	11.3	12.67	13.22	15.8	18.5	19.9	15.23	4.9	4.92	4.34	5.9	5.95	5.9	6.3	5.46	12.54
T_3	10.5	11.44	13.25	-	18.0	15.8	13.80	--	--				-	-		13.86
T_4	10.7	12.92	13.3	13.18	18.3	14.5	13.82	4.8	4.36	5.08	6	5.72	7.0	5.8	5.54	13.24
SE(m) ±	--	0.315	0.21	0.35	0.23	0.16		--	--	0.27	0.2	0.03	0.24	0.1		0.42
C.D. (P=0.05)	--	NS	NS	1.20	NS	0.99		--	--	0.93	0.5	0.09	NA	NS		NS
CV (%)				8.26							17.8	1.51				11.07
Nitrogen levels (kg/ha)																
N_0 - 0	10.5	12.0	12.7	13.2	17.5	13.3	13.20	4.6	4.3	4.0	2.7	5.2	6.2	4.5	4.50	10.87
N_1 - 50	11.3	12.2	13.2	14.6	18.0	16.2	14.25	4.9	4.4	4.5	2.9	5.9	6.2	6.0	4.97	13.26
N_2 - 100	11.0	12.4	13.5	15.0	18.7	18.8	14.90	5.1	4.6	5.3	3.1	6.0	6.0	6.5	5.23	14.26
N_3 - 150	11.3	12.5	13.7	15.1	19.3	21.8	15.62	4.6	5.3	5.0	3.2	6.2	7.5	7.0	5.54	14.39
SE(m) ±	--	0.25	0.22	0.17	0.25	0.27		--	--	0.19	0.1	0.05	0.30	0.3		0.23
C.D. (P=0.05)	--	NS	0.65	0.50	0.73	0.77		--	--	0.56	0.2	0.14	0.95	0.8		0.66
CV (%)	--			4.09				--			6.2	2.83				5.97

K-18-AST-2 (f): Effect of nitrogen levels and de-toping on Growth parameters.

Treatments	Total Plant Height (cm)				Height at de-topping (cm)							
	Kal-yani	Imp-hal	Urulikan-chan	Mean	Kal-yani	His-ar	Imp-hal	Rai-pur	Dhar-wad	Urulikan-chan	Man-dya	Mean
Maize varieties: no-detopping and de-topping												
T_1	217.4	183.6	245.3	215.4	--	-			-	-	-	
T_2	195.7	148.3	241.5	195.2	188.9	187.3	148.7	130.1	89.0	122.5	121.08	141.1
T_3	195.1	162.7	155.8	171.2	--	-			-	-	-	
T_4	195.3	166.0	155.0	172.1	168.1	184.9	212.7	111.8	70.0	69.7	112.67	132.8
SE(m) ±	2.5	20.96	2.76		2.4	-	3.46	0.7	1.87	1.59	2.5	
C.D. (P=0.05)	7.5	NS	9.72		7.2	-	11.97	2.3	6.49	10.41	NS	
CV (%)								3.9	8.21			
Nitrogen levels (kg/ha)												
N_0 - 0	195.3	140.2	175.7	170.4	164.6	169.2	155.5	53.4	66.0	89.7	95.83	113.5
N_1 - 50	210.9	156.4	198.8	188.7	169.9	185.1	168.4	59.5	81.0	90.5	109.0	123.3
N_2 - 100	212.6	180.3	201.8	198.2	186.1	191.9	204.3	61.7	83.0	94.8	122.3	134.9
N_3 - 150	219.8	183.6	224.2	209.2	193.5	198.1	194.4	67.4	86.0	109.6	140.3	141.3
SE(m) ±	1.6	5.31	2.16		1.2	-	3.06	1.2	1.91	2.86	3.2	
C.D. (P=0.05)	4.8	15.92	6.35		3.6	-	9.16	3.6	5.57	8.91	9.8	
CV (%)	8.4				10.2			7.0	8.37			

K-18-AST-2 (g): Effect of nitrogen levels and de-toping on yield attributes

Treatments	No. of grain/cob				No. of row/cob					Test weight (g)				
	Kal-yani	His-ar	Rai-pur	Mean	Kal-yani	His-ar	Rai-pur	Dhar-wad	Mean	Kal-yani	His-ar	Rai-pur	Dhar-wad	Mean
T_1	274.5	271.9	256.7	267.7	11.3	11.2	12.4	12.2	11.8	212.3	186.6	24.3	224.0	161.8
T_2	258.2	259.0	219.7	245.6	10.2	10.8	11.6	12.2	11.2	211.0	184.8	23.3	214.3	158.4
T_3	292.6	303.7	316.9	304.4	12.4	12.2	13.6	13.1	12.8	214.2	188.8	25.9	280.0	177.2
T_4	282.3	286.6	291.6	286.8	11.5	11.9	13.5	12.6	12.4	212.4	187.3	24.7	260.8	171.3
SE(m) ±	1.5	7.860	7.9		0.2	0.233	0.1	0.53		2.1	3.184	0.5	8.0	
C.D. (P=0.05)	4.5	27.198	27.3		0.6	0.806	0.4	NS		NS	NS	1.7	27.7	
CV (%)			10.1				3.4	14.56					13.4	
Nitrogen levels (kg/ha)														
N_0 - 0	185.9	255.8	130.5	190.7	9.2	11.1	12.3	10.7	10.8	210.5	183.3	19.8	140.2	138.4
N_1 - 50	249.3	276.7	212.7	246.2	10.6	11.4	12.5	12.8	11.8	211.7	184.3	24.4	269.2	172.4
N_2 - 100	317.8	280.7	323.1	307.2	11.8	11.6	13.0	13.5	12.5	212.3	189.5	25.7	281.5	177.3
N_3 - 150	354.6	308.0	418.5	360.4	13.2	12.1	13.3	13.2	13.0	23.2	190.3	28.4	288.3	132.6
SE(m) ±	3.2	12.34	9.0		0.3	0.21	0.2	0.19		2.5	4.17	0.6	4.8	
C.D. (P=0.05)	9.6	NS	26.2		0.9	0.64	0.5	0.55		NS	NS	1.9	14.2	
CV (%)	9.8		11.5		7.7		4.4	5.19		6.4		9.1	8.6	
C. Interaction														
Variety at Nitrogen level														

K-18-AST-2 (h): Effect of nitrogen levels and de-toping on cost of cultivation and gross returns

Treatments	Cost of cultivation (Rs./ha)						Gross returns (Rs./ha)						
	Kal-yani	His-ar	Rai-pur	Dhar-wad	Urulikanc han	Mean	Kal-yani	His-ar	Imp-hal	Rai-pur	Dhar-wad	Urulikan-chan	Mean
Maize varieties: no-detopping and de-topping													
T_1	41520	38917	31725	38605	48802	39913.80	178560	65766	144346	85262	100834	74686	108242.3
T_2	43680	44029	35475	38605	52553	42868.40	155430	56249	143092	85478	99079	54503	98971.8
T_3	45230	38917	34535	38605	54603	42378.00	191220	80535	139558	79491	82722	108113	113606.5
T_4	47890	44029	38285	38605	58353	45432.40	168500	64838	142455	78350	86670	93255	105678.0
SE(m) ±									1456	1691	1725	2023	
C.D. (P=0.05)									5038	5853	5968	7141	
Nitrogen levels (kg/ha)													
N_0 - 0	27924	40573	30396	37705	52599	37839.40	125130	59632	136680	47626	30745	68208	78003.5
N_1 - 50	32745	41173	35895	38305	53254	40274.40	170580	62970	138910	69744	95108	78396	102618.0
N_2 - 100	42580	41773	36537	38905	53902	42739.40	230645	70913	145862	96252	117129	87234	124672.5
N_3 - 150	52260	42373	37193	39506	54556	45177.60	242550	73872	148000	114959	126323	96719	133737.2
SE(m) ±									1371	1224	1894.26	2286	
C.D. (P=0.05)									4110	3572	5528.95	6714	
CV (%)										5.16	7.11		

K-18-AST-2 (i): Effect of nitrogen levels and de-toping on net returns and B: C ratio

Treatments	Net returns (Rs./ha)							B:C ratio						
	Kal-yani	His-ar	Imp-hal	Rai-pur	Dhar-wad	Urulikan chan	Mean	Kal-yani	His-ar	Imp-hal	Rai-pur	Dhar-wad	Urulikan chan	Mean
Maize varieties: no-detopping and de-topping														
T_1	137040	26849	96217	53537	62229	25883	66959.2	4.30	1.69	2.82	2.65	2.60	1.5	2.59
T_2	111750	12220	104302	50002	60474	1950	56783.0	3.55	1.28	3.98	2.37	2.55	0.0	2.29
T_3	145990	41618	94225	44955	44117	53509	70735.7	4.23	2.07	2.88	2.26	2.13	1.9	2.58
T_4	120610	20809	98421	40065	48065	34902	60478.7	3.52	1.47	3.25	2.01	2.23	1.6	2.35
SE(m) ±			1456	1691	1725	2023				0.04	0.05	0.05	0.03	
C.D. (P=0.05)			5038	5853	5968	7139				0.15	0.19	0.16	0.13	
Nitrogen levels (kg/ha)														
N_0 - 0	97206	19059	95026	17230	-6960	15608	39528.2	4.48	1.48	3.36	1.58	0.82	1.3	2.17
N_1 - 50	137835	21797	95854	33849	56802	25142	61879.8	5.21	1.55	3.14	1.95	2.48	1.5	2.64
N_2 - 100	188065	29140	100522	59715	78224	33332	81499.7	5.42	1.71	3.23	2.65	3.01	1.6	2.94
N_3 - 150	190290	31499	101762	77766	86817	42163	88382.8	4.64	1.76	3.21	3.11	3.2	1.7	2.94
SEm (±)			1371	1224	1894	2286				0.04	0.04	0.05	0.04	
CD (0.05)			4110	3572	5529	6714				0.12	0.11	0.14	0.12	
CV (%)				8.99	12.21						5.62	7.17		

K-18-AST-2 (j): Interaction effect of nitrogen levels and de-toping on growth, yield and quality of maize at Kalyani

Treatments	Plant height at harvest (cm)	Fresh wt. /plant(g)	Fresh wt. /ha(q)	Dry wt. /plant (g)	Dry wt. /ha (q)	CPY (q/ha)	Days to de-topping
T_1N_0	152.2	--	--	--	--	--	--
T_1N_1	182.9	--	--	--	--	--	--
T_1N_2	195.1	--	--	--	--	--	--
T_1N_3	212.3	--	--	--	--	--	--
T_2N_0	106.5	62.0	8.6	16.4	2.0	0.18	67.0
T_2N_1	118.8	66.0	9.3	19.4	2.1	0.22	67.0
T_2N_2	135.7	68.6	12.6	18.9	2.9	0.39	67.0
T_2N_3	138.1	76.3	14.6	17.6	3.5	0.43	67.0
T_3N_0	153.1	--	--	--	--	--	--
T_3N_1	162.6	--	--	--	--	--	--
T_3N_2	176.0	--	--	--	--	--	--
T_3N_3	205.0	--	--	--	--	--	--
T_4N_0	76.8	56.6	4.6	14.9	0.9	0.09	67.0
T_4N_1	90.0	65.0	10.0	13.7	2.01	0.22	67.0
T_4N_2	96.6	70.6	11.3	16.7	2.9	0.34	67.0
T_4N_3	111.1	72.6	13.3	17.6	2.6	0.35	67.0
T at same N							
SE(m) ±	2.5	0.4	0.2	0.6	0.05	0.02	--
C.D. (P=0.05)	7.5	1.2	0.6	1.72	0.15	0.06	--
N at same of different T							
SE(m) ±	2.8	0.6	0.3	0.7	0.04	0.03	--
C.D. (P=0.05)	8.4	1.8	0.9	2.1	0.12	0.09	--

K-18-AST-2 (k): Interaction effect of nitrogen levels and de-toping on growth, yield and quality of maize at Kalyani

Treatments	Number of days for harvesting cobs	Grain yield/ha (q)	Stover yield/ha (q)	Total number of leaves in the plant	Number of leaves in the de-topped portion	Total Plan Height (cm)	Height at de-topping (cm	Yield of cob/ha (q)	No. of grain/cob	No. of row/cob
T_1N_0	104.0	5.0	60.0	12.1	--	198.5	--	25.0	185.2	9.8
T_1N_1	104.0	33.0	70.0	11.8	--	205.2	--	56.0	265.4	10.7
T_1N_2	104.0	34.0	76.0	10.7	--	219.3	--	75.0	285.2	11.4
T_1N_3	104.0	71.0	83.0	12.1	--	227.6	--	100.0	324.5	12.8
T_2N_0	104.0	25.0	32.0	11.0	4.6	204.6	174.4	38.0	168.2	9.2
T_2N_1	104.0	28.0	50.0	11.6	5.3	200.6	173.1	48.0	257.3	10.1
T_2N_2	104.0	31.0	60.0	11.0	5.0	225.4	198.6	66.0	278.2	10.8
T_2N_3	104.0	32.0	78.0	11.6	4.6	238.9	209.7	66.0	307.2	11.6
T_3N_0	104.0	28.0	55.0	11.8	--	185.3	--	55.0	192.4	11.2
T_3N_1	104.0	30.0	60.0	12.1	--	192.1	--	59.0	287.2	12.8
T_3N_2	104.0	32.0	64.0	11.7	--	198.5	--	65.0	329.7	13.2
T_3N_3	104.0	37.0	68.0	11.5	--	205.3	--	69.0	365.2	13.7
T_4N_0	104.0	27.0	56.0	10.0	4.6	191.8	165.4	58.0	178.2	10.8
T_4N_1	104.0	37.0	60.0	11.0	4.6	183.3	156.1	59.0	268.7	11.7
T_4N_2	104.0	40.0	63.0	11.0	5.3	200.4	173.5	77.0	298.1	12.5
T_4N_3	104.0	49.0	73.0	11.0	4.6	207.5	177.3	88.0	325.3	13.2
T at same N										
SE(m) ±	2.2	1.4	2.2	--	--	4.3	2.1	1.8	1.1	0.3
C.D. (P=0.05)	NS	4.2	6.6	--	--	12.9	6.3	5.4	3.3	0.9
N **at same of different T**										
SE(m) ±	1.8	1.8	1.9	--	--	5.1	1.9	1.6	1.2	0.2
C.D. (P=0.05)	NS	7.2	5.7	--	--	15.3	5.7	4.8	3.6	0.4
CV (%)	8.52	6.42	10.2	--	--	5.5	6.9	7.8	10.2	9.7

K-18-AST-2 (l): Interaction effect between maize varieties with de-topping and nitrogen levels on growth, yield, quality and monetary parameters of maize at Dharwad

Treatment	Plant height at de-topping (cm)	Plant height at harvest (cm)	No. of rows/cob	Test weight (g)	Seed yield/ha (q)	Stover yield/ha (q)	CPY (Stover) (q/ha)	Gross returns (Rs/ha)	Net returns (Rs/ha)	B:C ratio (Rs/Re)
$V_1Dt_nN_0$	--	193.7	11.00	133.33	8.37	153.9	3.71	39398	1693	1.04
$V_1Dt_nN_{50}$	--	249.9	12.20	233.33	30.76	203.7	5.62	101354	63049	2.65
$V_1Dt_nN_{100}$	--	264.1	12.80	246.67	36.77	255.8	7.25	122616	83710	3.15
$V_1Dt_nN_{150}$	--	265.8	12.80	253.33	42.01	291.2	8.33	139968	100462	3.54
$V_1Dt_yN_0$	183.9	129.5	10.80	140.00	2.47	101.9	2.35	27112	-10593	0.72
$V_1Dt_yN_{50}$	259.3	171.8	12.07	223.33	21.47	165.5	4.11	91181	52875	2.38
$V_1Dt_yN_{100}$	268.5	177.5	13.13	253.33	37.90	191.0	4.81	136586	97680	3.51
$V_1Dt_yN_{150}$	284.3	188.7	12.67	246.67	38.04	226.9	5.78	141438	101932	3.58
$V_2Dt_nN_0$	--	125.2	11.47	160.00	6.50	93.7	2.28	22946	-14759	0.61
$V_2Dt_nN_{50}$	--	157.1	13.47	306.67	43.28	134.3	3.42	94011	55706	2.45
$V_2Dt_nN_{100}$	--	163.6	14.00	306.67	48.36	144.7	3.85	104403	65497	2.68
$V_2Dt_nN_{150}$	--	163.7	13.47	346.67	49.35	172.5	3.32	109528	70022	2.77
$V_2Dt_yN_0$	136.4	75.1	9.33	133.33	7.85	70.1	1.71	33522	-4183	0.89
$V_2Dt_yN_{50}$	165.4	89.3	13.33	270.00	36.74	91.7	2.30	93884	55579	2.45
$V_2Dt_yN_{100}$	167.7	92.9	13.87	300.00	41.07	104.3	2.70	104914	66008	2.70
$V_2Dt_yN_{150}$	170.7	93.8	14.00	306.67	44.57	121.1	3.19	114359	74854	2.89
SE(m) ±	4.01	6.54	0.38	8.39	1.66	5.7	0.38	3789	3789	0.10
C.D. (P=0.05)	11.69	19.10	1.10	24.48	4.85	16.5	1.10	11058	11058	0.29

B. Location Specific Trials

K-15-AST-5 L: Studies on carbon sequestration in subabul (*Leucaena leucocephala*) based silvi-pastoral cropping system under rain fed agriculture

[(Table Reference: K-15-AST-5L (a) to 5(b)]

Location: Hyderabad

The trial was initiated with the objective in 2015 to study the organic matter input to soil through *Leucaena* based perennial fodder cropping system and to study organic matter partitioning added through the ROTH-C in existing Subabul based Cropping system. The treatments included T_1- Subabul (Sole crop), T_2- Subabul + B N Hybrid (APBN-1) as intercrop, T_3- Subabul + B N Hybrid (APBN-1) + *Desmanthus* in 3:1 ratio, T_4- Subabul + B N Hybrid (APBN-1) + *Desmanthues* (3:1) in stylo (*Stylosanthus hamata*) ground cover, T_5- Subabul + *Cenchrus ciliaris*, T_6- Subabul +*Cenchrus ciliaris* + *Desmanthus* intercrop (3:1 ratio) in Stylo ground cover, T_7- Subabul +*Cenchrus ciliaris* + *Desmanthus* intercrop (3:1 ratio) and T_8- Subabul + *Desmanthus* as intercrop. The trial was conducted in Randomised Block design with three replications. Three to five cuts were obtained from the system during the year.

Biomass yields

During the third year of experimentation, it was observed that the green fodder yields were highest in T_3 i.e., Subabul + B N Hybrid (APBN-1) + *Desmanthus* in 3:1 ratio (71.91 q ha^{-1}) followed by T_4 i.e., intercrops of APBN-1 and *Desmanthus* in 3 : 1 ratio under *Stylo* ground cover (63.98 q ha^{-1}). The DFY followed similar tends as that of GFY.

Carbon sequestration in crop biomass (above + below ground crop biomass)

The total CO_2 sequestered by the crops in the silvi-pastoral cropping system was significantly highest when APBN-1 alone or along with *Desmanthus* and *Stylo* intercrops recording 45.8 to 53.3 t ha^{-1} of sequestered CO_2. As regards to soil carbon stock, no significant difference among the treatments was observed.

Total CO_2 sequestered in the system (crop + soil)

The treatments involving APBN-1 as intercrop recorded highest total carbon sequestration amongst all treatments. APBN-1 + *Desmanthus* in 3:1 ratio sequestered highest quantity of CO2 (55.12 t ha^{-1}) followed by T_4- Subabul + B N Hybrid (APBN-1) + *Desmanthus* (3:1) in stylo (*Stylosanthus hamata*) ground cover (53.9 t ha^{-1}) and APBN-1 as sole intercrop (47.32 t ha^{-1}). Similarly intercrops with *Cenchrus ciliaris* as intercrop recorded on par CO_2 sequestration varying between 40.98 to 44.9 t ha^{-1}.

Table K-15-AST-5L (a): Total biomass productivity (t/ha) of all crops in silvi -pastoral system during the year

Treatments	Total GFY all crops	Total DFY all crops	Total Root Biomass (below ground)	Total biomass (shoot and root)	Total CO_2 sequestered by all crops
T_1	6.35	0.76	3.05	15.24	25.15
T_2	48.53	10.77	6.94	27.77	45.82
T_3	71.91	15.92	8.35	32.29	53.28
T_4	63.98	13.78	7.81	31.53	52.03
T_5	25.96	5.98	7.45	24.19	38.98
T_6	40.28	7.43	8.10	21.60	42.15
T_7	41.90	7.84	7.69	22.32	42.08
T_8	31.54	2.40	3.05	15.21	25.09

Table K-15-AST-5L (b): Total biomass Carbon sequestered, retained (mitigated) and removed (emitted) by crops and soils C stocks during year

Treatments	Total biomass C removed in form of cuts (emitted) (t/ha)	Total biomass C retained (mitigated) (t/ha)	Total biomass C Sequestered A + B (t/ha)	C stocks in soil (t/ha)	Total C Sequestered Crop + soil (t/ha)	Bulk density (g/cc)	C stocks in soil (t/ha)
T_1	23.89	1.26	25.15	1.83	26.98	1.54	
T_2	28.04	17.78	45.82	1.50	47.32	1.50	1.83
T_3	27.00	26.28	53.28	1.84	55.12	1.51	1.50
T_4	29.29	22.74	52.03	1.92	53.95	1.52	1.84
T_5	29.11	9.86	38.98	2.00	40.98	1.51	1.92
T_6	29.89	12.26	42.15	1.94	44.09	1.50	2.00
T_7	29.13	12.94	42.08	2.18	44.26	1.55	1.94
T_8	21.13	3.96	25.09	1.98	27.07	1.52	2.18
SE(m) ±						0.04	1.98
C.D. (P=0.05)						NS	0.003
							NS

K-15-AST-6L: Nutrient management in genotypes of B x Napier hybrid.

[(Table Reference: K-15-AST-6L (a) to 6(c)]

Location: Rahuri

The field experiment was initiated during *Kharif* 2015 to find out the optimum fertilizer dose for various B x Napier Hybrid genotypes and to study the economics of different treatments. The treatments included two varieties namely RBN 2011-12 (V_1) and Phule Jaywant (V_2) under four fertilizer levels i.e. F_1-75 % RDF (112.5: 37.5:30 Kg NPK ha^{-1}), F_2 -100 % RDF (150:50:40 Kg NPK ha^{-1}), F_3 -125 % RDF (187.5:62.5:50 Kg NPK ha^{-1}) and F_4-150 % RDF (225:75:60 Kg NPK ha^{-1}). Before commencement of rains 10 t FYM ha^{-1} $year^{-1}$ was applied in July. Treatments were replicated thrice in factorial randomized block design. Total six cuts were obtained during the year.

The results indicated that plant height and leaf: stem ratio, number of tillers/ tussock, tussock girth (perimeter) of genotypes of B x N hybrid were significantly influenced with fertilizer application. Application of 150 % RDF (225:75:60 Kg NPK ha^{-1}) resulted in significantly improvement in growth parameters *viz*., plant height (134.77 cm), number of tillers per tussock (71.58), leaf: stem ratio (1.17) and tussock girth (132.43 cm) than remaining levels of fertilizer. The application of 150 % RDF also recorded significantly higher GFY (184.62 t ha^{-1}), DMY (49.35 t ha^{-1}) and CPY (3.34 t ha^{-1}) than other fertilizer levels. This dose also recorded significantly lower ADF (50.02 %), NDF (65.07 %) and higher IVDMD (50.12 %) than remaining fertilizer levels. Among varieties Phule Gunwant had significantly better growth parameters *viz*., plant height (125.62 cm), number of tillers per tussock (74.42), leaf:stem ratio (1.13) and tussock girth (125.70 cm) than Phule Jaywant. The B x N hybrid variety Phule Gunwant also produced the significantly higher GFY (166.74 t ha^{-1}), DMY (43.33 t ha^{-1}) and CPY (2.87 t ha^{-1}) than the Phule Jaywant. The Significantly lower ADF (50.44 %), NDF (64.81 %) and higher IVDMD (49.43 %) were also recorded in Phule Gunwant.

Table K-15-AST-6 (a): Effect of nutrient management on growth and yield of BN hybrid

Treatment	GFY (t/ha)	DMY (t/ha)	Plant height (cm)	Leaf Stem Ratio	No. of tillers/ tussock	Tussock girth (perimeter in cm)
Varieties						
V_1	166.74	43.33	125.62	1.13	74.42	125.70
V_2	148.53	39.38	120.03	1.04	68.75	118.23
SE(m) ±	4.08	1.02	2.02	0.03	1.59	2.14
C.D. (P=0.05)	12.37	3.10	6.14	0.11	4.82	6.48
Fertilizer levels						
F_1	127.37	31.62	116.52	0.99	64.17	113.94
F_2	152.16	38.62	118.94	1.09	69.00	120.56
F_3	166.37	45.83	121.06	1.11	71.00	120.92
F_4	184.62	49.35	134.77	1.17	82.17	132.43
SE(m) ±	4.71	1.18	2.34	0.12	1.84	2.47
C.D. (P=0.05)	14.29	3.58	7.09	0.04	5.57	7.49
V X F						
SE(m) ±	6.66	1.67	3.30	0.05	2.60	3.49
C.D. (P=0.05)	NS	NS	NS	NS	NS	NS
CV (%)	7.32	6.99	4.66	9.03	6.28	4.96

Table K-15-AST-6 (b): Effect of nutrient management on quality of B x Napier hybrid

Treatment	Crude Protein content (%)	Crude Protein Yield (t/ha)	ADF (%)	NDF (%)	IVDMD (%)
Varieties					
V_1	7.48	2.87	50.44	64.81	49.43
V_2	7.40	2.60	55.26	68.99	46.11
SE(m) ±	0.03	0.07	0.51	0.54	0.27
C.D. (P=0.05)	0.11	0.21	1.55	1.63	0.82
Fertilizer levels					
F_1	7.36	2.02	56.13	69.40	45.44
F_2	7.41	2.53	53.02	66.38	47.29
F_3	7.46	3.05	52.23	66.77	48.23
F_4	7.54	3.34	50.02	65.07	50.12
SE(m) ±	0.02	0.08	0.59	0.62	0.31
C.D. (P=0.05)	0.06	0.25	1.79	1.88	0.95
V X F					
SE(m) ±	0.05	0.11	0.83	0.88	0.44
C.D. (P=0.05)	NS	NS	NS	NS	NS
CV (%)	2.25	7.48	2.73	2.27	2.60

Table K-15-AST-6 (c): Effect of nutrient management on soil parameters

Treatment	Kg/ha			pH	EC (dS/m)	Organic carbon (%)
	Available N	Available P	Available K			
Varieties						
V_1	157.96	17.07	427	8.76	0.25	0.67
V_2	162.93	17.40	459	8.72	0.26	0.66
SE(m) ±	1.11	0.23	0.88	0.04	0.004	0.006
C.D. (P=0.05)	3.29	NS	0.61	NS	NS	NS
Fertilizer levels						
F_1	174.24	17.45	447	8.73	0.25	0.65
F_2	172.94	17.53	445	8.75	0.25	0.66
F_3	150.81	16.99	440	8.74	0.26	0.67
F_4	143.78	16.97	439	8.75	0.27	0.68
SE(m) ±	1.57	0.32	1.24	0.05	0.005	0.008
C.D. (P=0.05)	4.65	NS	3.69	NS	NS	NS
V X F interaction						
SE(m) ±	2.21	0.45	1.76	0.08	0.007	0.011
C.D. (P=0.05)	NS	NS	NS	NS	NS	NS
CV (%)	2.39	4.53	1.68	1.67	3.96	3.04

K-15 AST-8-7L: Screening of genotypes of fodder bajra under sodic soil

[(Table Reference: K--15-AST-8-7L (a) to (c)]

Location: Faizabad

The field experiment was conducted during *Kharif* 2015, 2016 and 2018 at Faizabad centre to screen the fodder pearl millet entries for their performance under sodic condition. The trial could not be conducted in 2017 due to flooding of the field. The treatment comprised of 8 genotypes including 2 checks *viz*; NDFB-936, NDFB-904, NDFB-939, NDFB-914, NDFB-926, NDFB-12, NDFB-2 (check), NDFB-3(check) replicated thrice in randomized block design. Experimental field soil was sodic and poor in fertility (pH - 9.0, E.C.- 0.95dsm^{-1}, organic carbon-0.27%, available- N-118.5 kg/ha, P_2O_5-18.3 kg/ha and K_2O-238.5 kg/ha), silty loam in texture and saline in reaction. The results indicated that among all the entries tested, NDFB-939 was superior in all parameters i.e., green fodder (418.4 q/ha), dry matter (126.3q/ha) and crude protein yields (9.8 q/ha) as well as per day productivity (5.98 q/ha) and resulted in higher return per rupee investment (Rs. 2.95).

Table K-15-AST-8-7L (a): biomass productivity of genotypes of fodder bajra under sodic soil

S. N.	Genotype	GFY (q/ha)				DMY (q/ha)			
		2015	2016	2018	Mean	2015	2016	2018	Mean
1	NDFB-936	394.5	408.4	390.7	397.9	112.1	115.9	112.1	113.4
2	NDFB-904	305.7	321.8	307.3	311.6	93.3	90.4	87.6	90.4
3	NDFB-939	410.3	431.6	418.4	420.1	129.9	127.3	121.7	126.3
4	NDFB-914	340.6	363.7	335.5	346.6	99.1	101.5	95.9	98.8
5	NDFB-926	360.5	373.3	362.6	365.5	100.6	101.5	104.4	102.2
6	NDFB-12	370.4	384.5	377.2	377.4	109.6	109.6	107.8	109.0
7	NDFB-2(check)	381.8	386.8	343.5	370.7	115.7	111.8	110.8	112.8
8	NDFB-3(check)	375.2	381.2	374.8	377.1	108.1	106.4	107.9	107.5
C.D. (P=0.05)		55.9	60.8	60.2		17.7	16.7	16.95	

Table K-15-AST-8-7L (b): Productivity of genotypes of fodder bajra under sodic soil

S.N.	Genotype	CPY (q/ha)			GFY (q/ha/day)			Mean	DMY (q/ha/day)			Mean
		2015	2016	2018	2015	2016	2018		2015	2016	2018	
1	NDFB-936	9.1	9.3	9.1	5.56	5.92	5.5	5.66	1.58	1.68	1.57	1.61
2	NDFB-904	7.1	6.9	7	4.31	4.66	4.39	4.45	1.31	1.31	1.25	1.29
3	NDFB-939	11.3	10.9	9.8	5.78	6.26	5.89	5.98	1.8	1.84	1.71	1.78
4	NDFB-914	7.1	7.4	7.3	4.8	5.27	4.79	4.95	1.4	1.47	1.37	1.41
5	NDFB-926	7.8	7.8	8.1	5.08	5.41	5.1	5.20	1.42	1.47	1.49	1.46
6	NDFB-12	8.2	8.3	8.4	5.22	5.57	5.31	5.37	1.54	1.59	1.52	1.55
7	NDFB-2 (check)	9.7	9.2	9	5.38	5.61	5.48	5.49	1.63	1.61	1.56	1.60
8	NDFB-3 (check)	8.6	8.4	8.6	5.28	5.52	5.35	5.38	1.52	1.54		1.53
C.D. (P=0.05)		1.2	1.2	0.9	-	-	-		-	-	-	

Table –K-15-AST-8-7L (c): Monetary returns of genotypes of fodder bajra grown under sodic soil

S.N.	Genotype	Mean GFY (q/ha)	Gross Return (Rs ha^{-1})	Net Return (Rs $ha^{-1)}$	Return per Rupee investment
1	NDFB-936	397.93	59690	38300	2.79
2	NDFB-904	311.60	46740	25350	2.18
3	NDFB-939	420.10	63015	41625	2.95
4	NDFB-914	346.60	51990	30600	2.43
5	NDFB-926	365.46	54819	33429	2.56
6	NDFB-12	377.36	56604	35214	2.64
7	NDFB-2(check)	384.03	57005	35615	2.66
8	NDFB-3(check)	377.06	56559	35169	2.64
C.D. (P=0.05)		59.01	-	-	-

K-16-AST-8: Resource management in rice-oat cropping system under sodic soils

[(Table Reference: K-16-AST-8 (a) to (b)]

Location: Faizabad

The field experiment was initiated during *Kharif* 2016 at Faizabad centre to study the resource management in rice-oat cropping system under sodic soils. The treatments comprised of eight treatments *viz*.; control, RDF (120N:60P_2O_5:40K_2O kg/ha), combination of 75% RDF and 50% RDF with 25% N and 50% N substitution through pressmud, *Dhaincha* and crop residue, respectively laid out in Randomized Block Design and replicated thrice. The soil of experimental field was sodic and poor in fertility (pH – 9.1, E.C.- 0.97dsm^{-1}, ESP-32.7%,organic carbon-0.23%, available N- 115.4 kg, P_2O_5 –15.6 kg and K_2O-240.0 kg/ha), silty loam in texture and saline in reaction. During third year of experimentation, paddy var. Sarjoo-52 was transplanted on July 24, 2018 and fertilized as per treatment. The results revealed that the values of grain and straw yields of paddy, plant height and no. of tillers were significantly higher with RDF and *at par* with 75% RDF+25% N through *Dhaincha*. Non significant response was recorded for harvest index. The lowest value was observed with control for all the growth and yield parameters. Observations recorded on physico- chemical properties of soil after harvest of the crop during second year of experimentation showed consistent increase in available nitrogen and phosphorous with 75% RDF+25%N through *Dhaincha* over control. Subsequent decrease in pH, EC and ESP as well as increase in organic carbon content observed through organic substitution over its initial values.

Table K-16-AST-8 (a): Effect of integrated nutrients management on growth, yield and yield attributes of rice

S.N.	Treatment	Grain yield (q/ha)	Straw yield (q/ha)	Harvest index (%)	Plant height (cm)	No. of tillers/m row length
1	Control	17.50	26.41	39.85	88.5	56
2	RDF(120N:60P_2O_5:40K_2O kg/ha)	41.26	54.40	43.13	110.3	91
3	75% RDF+25% N through pressmud	33.60	45.61	42.42	104.2	81
4	75% RDF+25% N through dhaincha	40.15	53.28	42.97	109.4	91
5	75% RDF+25% N through crop residue	31.80	45.29	41.25	102.7	78
6	50% RDF+50% N through pressmud	31.40	44.87	41.17	104.6	80
7	50% RDF+50% N through dhaincha	32.90	46.38	41.50	106.2	85
8	50% RDF+50% N through crop residue	29.86	43.66	40.61	101.8	77
SE(m) ±		2.64	3.38	2.71	6.59	4.10
C.D. (P=0.05)		5.66	7.25	NS	14.13	8.80
CV (%)		10.01	9.20	7.97	7.80	6.29

Table -K-16-AST-8 (b): Effect of INM on physico-chemical properties of soil after harvest of crop

S.N.	Treatment	Available nutrients(kg/ha)			pH value	EC dSm^{-1}	Exchangeable sodium (%)	O.C. (%)
		N	P	K				
1	Control	118.2	15.8	243	9.1	0.96	32.6	0.23
2	RDF(120N:60P_2O_5:40K_2O kg/ha)	126.3	16.8	258	9.0	0.92	31.0	0.24
3	75% RDF+25% N through pressmud	128.6	17.3	264	8.7	0.89	28.7	0.30
4	75% RDF+25% N through dhaincha	134.8	17.9	270	8.3	0.85	26.6	0.34
5	75% RDF+25% N through crop residue	126.5	16.8	260	8.7	0.90	29.4	0.27
6	50% RDF+50% N through pressmud	126.9	17.0	263	8.5	0.89	27.5	0.32
7	50% RDF+50% N through dhaincha	134.6	17.4	266	8.2	0.83	25.8	0.36
8	50% RDF+50% N through crop residue	125.4	16.7	256	8.6	0.89	28.8	0.28
Initial value		115.4	15.6	240	9.1	0.97	32.7	0.23
SE(m) ±		4.76	0.75	12.68	-	-	-	-
C.D. (P=0.05)		10.21	1.61	NS	-	-	-	-
CV (%)		4.57	5.42	5.97	-	-	-	-

K-17-AST-4L: Effect of teosinte + rice bean intercropping system and INM on succeeding *Kharif* rice

[(Table Reference: K-17-AST-4L (a) to (b)]

Location: Jorhat

A field experiment was initiated during Summer 2018 to study the productivity and economics of rice based food - forage cropping system as influenced by integrated nutrient management and planting geometry of Teosinte + rice bean intercropping systems. The treatments included four cropping system *viz* T_1 Sole Teosinte, T_2 Sole Rice bean, T_3 Teosinte + Rice bean (3:2) and T_4 Teosinte + Rice bean (3:3) and three INM treatments; M_1 RDF (inorganic), M_2 50% N through RDF+50%N through FYM and M_3 50% N of RDF+50%N through Vermicompost. The experiment was laid out in Split plot design taking cropping system in main plot and INM treatment in sub plot with three replications. The *Kharif* rice was grown with 50% recommended dose of fertilizer to study the residual effect of preceding crop on rice.

Perusal of the data revealed that the highest GFEY of the system as a whole was higher in Teosinte + Rice bean intercropping at 3:3 row ratio (839.9 q/ha) which was at par with Teosinte+ Rice bean intercropping at 3:2 row ratio being GFEY 793.3 q/ha. INM with 50% RDF + 50% N through Vermicompost recorded the highest GFEY (800.0 q/ha) and CP yield (9.01 q/ha) than other treatments. The highest crude protein yield was recorded in Teosinte + Rice bean intercropping at 3:3 row ratio (9.93 q/ha). The highest LER (1.38) was also recorded in Teosinte+ Rice bean intercropping at 3:3 row ratio. INM treatment could not bring about much difference in LER values. The residual effect on Rice crop indicated that the highest grain yield of rice was recorded in Teosinte+ Rice bean (3:3 ratio) followed by rice being 36.1 q/ha. The effect of INM treatment indicated that the highest grain yield of rice was recorded in 50% RDF + 50% N through FYM (36.1 8q/ha). In terms of cropping system as a whole, the highest gross return and net return were recorded in Teosinte+ Rice bean intercropping at 3:3 row ratio followed by Teosinte+ Rice bean intercropping at 3:2 row ratio. On the other hand application of 50% RDF + 50% N through vermicompost fetched the highest gross and net monetary return.

Table K-17-AST-4L (a) Effect of Teosinte + Rice bean intercropping system and INM

Treatment	GFY (q/ha)			DMY (q/ha)			Plant height (cm)		Grain yield-	Straw yield
	Teosinte	Rice Bean	Total	Teosinte	Rice Bean	Total	Teosinte	Rice Bean	rice (q/ha)	(q/ha)
Integrated nutrient management										
M1	222.6	155.0	283.2	53.6	38.5	69.07	140.7	93.7	30.9	46.9
M2	232.8	165.7	298.9	57.8	40.9	73.97	178.2	112.6	35.6	54.0
M3	243.0	174.5	313.1	58.9	43.3	76.65	181.2	126.9	36.1	54.0
SEm+			08.57			0.957			0.626	0.873
C.D. (P=0.05)			25.78			2.936			1.921	2.678
Intercropping systems										
C1	266.2	0.0	266.2	63.4	0.0	63.41	173.3	0.0	31.8	48.2
C2	0.0	239.0	239.0	0.0	59.1	59.10	0.0	123.3	35.0	51.9
C3	215.4	120.7	336.1	53.4	30.1	83.53	161.4	92.3	33.8	51.9
C4	216.7	135.5	352.2	53.4	33.5	86.88	165.3	117.6	36.1	54.4
SE(m) ±			77.23			14.75			9.317	14.059
C.D. (P=0.05)			NS			NS			NS	NS
C x M										
SE(m) ±			12.50			3.826			2.504	3.491
C.D. (P=0.05)			NS			NS			NS	NS

Table K-17-AST-4 (b) Effect of teosinte + rice bean intercropping system and INM

Treatments	Total GFEY (q/ha)	Plant population		CP Yield (q/ha)	LER	(Rs/ha)	
		Teosinte	Rice Bean			Gross income	Net income
Integrated Nutrient Management							
M1	700.6	5.12	4.97	7.81	1.15	70060	60014
M2	779.8	6.96	5.94	8.55	1.18	77982	66913
M3	800.0	5.62	5.11	9.01	1.19	80002	68974
SE(m) ±	11.490			0.145			
C.D. (P=0.05)	35.26			0.444			
Intercropping systems							
C1	696.5	5.12	0	5.25	1.00	69649	59154
C2	710.9	0.00	5.80	9.32	1.00	71087	59394
C3	793.3	5.28	3.68	9.32	1.32	79333	68940
C4	839.9	5.46	3.98	9.93	1.38	83990	73714
SE(m) ±	154.95			1.686			
C.D. (P=0.05)	NS			NS			
CXM							
SE(m) ±	45.961			0.579			
C.D. (P=0.05)	NS			NS			
CV (%)	16.13			18.53			

Exploratory Trials

Exploring the possibility of silage of paddy straw and sugarcane tops with different additives

[(Table Reference: E1 (a) to (b)]

Location: Ludhiana

The lab study was carried out on exploratory basis to explore the possibility of ensiling of paddy straw and sugarcane tops. For preparation of silage, paddy straw and sugarcane tops were mixed in the ratio of 100:0, 75:25, 50:50, 25:75 and 0:100. The silages combinations were treated with different additives urea, molasses and urea+ molasses. The silage thus prepared was analyzed for various parameters.

The results indicated that, dry weight varied significantly among ensiled sugarcane tops, paddy straw and mixture of two crops in different combinations. The dry weight ranged from 31.27-67.23%. With decrease in the ratio of paddy straw in the silage, the dry weight also showed a decreasing trend. Averaged over ratio, the use of 2% urea and 1% urea+ 1% molasses decreased the dry weight content by 0.35% and 1.12 % respectively over control. The pH **o**f silage varied significantly among ensiled sugarcane tops, paddy straw and mixture of two crops in different combinations. The pH of the silages ranged from 3.50-7.76. The values showed a decreasing trend with the increase in the proportion of sugarcane tops in the combinations. The pH value increased with the addition of 2% urea as an additive but decreased with the addition of molasses. The interaction between ratio and treatment (R×T) was significant.

NH_3-N concentrations varied significantly among ensiled sugarcane tops, paddy straw and mixture of two crops in different combinations. Ammonical nitrogen in all combinations ranged between 3-7% of total nitrogen. Silage with ammonical-N above 15% is not recommended. Ammonical nitrogen values decreased with increase in the proportion of paddy straw in the silage.

Crude protein concentrations vary significantly among ensiled sugarcane tops, paddy straw and mixture of two crops in different combinations. The total crude protein varies between 4.24-8.63% in sugarcane tops and paddy straw silages. Various additives used to enhance ensiling process and nutritional characteristics, had a significant ($p<0.01$) effect on CP content in all silage combinations. Averaged over ratio, the use of 2% urea and 1% urea+ 1% molasses increased the CP content by 31.60% and 26.25% respectively over control. The interaction between ratio and treatment (R×T) was significant.

ADF content ranged from 47.80-53.89% in different silage combinations. ADF content showed increasing trend with increase in the proportion of paddy straw in silage combinations. ADF decrease with the addition of 2% urea and 1%urea +1% molasses. Averaged over ratio, the use of 2% urea and 1% urea+ 1% molasses decreased the ADF content by 6.44% and 4.32% respectively over control. The interaction between ratio and treatment (R×T) was significant.

Neutral detergent fibre (NDF) is a good indicator of food quality. NDF increased with increase in the proportion of paddy straw in all combinations. NDF concentration decreases with the addition of 2% urea in all combinations. Averaged over ratio, the use of 2% urea and 1% urea+ 1% molasses decreased the NDF content by 8.15% and 6.21% respectively over control. The interaction between ratio and treatment (R×T) was significant.

Table E1 (a): Dry weight (%), pH and ammonical nitrogen (%) in the silage of paddy straw

Treatment	Paddy straw: sugarcane tops					
	100:0	**75:25**	**50:50**	**25:75**	**0:100**	
	Dry weight					**Mean**
Control	66.27±0.56	47.73±0.70	45.07±0.13	35.47±0.61	31.73±0.80	45.25[b]
2% Urea	65.73±0.67	47.40±0.78	43.83±0.18	38.10±0.36	31.97±0.92	45.41[b]
1% Molasses	65.46±0.45	49.80±0.26	43.60±0.52	39.70±0.81	33.23±0.77	46.36[a]
2% Molasses	65.23±0.46	48.20±0.34	44.73±0.12	39.27±0.51	32.87±0.63	46.16[a]
1% Urea+1% molasses	67.23±0.67	49.60±0.53	42.33±0.17	38.33±0.65	31.27±0.70	45.75[b]
Mean	**65.99[a]**	**48.55[b]**	**43.91[c]**	**38.17[d]**	**32.21[e]**	
C.D. (P=0.05)	**Ratio = 0.65, Treatment = 0.64, Ratio × Treatment = 1.46**					
	pH					
Control	6.76±0.15	6.70±0.20	5.40±0.10	4.70±0.10	3.66±0.12	5.44[c]
2% Urea	7.76±0.05	7.70±0.10	7.56±0.04	7.66±0.05	7.33±0.05	7.58[a]
1% Molasses	5.76±0.12	5.22±0.10	5.26±0.16	4.76±0.15	3.63±0.10	4.93[d]
2% Molasses	5.56±0.13	5.00±0.12	4.20±0.23	4.06±0.15	3.50±0.15	4.46[d]
1% Urea+1% molasses	7.56±0.05	7.03±0.11	6.85±0.21	6.46±0.05	7.03±0.05	6.99[b]
Mean	**6.68[a]**	**6.33[b]**	**5.85[c]**	**5.53[c]**	**5.03[d]**	
C.D. (P=0.05)	**Ratio = 0.76, Treatment = 0.78, Ratio × Treatment = 0.27**					
	NH3-N					
Control	3.71±0.01	5.22±0.02	5.50±0.01	6.41±0.02	7.81±0.01	5.73[ab]
2% Urea	3.72±0.02	5.12±0.03	5.41±0.02	6.31±0.02	7.62±0.02	5.70[b]
1% Molasses	3.81±0.01	5.22±0.02	5.51±0.01	6.41±0.01	7.70±0.01	5.73[ab]
2% Molasses	3.80±0.01	5.31±0.02	5.60±0.02	6.50±0.01	7.81±0.01	5.81[a]
1% Urea+1% molasses	3.70±0.01	5.03±0.01	5.40±0.01	6.50±0.01	7.60±0.01	5.65[b]
Mean	**3.75[e]**	**5.18[d]**	**5.48[c]**	**6.49[b]**	**7.70[a]**	
C.D. (P=0.05)	**Ratio = 0.12, Treatment = 0.13, Ratio × Treatment = 0.27**					

Table E1 (b): Crude protein (%), ADF (%), NDF (%) and IVDMD (%) in the silage of paddy straw

Treatment	Paddy straw : sugarcane tops					
	100:0	**75:25**	**50:50**	**25:75**	**0:100**	
	Crude protein					**Mean**
Control	4.46±0.11	5.12±0.39	5.40±0.15	5.75±0.46	6.46±0.15	5.44[d]
2% Urea	5.60±0.27	7.60±0.17	7.53±0.12	7.59±0.18	8.63±0.16	7.39[a]
1% Molasses	4.54±0.23	5.37±0.76	5.70±0.01	5.89±0.17	6.38±0.67	5.58[c]
2% Molasses	4.63±0.12	5.23±0.23	5.32±0.02	5.98±0.17	7.76±0.20	5.78[c]
1% Urea+1% molasses	5.46±0.35	7.23±0.25	7.26±0.20	7.36±0.12	8.00±0.36	7.06[b]
Mean	**4.94[d]**	**6.11[c]**	**6.24[c]**	**6.51[b]**	**7.45[a]**	
C.D. (P=0.05)	**Ratio = 0.12, Treatment = 0.11, Ratio × Treatment = 0.26**					
	ADF					
Control	53.89±1.28	53.20±1.96	52.17±1.31	51.67±1.40	50.86±0.42	52.36[a]
2% Urea	49.00±1.63	49.80±1.02	49.13±0.38	48.45±1.21	47.80±1.64	49.19[e]
1% Molasses	53.41±0.82	53.16±1.76	51.83±1.37	49.17±0.56	48.70±1.54	51.21[c]
2% Molasses	53.85±0.51	52.76±0.98	51.73±1.12	49.35±1.31	49.20±0.96	51.46[b]
1% Urea+1% molasses	50.46±1.13	50.10±2.46	49.67±2.36	48.51±0.89	47.93±1.20	50.19[d]
Mean	**52.12[a]**	**51.82[b]**	**51.03[c]**	**49.58[d]**	**49.75[d]**	
C.D. (P=0.05)	**Ratio = 0.24, Treatment = 0.23, Ratio × Treatment = 0.50**					
	NDF					
Control	75.70±1.30	74.75±1.05	73.95±1.25	73.60±1.12	70.55±0.65	73.11[a]
2% Urea	65.05±0.15	70.00±0.45	69.75±0.45	68.55±1.05	63.15±0.35	67.60[c]
1% Molasses	75.60±0.80	72.80±0.49	73.30±1.01	73.55±0.85	68.45±0.92	72.62[a]
2% Molasses	75.40±0.97	73.00±0.48	73.55±0.56	73.40±0.38	68.42±0.58	72.80[a]
1% Urea+1% molasses	66.30±0.89	71.05±1.25	68.8±1.03	68.10±0.53	69.85±0.75	68.83[b]
Mean	**71.53[a]**	**71.90[a]**	**71.59[a]**	**71.88[a]**	**68.06[b]**	
C.D. (P=0.05)	**Ratio = 0.89, Treatment = 0.87, Ratio × Treatment = 2.00**					

R-18-AST-6: Influence of cutting stages and chemical spray on pod maturity of fodder cowpea

[(Table Reference: R-18-AST- E2 (a) to (c)]

Locations: IGFRI, SRRS, Dharwad

The field experiment on pilot basis was started during *Kharif*, 2018 at IGFRI, SRRS, Dharwad with the objectives to identify the appropriate stage of harvesting the cowpea pods for optimum seed yield and quality and to evaluate the influence of growth retardants and defoliators on synchrony of cowpea pod maturity. The experiment was conducted in factorial Randomized block design. Factor one comprises three cutting stages *viz.*, C_1: Cutting of plant at 50 % pod maturity stage, C_2: Cutting of plant at 75 % pod maturity stage and C_3: Control (Regular pickings - Thrice) and factor two comprises four treatments viz., G_1: Spray of 2,4-D at pod filling stage, G_2: Spray of CCC at flower initiation and pod filling stage, G_3: Spray of 2, 4-D + CCC and 2, 4-D and CCC: Control (No Spray). The treatments were replicated thrice.

The results indicated that, days to maturity had significant differences among cutting stages. Significantly higher number pods per plant was recorded in treatment combination of C_3. Among cutting stages, the seed yield was highest when the crop was cut at 50 % pod maturity stage over control. Whereas, among chemical spray treatments, significantly highest mean seed yield per hectare (3.92q) was recorded in control treatment. The effect on seed quality parameters *viz.*, germination percentage, seedling vigour index and seedling dry weight were non significant among the treatments. Treatment G_4 recorded significantly highest test weight (10.93 g).

Table E2 (a): Influence of cutting stages and chemical spray on days to flower initiation, days to maturity and pods per plant in fodder cowpea

Treatments	Days to flower initiation				Days to maturity				Pods per plant			
	Chemical spray (G)				Chemical spray (G)				Chemical spray (G)			
Cutting stage	**G_1**	**G_2**	**G_3**	**G_4**	**G_1**	**G_2**	**G_3**	**G_4**	**G_1**	**G_2**	**G_3**	**G_4**
C_1	69.87	70.00	75.10	80.00	112.17	110.00	117.11	120.00	10.30	12.45	11.10	13.36
C_2	70.40	68.25	73.00	78.22	119.00	108.39	110.67	114.00	13.19	14.54	13.03	16.50
C_3	64.53	65.50	70.00	75.50	115.23	110.07	104.48	109.00	16.33	17.30	16.56	18.10
Mean	68.26	67.92	72.70	77.91	115.47	109.49	110.75	114.33	13.27	14.76	13.56	15.98
Interaction	**SE(m) ±**		**C.D. (P=0.05)**		**SE(m) ±**		**C.D. (P=0.05)**		**SE(m) ±**		**C.D. (P=0.05)**	
C	0.35		NS		0.44		1.76		0.19		0.77	
G	0.33		NS		0.40		NS		0.23		0.70	
C x G	0.73		NS		0.69		NS		0.41		1.22	

Table E2 (b): Influence of cutting stages and chemical spray on seed per pod, seed yield and seed germination in fodder cowpea

Treatments	Seeds per pod				Seed yield per hectare (q)				Germination (%)			
	Chemical spray (G)				Chemical spray (G)				Chemical spray (G)			
Cutting stage	**G_1**	**G_2**	**G_3**	**G_4**	**G_1**	**G_2**	**G_3**	**G_4**	**G_1**	**G_2**	**G_3**	**G_4**
C_1	10.67	12.03	11.20	14.86	3.04	3.09	3.04	3.29	82.00	89.83	82.33	83.67
C_2	10.38	11.67	10.13	13.52	3.02	3.07	3.04	3.85	82.70	88.10	83.00	84.33
C_3	8.93	10.41	9.77	12.52	3.21	3.80	2.98	3.93	83.97	87.23	84.10	84.17
Mean	9.99	11.37	10.37	13.63	3.01	3.05	3.02	3.92	82.89	88.39	83.14	84.06
Interaction	**SE(m) ±**		**C.D. (P=0.05)**		**SE(m) ±**		**C.D. (P=0.05)**		**SE(m) ±**		**C.D. (P=0.05)**	
C	0.16		0.64		0.02		0.06		0.53		NS*	
G	0.16		0.47		0.02		0.06		0.62		1.84	
C x G	0.27		NS*		0.03		0.09		1.07		NS	

***Non-significant**

Cutting stages (C): C_1: Cutting of plant at 50 % pod maturity stage, C_2: Cutting of plant at 75 % pod maturity stage, C_3: Control (two pickings)

Chemical spray (G) G_1: Spray of 2,4-D at pod filling stage, G_2: Spray of CCC at pod filling stage, G_3: Spray of 2, 4-D + CCC, G_4 : Control (No cut)

Table E2 (c): Influence of cutting stages and chemical spray on seedling vigour index, seedling dry weight and test weight in fodder cowpea

Treatments	Seedling vigour index				Seedling dry weight (mg)				Test weight (g)			
	Chemical spray (G)				Chemical spray (G)				Chemical spray (G)			
Cutting stage	**G_1**	**G_2**	**G_3**	**G_4**	**G_1**	**G_2**	**G_3**	**G_4**	**G_1**	**G_2**	**G_3**	**G_4**
C_1	4000	4025	4015	4168	0.43	0.53	0.59	0.65	9.50	10.50	10.03	11.00
C_2	3887	4010	3957	4118	0.49	0.51	0.49	0.60	9.00	10.03	8.70	10.99
C_3	2777	3035	2878	3297	0.42	0.46	0.36	0.56	9.00	9.63	9.77	10.81
Mean	3555	3690	3616	3861	0.45	0.50	0.48	0.60	9.17	10.05	9.50	10.93
Interaction	**SE(m) ±**		**C.D. (P=0.05)**		**SE(m) ±**		**C.D. (P=0.05)**		**SE(m) ±**		**C.D. (P=0.05)**	
C	146.08		NS		0.14		NS		0.12		NS	
G	141.32		NS		0.25		NS		0.15		0.46	
C x G	244.77		NS		0.30		NS		0.27		NS	

***Non-significant**

Cutting stages (C): C_1: Cutting of plant at 50 % pod maturity stage, C_2: Cutting of plant at 75 % pod maturity stage, C_3: Control (Regular pickings)

Chemical spray (G) G_1: Spray of 2,4-D at pod filling stage, G_2: Spray of CCC at pod filling stage, G_3: Spray of 2, 4-D + CCC, G_4 : Control (No cut)

C. AVT-2 Trials

K-18-AST-3: Effect of nitrogen levels on forage yield of promising entries of forage hybrid maize

[(Table Reference: K-18-AST-3 (a) to (d)]

Location: North East Zone -Imphal, Faizabad; South Zone - Hyderabad, Coimbatore

A field trial AVTM-2 was conducted to find out the response of promising entries of forage hybrid maize to graded doses of nitrogen. The study was undertaken at four locations; two in North East Zone and two in South Zone with two entries namely TSFM-15-5, ADV-6737, 2 national checks i.e.; J-1006 and African Tall and one Hybrid check i.e.,COHM-8 under influence of five levels of nitrogen 0, 40, 80, 120 and 160 Kg/ ha).

In North East Zone, on locational mean basis, no entry could surpass the national checks in terms of GFY as well as DFY. Best national check African Tall (NC) recorded 9.9 and 20.8 % higher GFY over TSFM-15-5 and ADV-6737, respectively. The CP content was also higher in check.
In South Zone, also no entry could surpass the national checks in terms of GFY, DFY or CPY. On overall mean basis of North East Zone and south zone no entry could surpass the national checks in terms of GFY, DFY or CPY.

The growth parameters, herbage yield and crude protein yield increased consistently with increasing level of nitrogen up to 120 Kg N/ha. However, at few centres the significant increase in GFY, DMY and CPY was noted with application of nitrogen up to 160kg N/ha.

Table –K-18-AST-3 (a) Effect of nitrogen levels on green fodder productivity of promising entries of forage maize

Treatment	Green Forage Yield (q/ha)							GFY (q/ha/ day)
	NEZ			SZ				
	Imphal	Faizabad	Mean	Hyderabad	Coimbatore	Mean	Overall Mean	Faizabad
A. Entries								
TSFM-15-5	347.29	317.52	332.41	435.84	554.6	495.22	413.8	4.56
ADV-6737	314.36	269.40	291.88	376.74	555.4	466.07	379.0	4.33
African Tall (NC)	441.51	296.07	368.79	447.98	540.6	494.29	431.5	4.54
J-1006 (NC)	398.13	333.55	365.84	431.24	542.2	486.72	426.3	4.76
Hybrid COHM-8 (NC)	350.98	280.22	315.60	473.89	537.2	505.55	410.6	4.38
SE(m) ±	3.51	07.24		22.31	13.59			0.08
C.D. (P=0.05)	9.97	20.29		7.60	27.32			0.22
B. Nitrogen levels (kg/ha)								
0 (N_1)	277.33	182.73	230.0	341.3	588.0	464.7	347.3	2.82
40 (N_2)	328.93	260.14	294.5	411.4	569.8	490.6	392.6	3.98
80 (N_3)	398.27	314.66	356.5	450.2	558.8	504.5	430.5	4.76
120 (N_4)	432.62	360.92	396.8	487.1	542.4	514.8	455.8	5.37
160 (N_5)	415.11	378.31	396.7	475.7	471.0	473.3	435.0	5.63
SE(m) ±	3.51	07.24		22.31	13.47			0.08
C.D. (P=0.05)	9.97	20.29		7.60	27.07			0.22
Interaction (Entries x Nitrogen levels)								
SE(m) ±	7.84	16.19			30.38			0.18
C.D. (P=0.05)	22.30	45.38		NS	61.09			0.50
CV (%)		9.37		16.99				6.89

Table –K-18-AST-3 (b) Effect of nitrogen levels on dry matter productivity of promising entries of forage maize

Treatment	DMY (q/ha)						
	NEZ			SZ			
	Imphal	Faizabad	Mean	Hyderabad	Coimbatore	Mean	Overall Mean
A. Entries							
TSFM-15-5	61.63	74.11	67.87	67.90	124.4	96.15	82.01
ADV-6737	59.36	55.91	57.64	66.19	124.7	95.45	76.54
African Tall (NC)	78.88	63.09	70.99	70.05	121.3	95.68	83.33
J-1006 (NC)	76.08	76.10	76.09	66.05	121.7	93.88	84.98
Hybrid COHM-8 (NC)	72.32	58.89	65.61	75.87	120.5	98.19	81.90
SE(m) ±	4.73	1.59		5.98	3.98		
C.D. (P=0.05)	13.45	4.45		2.03	8.02		
B. Nitrogen levels (kg/ha)							
0 (N_1)	50.51	38.64	44.58	52.04	131.6	91.82	68.20
40 (N_2)	69.90	56.04	62.97	65.67	129.3	97.49	80.23
80 (N_3)	73.04	68.95	71.00	74.07	123.5	98.79	84.89
120 (N_4)	76.06	80.29	78.18	82.29	123.6	102.95	90.56
160 (N_5)	78.77	84.18	81.48	72.01	104.6	88.31	84.89
SE(m) ±	4.73	1.59		5.98	3.92		
C.D. (P=0.05)	13.45	4.45		2.03	7.96		
Interaction (Entries x Nitrogen levels)							
SE(m) ±	10.58	3.55		4.55	6.12		
C.D. (P=0.05)	NS	9.96		NS	12.41		
CV (%)		9.38					

Table –K-18-AST-3 (b-1): Interaction effect of nitrogen levels and entries on green forage yield (q/ha) of forage maize (Faizabad)

Nitrogen levels	Entries					
	TSFM-15-5	ADV-6737	African Tall (NC)	J-1006 (NC)	Hybrid COHM-8 (NC)	Mean
0 (N_1)	191.26	169.93	180.67	197.33	174.56	182.73
40 (N_2)	272.84	238.29	258.17	286.17	245.22	260.14
80 (N_3)	332.84	282.71	312.18	351.53	294.03	314.66
120 (N_4)	385.25	320.29	357.57	405.57	336.04	360.92
160 (N_5)	405.41	335.87	371.77	427.26	351.23	378.31
Mean	317.52	269.40	296.07	333.55	280.22	
SE(m) ±	16.19					
C.D. (P=0.05)	45.38					
CV (%)	9.37					

Table –K-18-AST-3 (b-2): Interaction effect of nitrogen levels and entries on dry matter yield (q/ha) of forage maize (Faizabad)

Nitrogen levels	Entries					
	TSFM-15-5	ADV-6737	African Tall (NC)	J-1006 (NC)	Hybrid COHM-8 (NC)	Mean
0 (N_1)	42.46	34.13	37.07	43.61	35.95	38.64
40 (N_2)	61.93	48.85	53.44	64.96	51.01	56.04
80 (N_3)	78.22	58.80	65.87	80.15	61.74	68.95
120 (N_4)	92.07	67.26	77.23	93.66	71.24	80.29
160 (N_5)	95.89	70.54	81.83	98.12	74.51	84.18
Mean	74.11	55.91	63.09	76.10	58.89	
SE(m) ±	3.55					
C.D. (P=0.05)	9.96					
CV (%)	9.38					

Table –K-18-AST-3 (b-3): Interaction effect of nitrogen levels and entries on crude protein (%) content of forage maize (Faizabad)

Nitrogen levels X Entries	ADV-6737	TSFM-15-5	J-1006 (NC)	African Tall (NC)	Hybrid COHM-8 (NC)	Mean
0 (N_1)	6.05	7.25	7.31	6.12	6.10	6.57
40 (N_2)	6.36	7.38	7.47	6.46	6.42	6.82
80 (N_3)	6.56	7.56	7.62	6.63	6.62	6.99
120 (N_4)	6.70	7.76	7.83	6.78	6.74	7.16
160 (N_5)	6.66	7.72	7.78	6.74	6.70	7.12
Mean	6.46	7.53	7.60	6.54	6.51	6.93
SEm ±	0.17					
C.D. (P=0.05)	0.49					
CV%	4.36					

Table K-18-AST-3 (b-4): Interaction effect of nitrogen levels on crude protein yield (q/ha) of promising entries of forage hybrid maize (Faizabad)

Nitrogen levels X Entries	ADV-6737	TSFM-15-5	J-1006 (NC)	African Tall (NC)	Hybrid COHM-8 (NC)	Mean
0 (N_1)	2.06	3.08	3.19	2.27	2.19	2.56
40 (N_2)	3.11	4.57	4.85	3.53	3.27	3.87
80 (N_3)	3.85	5.91	6.11	4.37	4.09	4.87
120 (N_4)	4.50	7.14	7.33	5.24	4.80	5.98
160 (N_5)	4.69	7.40	7.63	5.51	4.99	6.04
Mean	3.64	5.62	5.82	4.18	3.87	4.63
SEm ±	0.12					
C.D. (P=0.05)	0.34					
CV%	4.56					

Table –K-18-AST-3 (c) Effect of nitrogen levels on crude protein content and productivity of entries of forage maize

Treatment	Crude Protein (%)							Crude Protein Yield (q/ha)						
	NEZ			SZ				NEZ			SZ			
	Faiza-bad	Imp-hal	Mean	Coimb-atore	Hydera-bad	Mean	Overall Mean	Faiza-bad	Imp hal	Mean	Hydera-bad	Coimb atore	Mean	Overall Mean
A. Entries														
TSFM-15-5	7.53	7.23	7.38	8.5	6.85	7.68	7.75	5.62	4.44	5.03	4.36	10.7	7.53	6.28
ADV-6737	6.46	7.53	7.00	8.4	6.65	7.53	7.46	3.64	4.54	4.09	4.46	10.5	7.48	5.79
African Tall (NC)	6.54	7.61	7.08	7.4	6.33	6.87	7.18	4.18	6.01	5.10	4.42	8.9	6.66	5.88
J-1006 (NC)	7.60	7.49	7.55	8.5	5.91	7.21	7.86	5.82	5.73	5.78	3.97	10.6	7.29	6.53
Hybrid COHM-8 (NC)	6.51	7.50	7.01	7.5	6.09	6.80	7.17	3.87	5.42	4.65	5.01	9.0	7.01	5.83
SE(m) ±	0.08	0.08		0.25	0.52			0.05	0.34		NS	0.31		
C.D. (P=0.05)	0.21	0.22		0.53	0.18			0.14	0.98		0.33	0.64		
B. Nitrogen levels (kg/ha)														
0 (N_1)	6.57	7.23	6.90	8.7	5.09	6.90	6.90	2.56	3.67	3.12	2.74	11.4	7.07	5.09
40 (N_2)	6.82	7.18	7.00	9.7	5.97	7.84	7.42	3.87	5.04	4.46	3.89	12.6	8.25	6.35
80 (N_3)	6.99	7.54	7.27	7.6	6.86	7.23	7.25	4.87	5.52	5.20	5.06	9.4	7.23	6.21
120 (N_4)	7.16	7.43	7.30	7.1	7.29	7.20	7.25	5.98	5.64	5.81	5.98	8.8	7.39	6.60
160 (N_5)	7.12	7.99	7.56	7.2	6.62	6.91	7.23	6.04	6.27	6.16	4.55	7.5	6.03	6.09
SE(m) ±	0.08	0.08		0.24	0.52			0.05	0.34		0.70	0.29		
C.D. (P=0.05)	0.21	0.22		0.49	0.18			0.14	0.98		0.23	0.6		
Interaction (Entries x Nitrogen levels)														
SE(m) ±	0.17	0.17		0.36	NS			0.12	0.77		0.53	0.41		
C.D. (P=0.05)	0.49	0.49		0.74	0.40			0.34	NS		NS	0.93		
CV (%)	4.36							4.56						

Table –K-18-AST-3 (d) Effect of nitrogen levels on plant height and Leaf: stem ratio of forage maize entries

Treatment	Plant height (cm)				Leaf :stem ratio			
	NEZ		SZ		NEZ		SZ	
	Faizabad	Imphal	Hyderabad	Mean	Faizabad	Imphal	Hyderabad	Mean
A. Entries								
TSFM-15-5	187.02	189.69	196.33	191.01	0.68	0.71	0.36	0.58
ADV-6737	177.33	181.53	178.23	179.03	0.60	0.64	0.47	0.57
African Tall (NC)	182.85	245.67	206.73	211.75	0.65	0.66	0.35	0.55
J-1006 (NC)	190.73	232.58	186.29	203.20	0.68	0.73	0.41	0.61
Hybrid COHM-8 (NC)	179.15	195.18	188.73	187.69	0.61	0.63	0.43	0.56
SE(m) ±	4.39	3.99	5.00		0.01	0.05	0.017	
C.D. (P=0.05)	11.32	11.35	1.70		0.03	NS	0.006	
B. Nitrogen levels (kg/ha)								
0 (N_1)	146.04	181.98	162.61	163.54	0.60	0.67	0.35	0.54
40 (N_2)	173.26	196.13	174.73	181.37	0.63	0.56	0.38	0.52
80 (N_3)	190.55	213.05	195.52	199.71	0.66	0.69	0.41	0.59
120 (N_4)	202.74	225.53	209.28	212.52	0.68	0.69	0.44	0.60
160 (N_5)	204.29	227.96	214.17	215.47	0.67	0.77	0.42	0.62
SE(m) ±	4.39	3.99	5.40		0.01	0.05	0.017	
C.D. (P=0.05)	11.32	11.35	1.70		0.03	NS	0.006	
Interaction (Entries x Nitrogen levels)								
SE(m) ±	9.03	8.93	3.8		0.025	0.12	0.013	
C.D. (P=0.05)	NS	NS	NS		NS	NS	NS	
CV (%)	8.53				6.67			

K-18-AST-4: Effect of nitrogen levels on forage yield of promising entries of forage pearl millet (AVTPM-2-1)

[(Table Reference: K-18-AST-4 (a) to 4 (e)]

Location: NWZ-Ludhiana, Bikaner; SZ-Hyderabad, Mandya

A field trial AVTPM-2 was conducted to find out the response of promising entries of pearl millet to graded doses of nitrogen. The study was undertaken at four locations; two in North West Zone and two in South Zone with two entries (TSFB-15-4 and TSFB-15-8), one national check; Giant Bajra and two zonal checks, i.e., AFB-3 in NWZ and Moti Bajra in SZ. All the entries were tested under four level of nitrogen application i.e. 0, 30, 60 and 90 kg/ha.

The results indicated that, in the North West Zone no entry could surpass the national check or Zonal checks in terms of GFY as well as DFY or CP Yields.

In south zone entry TSFB-15-4 produced maximum GFY and DMY (377.9 q & 88.2 q/ha, respectively), which was significantly higher over the other entry TSFB-15-8 and national as well as Zonal check. However, in terms of CP content and yield, TSFB-15-8 proved superior to checks but remained at par with TSFB-15-8. On the basis of overall mean over the zones, the entry TSFB-15-4 remained at par with Giant Bajra (NC) in terms of GFY. With respect to DMY national check (Giant Bajra) remained the highest yielder. In terms of CP content and yields, both entries proved superior to checks. The growth parameters, herbage yield and crude protein yield increased consistently with increasing level of nitrogen up to 90 Kg N/ha. With the application of 90 kg N/ha, the green forage yield increased by 42.7, 23.0 and 8.1 per cent over 0, 30 and 60 kg N/ha and respective increase with respect to dry matter yield was 84.3, 42.9 and 16.2 per cent.

K-18-AST-4 (a): Effect of nitrogen levels on GFY and DMY (q/ha) of promising entries of forage Pearl millet

Varieties	Green Forage Yield (q/ha)							Dry Matter Yield						
	NWZ			SZ				NWZ			SZ			
	Ludh-iana	Bika-ner	Mean	Hydera-bad	Man-dya	Mean	Overall Mean	Ludh-iana	Bika-ner	Mean	Hydera-bad	Man-dya	Mean	Overall Mean
TSFB-15-8	626.2	499.50	562.9	509.72	209.75	359.7	440.98	88.2	145.35	116.8	116.56	45.54	81.1	98.91
TSFB-15-4	737.1	611.89	674.5	471.72	284.03	377.9	496.52	98.0	113.47	105.7	112.44	64.02	88.2	96.98
Giant Bajra (NC)	641.8	803.36	722.6	400.66	262.77	331.7	488.06	94.9	159.84	127.4	97.60	57.21	77.4	102.39
AFB-3 (ZC-NWZ)	765.1	904.65	834.9					119.0	119.49	119.2				
Moti Bajra (ZC-SZ)				437.52	178.21	307.9	307.87				107.29	39.60	73.4	73.45
SE(m) ±	25.3	39.34		27.22	6.18			4.8	10.99		8.41	1.51		
C.D. (P=0.05)	73.0	113.62		9.38	21.39			13.8	31.75		2.90	5.21		
N Levels (kg/ha)														
0	514.8	593.85	554.3	428.19	163.64	295.9	425.1	74.0	70.82	72.41	99.37	29.88	64.63	68.52
30	670.6	622.99	646.8	453.30	225.90	339.6	493.2	93.9	111.44	102.67	101.39	46.76	74.08	88.37
60	764.0	749.25	756.6	478.41	252.37	365.4	561.0	109.6	156.48	133.04	110.83	57.95	84.39	108.72
90	820.8	853.31	837.1	459.72	292.84	376.3	606.7	122.6	199.41	161.01	111.29	71.79	91.54	126.27
SE(m) ±	25.3	39.34		27.22	6.04			4.8	10.99		8.41	2.13		
C.D. (P=0.05)	73.0	113.62		9.38	17.62			13.8	31.75		2.9	6.21		
Interaction														
SE(m) ±	50.5			18.76	12.15			9.5			5.80	3.98		
C.D. (P=0.05)	NS			NS	NS			NS			NS	NS		
CV (%)	12.6							16.5						

K-18-AST-4 (b): Effect of nitrogen levels on Crude protein Yield (q/ha) & Crude protein content (%) of promising entries of forage Pearl millet

Varieties	Crude Protein yield (q/ha)						Overall Mean	Crude Protein (%)						Overall Mean
	NWZ			SZ				NWZ			SZ			
	Ludh-iana	Bika-ner	Mean	Hydera-bad	Man-dya	Mean		Ludh-iana	Bika-ner	Mean	Hyde-rabad	Man-dya	Mean	
TSFB-15-8	7.4	7.44	7.42	9.9	3.43	6.67	7.04	8.3	4.92	6.61	8.6	7.35	7.98	7.29
TSFB-15-4	7.3	5.79	6.55	10.0	4.70	7.35	6.95	7.4	5.08	6.24	8.8	7.18	7.99	7.12
Giant Bajra (NC)	7.3	6.77	7.04	8.1	3.71	5.91	6.47	7.6	4.53	6.07	8.2	6.37	7.29	6.68
AFB-3 (ZC-NWZ)	9.2	5.29	7.25					7.6	4.56	6.08				
Moti Bajra (ZC-SZ)				8.4	2.55	5.48	5.48				7.8	6.22	7.01	7.01
SE(m) ±	0.4	0.59		0.60	0.06			0.1	0.33		0.23	0.12		
C.D. (P=0.05)	1.2	1.72		0.21	0.20			0.2	0.95		0.08	0.42		
N Levels (kg/ha)														
0	5.2	3.21	4.21	7.4	1.80	4.60	4.40	7.1	4.59	5.85	7.6	5.98	6.79	6.32
30	7.0	5.37	6.19	9.1	3.13	6.12	6.15	7.5	5.10	6.30	8.3	6.60	7.45	6.88
60	8.9	7.14	8.02	10.3	4.08	7.19	7.61	8.1	4.53	6.32	8.9	7.05	7.98	7.15
90	10.2	9.57	9.89	9.5	5.38	7.44	8.66	8.3	4.86	6.58	8.5	7.49	8.00	7.29
SE(m) ±	0.4	0.59		0.60	0.16			0.1	0.33		0.23	0.22		
C.D. (P=0.05)	1.2	1.72		0.21	0.48			0.2	0.95		0.08	0.64		
Interaction														
SE(m) ±	0.8			NS	0.29			0.2			NS	0.40		
C.D. (P=0.05)	NS			0.42	NS			0.5			0.16	NS		
CV (%)	17.7							3.7						

K-18-AST-4 (c): Interaction effect of nitrogen levels and entries on Crude Protein (%) at Mandya

Varieties	Nitrogen Levels (Kg/ha)				
	0	**30**	**60**	**90**	**Mean**
TSFB-15-8	6.30	7.23	7.50	8.37	7.35
TSFB-15-4	6.57	7.13	7.30	7.73	7.18
Giant Bajra (NC)	5.60	6.20	6.80	6.87	6.37
Moti Bajra (ZC-SZ)	5.43	5.83	6.60	7.00	6.22
Mean	**5.98**	**6.60**	**7.05**	**7.49**	**-**
	Varieties	**Nitrogen**		**Interaction**	**Interaction**
				V X N	V X N
SE(m) ±	0.12	0.22		0.44	0.40
C.D. (P=0.05)	0.42	0.64		NS	NS

K-18-AST-4 (d): Interaction effect of nitrogen levels and entries on Crude Protein Yield (q/ha) at Mandya

Varieties	Nitrogen Levels (Kg/ha)				
	0	**30**	**60**	**90**	**Mean**
TSFB-15-8	1.83	2.93	3.80	5.17	**3.43**
TSFB-15-4	2.33	4.07	5.20	7.20	**4.70**
Giant Bajra (NC)	1.73	3.50	4.23	5.37	**3.71**
Moti Bajra (ZC-SZ)	1.30	2.00	3.10	3.80	**2.55**
Mean	**1.80**	**3.13**	**4.08**	**5.38**	**-**
	Varieties	**Nitrogen**		**Interaction**	**Interaction**
				V X N	**V X N**
SE(m) ±	0.06	0.17		0.33	0.29
C.D. (P=0.05)	0.20	0.48		NS	NS

K-18-AST-4 (e): Effect of nitrogen levels on growth parameters of promising entries of forage Pearl millet

Varieties	GFY (q/ha/day)			Plant Population/m^2			Plant Height (cm)						Leaf Stem Ratio					
	Ludh-iana	Bika-ner	Mean	Ludh-iana	Bika-ner	Mean	Ludh-iana	Bika-ner	Mean	Hydera-bad	Man-dya	Mean	Ludh-iana	Bika-ner	Mean	Man-dya	Hydera-bad	Mean
TSFB-15-8	8.1	7.57	7.84	42.2	5.17	23.69	204.7	144.00	174.35	198.72	173.48	186.10	0.36	0.49	0.43	0.39	0.19	0.29
TSFB-15-4	8.9	9.27	9.09	44.6	6.00	25.30	174.9	103.25	139.08	189.82	194.18	192.00	0.76	0.70	0.73	0.44	0.20	0.32
Giant Bajra (NC)	8.3	12.17	10.24	34.0	17.67	25.84	230.0	168.20	199.10	191.11	191.20	191.16	0.61	0.42	0.52	0.47	0.20	0.34
AFB-3 (ZC-NWZ)	10.8	13.71	12.26	52.8	17.25	35.03	281.8	172.15	226.98				0.69	0.49	0.59			
Moti Bajra (ZC-SZ)										197.95	192.65	195.30				0.44	0.21	0.33
SE(m) ±	0.3	0.60		1.0	0.54		4.2	5.69		NS	3.53		0.01	0.04		0.01	0.02	
C.D. (P=0.05)	1.0	1.72		3.0	1.57		12.3	16.43		3.61	12.21		0.03			0.04		
N Levels (kg/ha)																		
0	6.7	9.00	7.85	40.3	10.17	25.24	176.9	118.80	147.85	178.12	127.36	152.74	0.51	0.58	0.55	0.29	0.22	0.26
30	8.7	9.44	9.07	42.5	11.58	27.04	221.7	134.10	177.90	195.58	171.60	183.59	0.55	0.47	0.51	0.36	0.21	0.29
60	10.0	11.35	10.68	43.9	11.83	27.87	238.1	156.47	197.29	200.22	211.39	205.81	0.65	0.53	0.59	0.51	0.20	0.36
90	10.7	12.93	11.82	46.9	12.50	29.70	254.7	178.23	216.47	203.69	241.16	222.43	0.72	0.52	0.62	0.59	0.18	0.39
SE(m) ±	0.3	0.60		1.0	0.54		4.2	5.69		10.49	4.62		0.01	0.04		0.01	NS	
C.D. (P=0.05)	1.0	1.72		3.0	1.57		12.3	16.43		3.61	13.45		0.03			0.04		
Interaction																		
SE(m) ±	0.7			2.1			8.5			7.23	8.74		0.02			0.02		
C.D. (P=0.05)	NS			NS			24.5			NS	NS		0.06			0.07		
CV (%)	13.4			3.0			6.6						6.1					

FORAGE CROP PROTECTION KHARIF-2018

PPT 1: MONITORING OF DISEASES AND INSECT PESTS IN KHARIF FORAGE CROPS ECOSYSTEM

During *kharif* 2018, study of population dynamics of important diseases and insect pest in *kharif* forages (sorghum, maize, bajra, cowpea and Bajra X Napier hybrids) was carried out at various locations. Location and crop wise observations are given below.

Location - Ludhiana

PEARL MILLET

Leaf Blast: Leaf blast of Pearl millet on variety FBC-16 started appearing in the first week of August (Table Ludhiana PPT-1a). Disease progressed at alarming rate during the crop season till end of September with favourable temperature range of 25.6-32.4^{0}C and Relative humidity of 73-79 percent. Due to adequate showers, the disease development was very fast with maximum disease severity of 57 percent.

Downy mildew: The incidence of downy mildew was observed on FBC-16 from 1st week of August upto end of September. The incidence of downy mildew increased at very fast rate with maximum disease incidence of 33.5 percent which is favoured by optimum temperature range of 25.6-32.4^{0}C and relative humidity (73-79 %) along with heavy rainfall (Table Ludhiana PPT-1a).

SORGHUM

Grey leaf spot: Grey leaf spot of sorghum appeared on SL-44 variety in the first week of August (Table Ludhiana PPT-1a). Disease progressed slowly upto last week of September with 29.5 percent disease severity. During this period, 68.2 to 146.8 mm rainfall and moderate temperatures of 25.6-32.4^{0}C with mean relative humidity of 67-79 percent favoured the disease development.

Zonate leaf spot: The occurrence of zonate leaf spot on SL-44 variety of sorghum was very less i.e. 10.0 per cent and also it appeared late in the season (Table Ludhiana PPT-1a).

Anthracnose: Anthracnose of sorghum on SL-44 variety was observed in the last week of July (Table Ludhiana PPT-1a). Disease progressed slowly till end of August and further progressed at rapid rate upto last week of September. Maximum disease severity recorded was 49.5 percent with mean rainfall of 107.5 mm, mean temperatures and mean relative humidity of 25.6 to 32.4^{0}C and more than 79 percent respectively.

MAIZE

Leaf blight: Disease appeared in the end of July on J-1006 variety and progressed slowly upto end of September with severity of 55.0 percent. Thereafter, as the crop reached physiological maturity, disease progressed at a steady pace (Table Ludhiana PPT-1a).

Table Ludhiana PPT-1a: Percent severity of diseases associated with pearl millet, maize and sorghum

Crop/ variety	Name of disease	Percent Disease Incidence / Severity (Weekly interval)									
		25.7. 18	1.8. 18	8.8. 18	15.8. 18	22.8. 18	29.8. 18	5.9. 18	12.9. 18	19.9. 18	26.9. 18
Sorghum/ SL-44	Anthracnose	5.0*	9.3	11.5	18.7	25.6	29.7	32.8	39.4	45.3	49.5
	Grey leaf spot			2.7*	7.4	10.9	14.5	19.0	22.8	26.0	29.5
Maize/ J-1006	Leaf blight		9.8*	15.5	20.3	24.1	30.5	37.0	44.0	49.5	55.0
Bajra/ FBC 16	Leaf Blast			11.0*	19.5	27.7	32.8	39.0	43.3	51.7	57.0
	Downy mildew			5.5*	10.0	14.3	21.0	23.6	27.0	30.5	33.5

*** Date of appearance**

Incidence of different insect pest in *Kharif* forages at Ludhiana:

Pest Population in different *kharif* forages was recorded at the time of pest appearance in different meteorological weeks (Table Ludhiana PPT-1b). The population of sorghum shoot fly started appearing in the month of June (25th SMW) and it was recorded on young seedlings of sorghum entries. The attack of this pest starts after one week of sowing and was reported to be in range of 10-75 % deadhearts in sorghum across different meteorological weeks. Temperature in the range of 30-35^{0}C and high RH were conducive for the population build up as observed during growth season of the crop. The stem borer population also started appearing in the month of June and peak population was observed in the month of June-July in both maize and sorghum with slightly higher pest incidence on sorghum. The sporadic attack of rice grasshopper in pearl millet, Bajra X Napier hybrids was recorded in the month of July. In Bajra X Napier hybrids, minor attack of cotton grey weevil was also recorded during rainy and post rainy season. The spotted pod borer, *Maruca vitrata* was observed in different entries of cowpea. It was recorded in the month of September.

Table Ludhiana PPT-1b: Incidence of different insect-pest in *Kharif* forages

Name of Insect	Crop	Observation									
		18/6/18	**25/6/18**	**2/7/18**	**9/7/18**	**16/7/18**	**23/7/18**	**30/7/18**	**6/8/18**	**13/8/18**	**20/8/18**
Shoot fly (% dead hearts)	Sorghum	15	23	40	51	75	64	45	23	20	10
Maize borer (% deadhearts)	Sorghum	6	10	12	14	18	19	16	14	10	6
Maize borer (% dead hearts)	Maize	10	12	14	18	14	13	12	13	14	8
Std Met. Week		**16/7/18**	**23/7/18**	**30/7/18**	**6/8/18**	**13/8/18**	**20/8/18**	**27/8/18**	**3/9/18**	**10/9/18**	**17/9/18**
Grasshopper (adults/10 plants)	Pearl millet	2	4	3	4	4	3	3	2	1	-
Grasshopper (adults/5 plants)	BajraXNapier hybrids	3	4	5	5	6	4	3	3	2	-
Hairy caterpillar (larvae/plant)	Cowpea	3	6	8	12	16	16	14	18	7	6
Cowpea aphid (adults per twig)	Cowpea	-	7	12	13	12	14	16	16	18	-
Std Met. Week		**6/8/18**	**13/8/18**	**20/8/18**	**27/8/18**	**3/9/18**	**10/9/18**	**17/9/18**	**24/9/18**	**1/10/18**	**8/10/18**
Spotted pod borer (larvae/ 5 pod)	cowpea	2	3	4	5	5	6	7	6	-	-

Location: Dharwad

Seasonal incidence of insect pest indicated that aphid (*Aphis craccivora*) population was active during 30th to 35th Standard Meteorological Week (SMW) and reached peak population of 610.2 on 33rd SMW i.e. during second week of August. Hairy caterpillar (*Spilosoma oblique*) was highest of 5.4/plant on 30th SMW i.e. during last week of July. Cowpea yellow mosaic virus was observed on cowpea and highest incidence of 42.80% was noticed during 32nd SMW i.e. first week of August (Table Dharwad PPT-1).

Table Dharwad PPT-1: Monitoring of important insect pests and diseases in *Kharif* cowpea

Standard Meteorological Week	Period	Cowpea Aphid *Aphis craccivora* (No./plant)	Hairy caterpillar (No./plant) *Spilosoma obliqua*	Cowpea yellow mosaic virus (%)
27	02 Jul –08 Jul	0.0	0.0	0.0
28	09 Jul – 15 Jul	0.0	0.0	0.0
29	16 Jul – 22 Jul	0.0	2.4	8.2
30	23 Jul – 29 Jul	30.2	5.4	16.4
31	30 Jul – 05 Aug	308.4	5.2	30.8
32	06 Aug – 12 Aug	522.4	1.0	38.0
33	13 Aug – 19 Aug	610.2	0.4	10.2
34	20 Aug – 26 Aug	390.4	0.2	5.0
35	27 Aug – 02 Sep	52.2	0.0	0.0
36	03 Sep – 09 Sep	0.0	0.0	0.0

Location- Palampur

At Palampur during *Kharif* 2018, wilt-root rot complex (65%) and leaf sports & blight (40%) were the major diseases of cowpea, whereas, pod borer and aphids were also observed with mild intensity (7 and 9%, respectively). In maize, leaf bights (18%) and Banded leaf and sheath blight (7%) were the major diseases along with stem borer incidence of 3%. Sorghum was severely infected with zonate leaf spot having 55 per cent disease severity. Leaf blight (40%) in Bajra was observed as major disease (Table Palampur PPT-1).

Table Palampur PPT-1: Seasonal occurrence of the insect pests and diseases on kharif forage crops

Crop	Diseases and insect pest	Severity /incidence(%) recorded on different dates									Maximum
		25.06.18	02.07.18	09.07.18	16.07.18	23.07.18	30.07.18	06.08.18	13.08.18	20.08.18	
Cowpea	Wilt/root rot (*Fusarium, Rhizoctonia)*	10	25	40	65	-	-	-	-	-	65
	Leaf spot, Phytophthora Blight Anthracnose and blight (*Ascochyta, Colletotrichum* and *Phyllostricta*)	-	-	10	12	20	30	40	-	-	40
	CMV	-	-	-	-	-	-	2	3	5	5
	Pod borer	-	-	-	-	-	-	-	3	7	7
	Aphids	-	-	-	-	-	-	3	5	9	9
Maize	Blight (*Helminthosprium maydis and H. turcicum)*	-	-	-	-	-	5	10	15	18	18
	Banded leaf & sheath blight (*Rhizoctonia)*	-	-	-	2	3	5	6	7	7	7
	Maize stem borer	-	-	-	-	-	2	2	2	3	3
Sorghum	Zonate leaf spot (*Gloeocercospora sorghi)*	-	-	-	5	10	25	30	40	55	55
Bajra	leaf blight *(Pyricularia*)	-	-	-	7	10	15	20	25	40	40

Location: Rahuri

During *kharif* 2018, very meager incidence/infestation of insect-pests and diseases was noticed throughout the crop period at Rahuri. The incidence of stem borer was negligible on maize (< 5%). In cowpea, low to moderate level of infestation of aphids per plant (4.67 to 15.67/plant) was noticed. Similarly, jassids population was also observed at low level (1.33 to 2.67/leaf). The population of coccinellids was from 0.67 to 2.67/plant on cowpea during the infestation of aphids. The symptom of yellow mosaic virus was found low to moderate throughout the crop period. Defoliators were not observed throughout the crop period. In pearl millet insect-pests and diseases were not observed (Table Rahuri PPT-1).

Table Rahuri PPT-1: Seasonal occurrence of the insect pests and diseases on kharif forage crops

Date	Maize		Bajra	Cowpea				Coccinellid Predators
	Stem borer Score	Leaf spot (%)	Stem fly damage (%)	Aphids / plant	Jassids / plant	Defoliators/ m^2	YMV score	
20/7/18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27/7/18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3/8/18	1.33	0.00	0.00	4.67	0.00	0.00	0.00	0.0
10/8/18	1.33	0.00	0.00	7.00	1.33	0.00	1.00	0.67
17/8/18	1.67	0.00	0.00	10.33	1.33	0.00	1.00	1.00
24/8/18	1.67	5.0	0.00	15.67	2.00	0.00	1.67	1.67
31/8/18	2.00	7.5	0.00	12.00	2.00	0.00	3.00	2.33
7/9/18	2.00	8.00	0.00	9.67	2.67	0.00	3.00	2.67
14/9/18	2.00	8.00	0.00	13.67	2.00	0.00	3.00	2.00

Location: Bhubaneswar

At Bhubaneswar during *Kharif* 2018, Wilt-root rot complex (28%) and leaf spots (30%) and Yellow mosaic virus (22%) were the major diseases of cowpea, whereas leaf defoliators and aphids were also observed with incidence of 31% and 15% respectively. In Maize, leaf bight (20%) and Banded leaf and sheath blight (29%) were the major diseases along with stem borer incidence of 7%. Bajra was infected with leaf blight having 24 percent severity and foliage feeder incidence of 14%. In Rice bean, incidence of leaf defoliators (24%) and leaf spot (18%), root rot (44%) and Yellow mosaic virus (21%) was observed (Table Bhubaneswar PPT-1).

Table Bhubaneswar PPT-1: Seasonal occurrence of the insect pests and diseases on kharif forage crops

Crop	Diseases and insect pest	Severity/incidence (%) recorded on different dates									Maximum (%)
		12.08.18	18.08.18	25.08.18	01.09.18	08.09.18	15.09.18	24.09.18	01.10.18	08.10.18	
Cowpea	Wilt/root rot (*Fusarium, Rhizoctonia)*	-	11	20	28	-	-	-	-	-	28
	Leaf spot (*Cercospora* sp.)	-	3	6	12	18	24	30	-	-	30
	Yellow mosaic virus	-	-	-	-	-	4	8	14	22	22
	Aphids	-	-	-	-	-	-	5	11	15	15
	Leaf defoliators			4	8	12	18	20	25	31	31
Maize	Blight (*Helminthosprium maydis and H. turcicum)*	-	-	-	-	-	3	6	14	18	20
	Banded leaf & sheath blight (*Rhizoctonia solani)*	-	-	-	3	7	11	16	20	24	29
	Maize stem borer	-	-	-	-	2	4	5	6	7	7
Rice bean	Leaf defoliators			3	7	14	24				24
	Leaf spot			3	5	10	14	18			18
	Root rot		7	15	22	30	38	44			44
	Yellow mosaic virus	-	-	-	-	-	5	8	14	21	21
Bajra	Leaf blight *(Pyricularia*)	-	-	-	-	3	6	14	15	24	24
	Foliage feeder		3	6	10	14					14

Location: Jhansi

At Jhansi during Kharif 2018, defoliators (35 %) and aphids (15 %) were major insect-pests of cowpea. No major incidence of any disease in cowpea was observed. In Maize, leaf blight (55 %) was the major disease along with leaf folder damage of 15%. Bajra was severly infected with leaf blast with severity of as high as 60% and defoliators damage of 20%. Sorghum was severely infected with zonate leaf spot having 55 per cent disease severity (Table Jhansi PPT-1).

Table Jhansi PPT 1: Seasonal occurrence of the insect pests and diseases on kharif forage crops

Crop	Diseases and insect pest		Severity/incidence/damage (%) of diseases and insect-pests recorded on different dates										
		Date of observation	25/7/18	2/8/18	9/8/18	16/8/18	23/8/18	30/8/18	6/9/18	13/9/18	20/9/18	27/9/18	Maximum
Cowpea	Defoliators		2	10	20	25	30	35	-	-	-	-	35
	Aphids		-	5	5	10	15	5	-	-	-	-	15
Maize	Leaf folder		5	8	10	10	15	5	-	-	-		15
	Leaf blight		-	-	-	5	15	20	30	35	40	55	55
Pearl millet	defoliators		5	10	15	15	20	10	-	-	-	-	20
	Blast		-	-	5	15	25	25	35	40	55	60	60
Sorghum	Zonate leaf spot		-	-	-	-	5	15	30	40	50	55	55

PPT-2: EVALUATION OF KHARIF BREEDING MATERIALS FOR THEIR RESISTANCE TO DISEASES AND INSECT-PESTS UNDER NATURAL CONDITIONS

In these trials, various contributed entries along with national and zonal checks were screened for their resistance to diseases and insect pests under natural conditions. The trial wise and entry wise observations are given below.

IVTPM – IVT in Pearl Millet: (Table: Disease –pest resistance in IVT Pearl Millet trial)

At Rahuri, in IVTPM, no insect-pests and disease infestation/ incidence was noticed on pearl millet.
At Ludhiana, All the entries showed moderately resistant disease reaction to leaf blast except FBL-1 and ADV160061 which were resistant. Downy mildew incidence was very less in all the entries except JKFBH 1521 and Giant bajra. All the entries showed low incidence of grasshopper per ten plants and its range was recorded to be 0.66 - 4.00.
At Bhubaneswar, 13 entries of pearl millet were evaluated under IVT programme and out of those ADV160061, FBL-2, TSFB-17-7 and AFB-38 were resistant to both leaf blast as well as defoliators. Other entries were moderately resistant to leaf blight and defoliators. However the entries RBB-10 and FBL-3, showed susceptible reaction during the season.
At Jhansi, entries FBL-1, FBL-2, AFB-38, K-25 and JPM-18-3 were moderately resistant to leaf blast and rest were in moderately susceptible to susceptible category.

AVTPM-2 Pearl Millet: (Table: Disease –pest tolerance in AVT-2 Pearl Millet trial)

At Ludhiana, All entries showed moderately resistant reaction to leaf blast. Downy mildew incidence was very less in all the entries. All the entries showed very less incidence of grasshopper per ten plants and its range recorded was from 0.33 - 1.33.

AVTPM-2 (Seed) Pearl Millet: (Table: Disease –pest tolerance in AVT-2 (Seed) Pearl Millet trial)
At Ludhiana, All entries showed moderately resistant disease reaction to leaf blast. Downy mildew incidence was very less. All the entries showed less incidence of grasshopper per ten plants and its range recorded was from 0.66-1.66.

Table: Disease –pest tolerance in IVT Pearl Millet trial

S. N.	Entry	Ludhiana						Bhubaneswar				Jhansi	
		Downy mildew incidence (%)	Disease reaction	Leaf blast severity (%)	Disease reaction	Grasshoppers incidence/ 10 plants	*Pyrilla* incidence/plant	Leaf blast severity (%)	Disease Reaction	Leaf defoliators (No./10 plants)	Reaction	Leaf blast severity (%)	Disease Reaction
1	FBL - 1	8.0	R	7.0	R	1.00	0	30	R	3.6	MR	34.81	MR
2	ADV160061	8.0	R	10.0	R	2.33	0.50	34	R	2.6	R	50.00	MS
3	FBL - 2	9.0	R	22.0	MR	1.33	0.33	32	R	2.3	R	38.52	MR
4	Star chandra	12.5	MR	17.5	MR	4.00	0.66	50	MR	3.6	MR	51.11	MS
5	RBB - 10	8.5	R	16.4	MR	1.33	0.66	72	S	4.6	S	71.48	S
6	TSFB - 17 - 7	11.5	MR	23.9	MR	3.00	0.33	30	R	2.0	R	55.93	MS
7	Giant Bajra (NC)	15.5	MR	28.7	MR	2.33	0.50	36	R	4.0	S	46.30	MS
8	BAIF Bajra 1 (ZC-CZ)											49.63	MS
8	AFB – 3 (ZC-NWZ)	11.0	MR	19.8	MR	0.66	0.33						
8	APFB - 9 – 1 (ZC-NEZ)							52	MR	4.3	S		
9	AFB - 38	9.0	R	17.0	MR	1.00	0.66	32	R	2.3	R	37.04	MR
10	K - 25	7.5	R	20.0	MR	1.66	0.33	52	MR	3.6	MR	39.26	MR
11	JPM - 18 - 3	7.0	R	18.0	MR	4.00	0.50	50	MR	3.6	MR	34.81	MR
12	FBL - 3	12.0	MR	24.7	MR	1.33	0.66	72	S	4.6	S	74.81	S
13	JKFBH 1521	16.0	MR	14.6	MR	5.00	1.00	36	R	3.3	MR	46.30	MS

***At Rahuri, in IVTPM, no insect-pests and disease infestation/ incidence was noticed**

Table: Disease –pest tolerance in AVT Pearl Millet trial (AVTPM-2)

S. N.	Entry	Ludhiana					
		Downy mildew incidence (%)	Disease reaction	Leaf blast severity (%)	Disease reaction	Grasshoppers incidence/10 plants	Pyrilla incidence/plant
1	TSFB - 15 - 8	10.0	R	16.9	MR	1.33	0.66
2	AFB – 3 (ZC-NWZ)	9.5	R	12.5	MR	0.66	0.33
3	Giant Bajra (NC)	12.0	MR	19.7	MR	0.66	0.66
4	TSFB - 15 - 4	8.0	R	29.0	MR	0.33	0.33

Table: Disease –pest tolerance in AVT Pearl Millet (AVTPM-2 (Seed))

S. N.	Entry No.	Ludhiana					
		Downy mildew incidence (%)	Disease reaction	Leaf blast severity (%)	Disease reaction	Grasshoppers incidence/10 plants	*Pyrilla* incidence/plant
1	TSFB - 15 - 8	9.0	R	18.0	MR	1.66	1.00
2	AFB – 3 (ZC-NWZ)	9.7	R	10.7	MR	1.00	0.66
3	Giant Bajra (NC)	10.5	MR	21.3	MR	0.66	0.66
4	TSFB - 15 - 4	7.3	R	25.0	MR	0.66	0.66

IVTC – IVT in cowpea

At Rahuri, in IVTC, All the entries showed less than 10 aphids/plant throughout the crop period. It indicate that all the entries were less susceptible to aphids. All the entries were resistant except HFC-16-3 and UPC-5286 which were susceptible and highly susceptible respectively to yellow mosaic virus.

At Palampur, in IVTC, all the entries were found either susceptible or highly susceptible to wilt root rot complex.

At Ludhiana, in IVTC, UPC-1801, MFC-16-1, PFC 31, Bundel Lobia-2, RFC-1-(RCC-46), HFC-16-3, Bundel Lobia-1 and UPC-5286, were moderately resistant to cowpea mosaic virus and rest entries were susceptible. In cowpea the attack of bihar hairy caterpillar was recorded to be in range of 1.00-2.33. There was no statistical difference in population built up of bihar hairy caterpillar across different entries. Similarly, the population of spotted pod borer showed non-significant differences in population buildup and it varied from 2.33-3.33 in all the entries.

At Bhubaneswar, in IVTC, UPC-1801, MFC-16-1 and UPC-5286 were resistant to both Root rot and yellow mosaic virus (YMV) and others were moderately resistant to Root rot. However the entries PFC 31, RFC-1 (RCC-46) and C-150 expressed susceptibility to YMV. The number of cowpea aphid varies 6.7 to 17.7 across the entries and damage by defoliators were less and not significant among the entries.

At Jhansi, all the entries showed intermediate level of resistance against defoliators as compared to national checks.

AVT-1 cowpea: (Table: Disease –pest tolerance in AVT Cowpea trial (AVTC-1))

At Palampur, In case of AVTC-1 trial all the 9 entries each were found highly susceptible to root-rot/wilt complex.

Table: Disease –pest tolerance in IVT Cowpea trial

Sr. No.	Entries	Ludhiana				Palampur		Bhubaneswar					
		Percent mosaic incidence	Disease reaction	Bihar hairy caterpillar/ 5 plants	Spotted pod borer (larvae / 5pods)	Root rot/wilt/collar rot complex							
						Incidence (%)	Disease Reaction	Root rot %	Disease reaction	Mosaic incidence (%)	Disease reaction	Cowpea aphid (No./top leaf with 10 cm petiole	Leaf defoliators (No./ 10 plant)
1	UPC - 1801	16.4	MR	1.00	2.33	60	HS	13.0	R	34	R	11.3	1.8
2	MFC - 16 - 1	26.9	MR	1.33	2.66	50	S	8.0	R	30	R	10.7	2.3
3	RFC - 2 - (RCC - 48)	66.5	HS	1.66	3.00	95	HS	11.0	R	52	MR	8.7	2.6
4	PFC 31	17.6	MR	2.00	3.33	95	HS	15.0	R	66	S	12.0	3.3
5	UPC – 622 (ZC-HZ)					50	S						
5	UPC – 628 (ZC-NEZ)							12.0	R	50	MR	9.7	3.0
5	Bundel Lobia – 2 (ZC-NWZ)	15.4	MR	1.66	2.66								
6	RFC - 1 - (RCC - 46)	17.7	MR	2.33	3.00	90	HS	20.0	MR	62	S	11.3	3.6
7	TSFC - 17 - 3	48.9	S	1.00	2.66	70	HS	22.0	MR	54	MR	17.7	3.0
8	C - 150	35.6	S	1.33	3.33	50	S	24.0	MR	70	S	14.3	3.6
9	HFC - 16 - 3	28.4	MR	2.00	3.00	45	S	10.0	R	54	MR	12.6	2.3
10	Bundel Lobia – 1 (NC)	26.8	MR	1.66	2.66	80	HS	22.0	MR	42	R	14.3	3.6
11	UPC – 5286 (NC)	18.3	MR	1.33	2.33	60	HS	9.0	R	34	R	6.7	2.0

Table: Disease –pest tolerance in IVT Cowpea trial cont.

Sr. No.	Entries	Rahuri			Jhansi	
		Av. No. of aphids/plant	Score rating of YMV	Disease reaction	Cowpea defoliator Resistance (%)	Resistance level
1	UPC - 1801	3.45	1.33	R	15.20	Intermediate
2	MFC - 16 - 1	5.23	2.33	R	15.72	Intermediate
3	RFC - 2 - (RCC - 48)	3.56	2.45	R	16.09	Intermediate
4	PFC 31	3.89	2.44	R	16.01	Intermediate
5	UPC – 9202 (ZC-CZ)	4.00	1.45	R	15.06	Intermediate
6	RFC - 1 - (RCC - 46)	6.00	2.44	R	15.99	Intermediate
7	TSFC - 17 - 3	6.11	2.11	R	15.48	Intermediate
8	C - 150	5.34	2.33	R	15.77	Intermediate
9	HFC - 16 - 3	8.00	4.89	S	16.21	Intermediate
10	Bundel Lobia – 1 (NC)	5.45	2.00	R	16.00	Intermediate
11	UPC – 5286 (NC)	6.45	5.00	HS	15.85	Intermediate
	CD (p=0.05)	1.94				
	SE±	0.68				

Table: Disease –pest tolerance in AVT Cowpea trial (AVTC-1)

S.N.	Entry Code	Palampur		
		Root rot/wilt/collar rot complex		
		Incidence (%)	Disease Ratting	Disease Reaction
1	UPC – 622 (ZC-HZ)	80	9	HS
2	PFC - 12	95	9	HS
3	C - 217	85	9	HS
4	MFC - 16 - 3	75	9	HS
5	TSFC - 16 - 1	95	9	HS
6	UPC – 5286 (NC)	80	9	HS
7	MFC - 16 - 4	60	9	HS
8	Bundel Lobia – 1 (NC)	80	9	HS
9	HFC - 16 - 1	70	9	HS

IVTM – IVT in Maize (Table: Disease –pest tolerance in IVT Maize trial)

At Rahuri, in IVTM, all the entries were found resistant to stem borer. For leaf blight, all the entries were resistant except BAIF Maize-6, which was found susceptible to leaf blight.

At Palampur, in IVTM, all the entries were moderately resistant except IMHBG-18KF-1 and AH-8070, which were moderately susceptible.

At Ludhiana, in IVTM, Vivek Maize Hybrid VMH 45 & IMHBG-18KF-1 showed resistant disease reaction and rest of entries gave moderately resistant reaction to leaf blight of maize. All the entries exhibited per cent deadhearts in range of 2.00- 5.66% with no significant variation amongst different test entries. Numerically higher per cent of deadhearts were recorded in ADV-6781 and lowest in TNFM 131-9, MF-2018, IMHBG-18KF-2 and KDFM-3.

At Bhubaneswar, out of 22 IVTM entries evaluated, TNFM 131-9, PFM-9, PFM-10, HPFM -9, ADV 6781, IMHBG - 18KF-1, AH 8071R, TSFM-16-10, AH 8070, IMHBG-18KF-2, were found resistant to both leaf blight and banded leaf and sheath blight (BLSB) disease. Other entries showed moderate resistance. However the entries viz. DFH-1, J-1006, MF-2018 were susceptible to BLSB and leaf blight whereas SCH-201 expressed moderate resistant to BLSB, but susceptible reaction to leaf blight disease.

At Jhansi, entries DFH-1, ADV-6781, AFH–6, MF–2018, Star-111, AH-8070, CMVLBC-2 and KDFM-3 were moderately resistant to leaf blight and rest of the entries were in susceptible to moderately susceptible category.

Table: Disease –pest tolerance in IVT Maize trial

S. N.	Entry	Rahuri			Palampur		Ludhiana				Bhubaneswar				Jhansi	
		Mean leaf injury score/plant	Leaf blight score	Leaf blight Reaction	Leaf blight severity (%)	Disease Reaction	Leaf blight severity (%)	Disease reaction	Grasshopper incidence/ 10 plants	% deadhearts	Leaf blight severity (%)	Disease Reaction	Banded Leaf and Sheath Blight Severity (%)	Disease Reaction	Leaf blight severity (%)	Disease Reaction
1	TNFM 131 - 9	1.80	1.45	R	20	MR	21.0	MR	1	2.00	32	R	16.7	R	59.33	S
2	PFM - 9	1.93	1.00	R	20	MR	16.0	MR	1	2.33	34	R	27.8	R	52.00	MS
3	Vivek Maize Hybrid VMH 45	1.87	1.22	R	10	MR	7.3	R	1	2.33	56	MR	38.8	MR	60.00	S
4	PFM-10	2.00	1.00	R	10	MR	18.6	MR	2	3.00	30	R	21.1	R	52.00	MS
5	HPFM - 9	1.93	1.22	R	15	MR	25.0	MR	1	3.66	32	R	18.8	R	54.67	MS
6	DFH 1	1.60	1.00	R	-	-	-	-	0	2.33	72	S	72.2	S	44	MR
7	ADV 6781	2.00	1.33	R	10	MR	21.5	MR	0	5.66	30	R	30.0	R	45.33	MR
8	AFH – 6	2.07	1.00	R	-	-	18.2	MR	1	2.33	52	MR	51.1	MR	42	MR
9	IMHBG - 18KF - 1	2.20	1.00	R	30	MS	3.0	R	0	2.66	32	R	52.2	R	55.33	MS
10	BAIF Maize - 6	1.87	4.00	S	10	MR	22.5	MR	2	3.00	54	MR	50.00	MR	55.33	MS
11	CO HM - 8 (NC-Hybrid)	1.73	1.44	R	10	MR	15.0	MR	1	3.00	50	MR	41.10	MR	58.67	MS
12	J – 1006 (NC)	1.87	1.00	R	10	MR	12.0	MR	1	2.33	72	S	73.30	S	60.67	S
13	AH 8071R	2.00	1.00	R	10	MR	14.6	MR	1	3.00	30	R	27.7	R	60.00	S
14	MF - 2018	2.00	1.00	R	10	MR	13.3	MR	1	2.00	74	S	74.40	S	45.33	MR
15	Star 111	1.80	1.00	R	15	MR	11.0	MR	1	2.33	52	MR	51.10	MR	48.00	MR
16	TSFM - 16 - 10	2.00	1.00	R	15	MR	28.7	MR	1	4.00	30	R	16.60	R	60.00	S
17	SCH 201	1.87	1.00	R	10	MR	18.0	MR	1	3.00	74	S	52.20	MR	57.33	MS
18	African Tall (NC)	1.80	1.00	R	10	MR	17.6	MR	0	2.66	52	MR	50.00	MR	58.67	MS
19	AH 8070	1.87	1.00	R	30	MS	11.3	MR	2	2.33	32	R	31.10	R	46.67	MR
20	IMHBG - 18KF - 2	1.60	1.00	R	15	MR	12.7	MR	2	2.00	36	R	27.70	R	56.00	MS
21	CMVLBC 2	2.07	1.00	R	25	MR	19.0	MR	1	2.33	52	MR	28.80	R	42.67	MR
22	KDFM - 3	2.00	1.00	R	10	MR	16.0	MR	1	2.00	50	MR	51.10	MR	46.67	MR

AVTM Maize trial (AVTM)

Combined AVTM-1 & AVTM-2

At Bhubaneswar during *Kharif*, 2018, eight entries of combined 1st and 2nd AVT in forage maize were evaluated out of which ADV-6737, IMH-1527, J-1006 and DMRH-1410 were found resistant to both leaf blight and banded leaf and sheath blight and others were moderately resistant except CO HM-8 which was susceptible to both leaf blight and banded leaf and sheath blight.

Table: Disease –pest tolerance in Combined AVT (1&2) Maize trial

S.N.		Bhubaneswar			
	Entry Code	**Leaf blight Severity (%)**	**Disease Reaction**	**Banded Leaf and Sheath Blight Severity (%)**	**Disease Reaction**
1	ADV-6737	30	R	16.6	R
2	TSFM-16-3	72	MR	50.0	MR
3	IMH-1527	34	R	28.8	R
4	CO HM-8 (NC-Hybrid)	74	S	73.3	S
5	TSFM-15-5	58	MR	54.4	MR
6	J-1006 (NC)	32	R	30	R
7	African Tall (NC)	52	MR	48.8	MR
8	DMRH-1410	34	R	31.1	R

VT-Setaria

At Palampur 6 entries of Setaria were evaluated for leaf spot and all the entries were found Resistant. The disease on these entries was very low i.e less than 10 percent.

Table: Disease –pest tolerance in VT-Setaria trial

S.N.	**(Palampur)**				**Yield (q/ha)***
	Entry Code	**Leaf spot**			
		Severity (%)	**Disease Rating**	**Disease Reaction**	
1	PSS-1	2	1	R	835.3
2	S-92	5	3	MR	671.3
3	S-4	2	1	R	755.6
4	S-25	1	1	R	881.2
5	S-18	7	3	MR	543.1
6	S-6	7	3	MR	517.1

VT-BN:

At Palampur, 9 entries of BN were evaluated for leaf spot and all the entries were found Resistant. The disease on these entries was very low i.e. less than 10 per cent.

At Ludhiana, no disease was observed. Leaf damage by grasshopper was observed in some entries, however, damage level was non-significant.

Table: Disease –pest tolerance in VT-BN trial

S.N.	Palampur				Yield (q/ha) *
	Entry Code	Leaf spot			
		Severity (%)	Disease Rating	Disease Reaction	
1	TNCN 1280	7	3	MR	406.6
2	BNH-14	4	1	R	650.0
3	CO (BN) 5 (NC)	5	1	R	568.6
4	BNH-22	8	3	MR	345.5
5	PBN 351	1	1	R	626.6
6	BNH-12	3	1	R	414.6
7	NB-21 (NC)	4	1	R	505.3
8	BNH-11	4	1	R	557.3
9	CO-3 (NC)	2	1	R	520.0

PPT-21: INTEGRATED MANAGEMENT OF BANDED LEAF AND SHEATH BLIGHT (BLSB) OF FORAGE MAIZE (MODIFIED)

Location: Bhubaneswar and Palampur
Design: RBD **Treatments:** 13
Replication: 3 **Plot size:** 3 x 2 m^2

Treatments:
T_1 = Seed treatment with *T. viride* @ 5g/kg
T_2 = Seed treatment with carbendazim @ 2 g/kg seed
T_3 = T_1 + Two spray of carbendazim @ 1g/L
T_4 = T_1 + Two foliar sprays with *P. fluorescens* @ 5g (CFU 10^7) /L
T_5 = T_1 + Two foliar sprays with (tryflosystrobin + tebuconazole) @ 1g/L
T_6= T_2 + Two spray of carbendazim @ 1g/L
T_7= T_2+ Two foliar sprays with (tryfloxystrobin + tebuconazole) @ 1g/L
T_8 = T_2 + Two foliar sprays with *P. fluorescens*@ 5g (CFU 10^7) /L
T_9= T_1 + One spray each of carbendazim@ 1g/L and *P. fluorescens* @ 5g (CFU 10^7) /L
T_{10}= T_2 + One spray each of carbendazim@ 1g/L and *P. fluorescens* @ 5g (CFU 10^7) /L
T_{11} = T_2 + One spray each of (tryfloxystrobin +tebuconazole) @ 1g/L and *P. fluorescens* @ 5g (CFU 10^7) /L
T_{12}= Stripping of lower leaves
T_{13} = Control

Results:

The experiment was conducted with 13 treatments having three replication in RBD during *Kharif* 2018 for the management of BLSB at Palampur. It was observed that seed treatment with carbendazim followed by two foliar sprays with tryfloxystrobin + tebuconazole was found highly effective with 69.2 % disease control and 10.6 % increase in yield over check. This treatment was followed by seed treatment with carbendazim and two foliar sprays of carbendazim provided 59.8 % disease control and 9.5 % increase in yield over check.

Treatments having one spray of fungicide and one spray of bioagent (*P. fluorescens*) also provides 46.7 to 52.3 percent disease control with 3.3 to 4.8 per cent increase in the yield. As non-chemical method, seed treatment with *T. viride* followed by two foliar sprays with *P. fluorescens* provided 31.8 per cent disease control with 2.1 per cent increase in the yield over control (Table PPT-21).

At Bhubaneswar, seed treatment with carbendazim followed by two foliar sprays with tryfloxystrobin + tebuconazole was found highly effective with 82.5 % disease control and 21.2 % increase in yield over check. This treatment was followed by seed treatment with - carbendazim and two foliar sprays of carbendazim which provided 79.4 % disease control and 16.8% increase in yield over check. Treatments having one spray of fungicide and one spray of bioagent (*P. fluorescens*) also provides more than 63 per cent disease control with 11.4 to 14.3 per cent increase in the yield. As non-chemical method, seed treatment with *T. viride* followed by two foliar sprays with *P. fluorescens* provided 53.9 per cent disease control with 12.5 per cent increase in the yield over control. However stripping lower leaves alone without any other treatment expressed 42.9 % disease reduction with 6.9 % yield increase compared to control (Table PPT-21).

Table PPT-21: Integrated Management of BLSB of forage Maize (Modified)

Treatment	Palampur				Bhubneshwar			
	BLSB		GFY		BLSB		GFY	
	Incidence (%)	Control (%)	(q/h)	Increase over check (%)	Incidence (%)	Control (%)	(q/h)	Increase over check (%)
T1	10.7	0.0	350.3	0.4	14.33	31.8	278.00	5.3
T2	6.3	41.1	361.4	3.6	9.00	57.1	280.67	6.3
T3	5.7	46.7	360.5	3.3	5.33	74.6	304.67	15.4
T4	7.3	31.8	356.3	2.1	9.67	53.9	297.00	12.5
T5	5.0	52.3	365.2	4.6	6.33	69.8	307.00	16.3
T6	4.3	59.8	382.3	9.5	4.33	79.4	308.33	16.8
T7	3.3	69.2	386.1	10.6	3.67	82.5	320.00	21.2
T8	6.0	43.9	360.1	3.2	8.00	61.9	294.00	11.4
T9	5.7	46.7	360.5	3.3	7.33	65.1	301.67	14.3
T10	5.0	52.3	365.7	4.8	7.67	63.5	299.33	13.4
T11	5.3	50.5	364.8	4.5	6.67	68.2	303.00	14.8
T12	9.0	15.6	351.1	0.6	12.00	42.9	282.33	6.9
T13	10.7	-	349.0	-	21.00	-	264.00	-
CD	0.99		12.88		2.1	-	12.0	-

PPT-22: INTEGRATED DISEASE MANAGEMENT OF FOLIAR DISEASES OF FORAGE SORGHUM

Location: Palampur and Ludhiana

Design: RBD **Treatments:** 11

Replications: 3 **Plot size:** 3.0 X 3.0 m^2

Treatments:

T1: Seed treatment with *T. viride* @ 5g/kg

T2: Seed treatment with carbendazim @ 2 g/kg seed

T3: Two foliar sprays with neem bio-pesticide (Achook) @ 3%

T4: Two foliar sprays with propiconazole @ 1g/L

T5: T_{1+} Two foliar sprays with neem bio-pesticide (Achook) @ 3%

T6: T_{1+} Two foliar sprays with propiconazole @ 1g/L
T7: T_{2+} Two foliar sprays with neem bio-pesticide (Achook) @ 3%
T8: T_{2+} Two foliar sprays with propiconazole @ 1g/L
T9: T_{1+} One spray each of neem bio-pesticide (Achook) @ 3% and propiconazole @ 1g/L
T10: T_{2+} One spray each of neem bio-pesticide (Achook) @ 3% and propiconazole @ 1g/L
T11: Control

Results:

The experiment was conducted with 11 treatments having 3 replication in RBD at Palampur for the management of zonate leaf spot disease of sorghum using bio-agent & chemicals. Among all the treatments, the seed treatment with carbendazim followed by two foliar sprays of propiconazole was found highly effective which gave 75.9 % disease control with 14.4 % increase in the yield over check. This treatment was followed by two sprays of propiconazole (74.3 % disease control with 13.4 % increase in the yield) and seed treatment with *T. viride* and two spray of propiconazole which gave 73.8 % disease control with 13.8 % increase in the yield over check. The two sprays of Achook (bio-pesticide) gave only 36.6 % disease control with 5 % increase in the yield over check. The combination of bio-agent & chemical *i.e.* seed treatment with *T. viride* with one spray each of propiconazole and Achook (bio-pesticide) was effective in controlling zonate leaf spot and gave 59.5 % disease control with 8.5 % increase in the field.

At Ludhiana (Table PPT-22) among all the treatments, maximum anthracnose disease control of 45.36 and 38.62 percent was observed in T_{10} [seed treatment with carbendazim @ 2g/kg seed + one spray each with neem bio-pesticide (Achook) @ 3% and propiconazole @ 1g/l] followed by T_9 [seed treatment with *Trichoderma viride* @ 5g/kg seed + one spray each with neem bio-pesticide (Achook) @ 3% and propiconazole @ 1g/l] with percent disease severity of 24.33 and 27.33 respectively in case of anthracnose as compared to check (44.53 %). All the treatments were statistically at par with each other. In case of grey leaf spot, T_{10} showed minimum disease severity (18.0 %) followed by T_9 (20.33 %) as compared to check (29.0 %). Increase in green fodder yield was also observed in both these treatments i.e. 485.67 (T10) and 454.33 (T9) q/ha respectively as compared to check (320.0 q/ha).

Table PPT-22: Integrated disease management of foliar diseases of forage sorghum

Treatment	Palampur				Ludhiana					
	Zonate leaf spot		GFY		Leaf spot severity (%)				Green Fodder Yield (q/ha)	Percent Increase
	Disease severity * (%)	Control (%)	(q/h)	Increase over check (%)	Grey leaf spot	Disease Control (%)	Anthracnose	Disease Control (%)		
T1	59.7 (50.6)	2.2	322.8	0.2	27.57	4.94	38.57	13.39	360.00	13.45
T2	42.7 (40.8)	30.0	334.4	3.9	28.00	3.45	40.00	10.17	324.33	2.21
T3	38.7 (38.4)	36.6	338.0	5.0	25.13	13.33	30.00	32.63	407.87	28.53
T4	15.7 (23.3)	74.3	365.2	13.4	27.00	6.90	37.00	16.91	367.87	15.93
T5	38.3 (38.2)	37.2	332.0	3.1	25.83	10.92	35.33	20.65	377.67	19.01
T6	16.0 (23.6)	73.8	366.4	13.8	23.57	18.74	30.17	32.26	448.33	41.28
T7	37.0 (37.0)	39.3	336.0	4.4	25.00	13.79	33.00	25.89	402.67	26.89
T8	14.7 (22.5)	75.9	368.4	14.4	21.33	26.44	28.00	37.12	451.67	42.33
T9	24.7 (29.7)	59.5	349.6	8.5	20.33	29.89	27.33	38.62	454.33	43.17
T10	22.3 (28.2)	63.4	350.0	8.7	18.00	37.93	24.33	45.36	485.67	53.05
T11	61.0 (51.3)	-	322.0	-	29.00	-	44.53	-	320.00	-
CD	1.91		9.58		1.165		1.383		4.587	
CV					2.760		2.408		13.372	

* Figure in parentheses are angular transformed values

PPT-23: MANAGEMENT OF DOWNY MILDEW OF PEARL MILLET USING BIOAGENTS

Location: Ludhiana **Design:** RBD
Plot size: 3 x 3 m^2 **Treatments:** 9

Treatments:
T1 Seed treatment with *Trichoderma viride* @ 5g/kg seed
T2 Seed treatment with *Pseudomonas fluorescence* @ 5g/kg seed
T3 Seed treatment with *Bacillus subtilis* @ 5g/kg seed
T4 Seed treatment with Metalaxyl @ 2g/kg seed
T5 T1 + two foliar sprays of *Trichoderma viride* @ 5g/L
T6 T2 + two foliar sprays of *Pseudomonas fluorescence* @ 5g/L
T7 T3 + two foliar sprays of *Bacillus subtilis* @ 5g/L
T8 Two foliar sprays of Ridomil MZ @ 2.5g/L
T9 Control

Results:
Different bioagents were tested for the management of downy mildew in pearl millet. The downy mildew incidence was very less in T_7 [Seed treatment with *Bacillus subtilis* @ 5g/kg seed + two foliar sprays of *Bacillus subtilis* @ 5g/l] followed by T_6 [Seed treatment with *Pseudomonas fluorescence* @ 5g/kg seed + two foliar sprays of *Pseudomonas fluorescence* @ 5g/l] with 16.0 and 19.0 percent respectively as compared to check (32.93 %). Green fodder yield was also maximum in both the treatments that is 393.39 and 348.35 q/ha respectively as compared to check 243.24 q/ha.

Table PPT-23: Effect of different treatments against downy mildew in pearl millet

Treatments		Downy mildew Incidence (%)	Disease control (%)	Green Fodder Yield (q/ha)	Percent Increase
T_1	Seed treatment with *Trichoderma viride* @ 5g/kg seed	29.33	10.92	255.26	4.94
T_2	Seed treatment with *Pseudomonas fluorescence* @ 5g/kg seed	26.67	19.02	261.26	7.41
T_3	Seed treatment with *Bacillus subtilis* @ 5g/kg seed	28.83	12.44	255.26	4.94
T_4	Seed treatment with Metalaxyl @ 2g/kg seed	26.50	19.53	267.27	9.88
T_5	T1 + two foliar sprays of *Trichoderma viride* @ 5g/l	22.93	30.36	315.32	29.63
T_6	T2 + two foliar sprays of *Pseudomonas fluorescence* @ 5g/l	19.00	42.30	348.35	43.21
T_7	T3 + two foliar sprays of *Bacillus subtilis* @ 5g/l	16.00	51.41	393.39	61.73
T_8	Two foliar sprays of Ridomil MZ @ 2.5g/l	24.33	26.11	306.31	25.93
T_9	Control	32.93	-	243.24	-
CD (P=0.05)		5.427		1.620	
CV		9.526		3.688	

PPT-25: Non-chemical management of *Helminthosporium* leaf blight in fodder maize

Location: Ludhiana **Design:** RBD
Plot size: 3x3 m^2 **Treatments:** 7

Treatments:
T1: Two foliar spray of *Pseudomonas fluorescens* @ 10g/L at 10 days interval
T2: Two foliar spray of *Bacillus subtilis* @ 10g/L at 10 days interval
T3: Two foliar spray of *Melia azedarach* @ 3.0% at 10 days interval
T4: Two foliar spray of *Murraya koenigii* @ 3.0% at 10 days interval
T5: Two foliar spray of chitosan @ 0.05% at 10 days interval
T6: Two foliar spray of mancozeb @ 0.25% at 10 days interval
T7: Control

Results:

Plant extracts and bioagents were tested for the management of leaf blight of fodder maize. Leaf blight severity was observed very less in T_5 [Two foliar sprays of chitosan @ 0.05 % at 10 days interval] followed by T_4 [Two foliar sprays of *Murraya koenigii* @ 3.0% at 10 days interval] with 21.50 and 26.00 percent respectively with 49.6 and 39.07 percent disease control as compared to check (42.67 %). Green fodder yield was also maximum in both the treatments that is 573.89 and 557.50 q/ha respectively as compared to check 404.44 q/ha.

Table PPT-25: Management of *Helminthosporium* leaf blight in fodder maize

Treatments		Leaf blight severity (%)	Disease control (%)	Green Fodder Yield (q/ha)	Percent Increase
T_1	Two foliar spray of *Pseudomonas fluorescence* @ 10g/L at 10 days interval	35.33	17.19	458.61	13.39
T_2	Two foliar spray of *Bacillus subtilis* @ 10g/L at 10 days interval	38.50	9.77	453.06	12.02
T_3	Two foliar spray of *Melia azedarach* @ 3.0% at 10 days interval	32.60	23.60	462.78	14.42
T_4	Two foliar spray of *Murraya koenigii* @ 3.0% at 10 days interval	26.00	39.07	557.50	37.84
T_5	Two foliar spray of chitosan @ 0.05% at 10 days interval	21.50	49.61	573.89	41.90
T_6	Two foliar spray of mancozeb @ 0.25% at 10 days interval	29.57	30.71	488.00	20.66
T_7	Control	42.67	-	404.44	-
CD (P=0.05)		1.287		3.386	
CV		2.214		6.462	

Breeder Seed Production in Forage Crops (*Kharif*-2018)
[Indent year *kharif* 2019]

(Table Reference: Tables BSP 1, 2, 3)

In *Kharif*-2018, the indent for Breeder Seed Production (Indent year Kharif 2019) was received from DAC, GOI for 8 varieties of four forage crops *viz.*, fodder Maize, fodder Pearl millet, fodder rice bean and fodder Cowpea. The total indent for breeder seed production was 87.94q.

The indent was allocated to seven SAUs/ICAR/NGO institutes. Among the quantity allocated for different forage crops, the maximum was for Maize (74.14 q) followed by Cowpea (12.05q), Pearl millet (1.50q) and minimum was for fodder rice bean (0.25q).

The final Breeder Seed Production Report (BSP-IV) received from different seed producing centers as well as availability of previous year breeder seed revealed that the overall breeder seed production was higher in forage pearl millet; forage maize and forage rice bean whereas it failed to meet the target in forage cowpea. Coming to the crop wise scenario, as compared to allocation in Maize, the final production was 118.36 q surplus. In Pearl millet production was 1.50q surplus. In cowpea, production in UPC 8705 was met, however it was 1.50q deficit in EC 4216 and 1.25q deficit in Bundel Lobia-2. Thus in cowpea total deficit was 2.75q. However in cowpea, IGFRI Jhansi and PAU Ludhiana has surplus of 0.6q and 0.71q breeder seed respectively of notified and good varieties. The overall breeder seed production (82.55q) and previous year availability (12.50q) was 206.05 q as against indent of 87.94q.

Many centers have also produced breeder seed of the varieties are also available totaling 6.25q (details in table BSP 3).

Table BSP 1: Centre wise Breeder Seed Production (q) during *Kharif*-2018

[Indent Kharif 2019]

S N	Producing centre/ State	Variety	Crop	DAC indent	Actual Allocation	Actual Production	Produce of 2017	Production Surplus (+) / Deficit (-)
Maharashtra								
1.	BAIF, Urulikanchan	African Tall	Maize	25.46	11.0	12.50	-	(+) 1.50
2.	MPKV, Rahuri	African Tall	Maize		14.46	10.50	-	**(-) 3.96**
	BAIF, Urulikanchan	BAIF Bajra 1	Pearl millet	1.50	1.50	3.00	-	(+) 1.50
	MPKV, Rahuri	EC-4216	Cowpea	6.0	4.0	1.80	-	**(-) 2.20**
	BAIF, Urulikanchan	EC-4216	Cowpea		2.0	6.0	-	(+) 4.00
Punjab								
3.	PAU, Ludhiana	J-1006	Maize	44.58	44.58	46.00	33.5	(+) 34.92
Rajasthan								
4.	MPUAT, Udaipur	Pratap Makka Chari-6	Maize	4.10	4.10	-	90.00	(+) 85.90
Uttarakhand								
5.	GBPUAT, Pantnagar	UPC-8705	Cowpea	0.5	0.5	0.50	-	-
Uttar Pradesh								
6.	ICAR-IGFRI, Jhansi	EC-4216	Cowpea	3.55	3.55	0.25	-	**(-) 3.30**
		Bundel Lobia 2	Cowpea	2.00	2.00	0.75		**(-) 1.25**
West Bengal								
7.	BCKV, Kalyani	Bidhan Ricebean -4	Rice Bean	0.25	0.25	1.25	-	(+) 1.00

Table BSP 2: Variety-wise Breeder Seed Production (q) during *Kharif*-2018

[Indent Kharif 2019]

Crop	SN	Variety	Produced by	Year of Notification	DAC indent	Allocation As per BSP-1	Actual Production	Produce of 2017	Production Surplus (+) Deficit (-)
Forage Maize	1	African Tall	MPKV, Rahuri; BAIF, Urulikanchan	1983	25.46	25.46	23.00	-	(-) 2.46
	2	J-1006	PAU, Ludhiana	1992	44.58	44.58	46.00	33.5	(+) 34.92
	3	Pratap Makka Chari-6	MPUAT, Udaipur	2009	4.10	4.10	-	90.00	(+) 85.90
	Total				**74.14**	**74.14**	**69.00**	**123.5**	**(+) 118.3**
Forage Pearl Millet	4	BAIF Bajra 1	BAIF, Urulikanchan	2010	1.50	1.50	3.00	-	(+) 1.50
		Total			**1.50**	**1.50**	**3.00**		(+) 1.50
Fodder Rice bean	5.	Bidhan Rice Bean -2 (KRB-4)	BCKV, Kalyani	2005	0.25	0.25	1.25		(+) 1.00
	Total				**0.25**	**0.25**	**1.25**		**(+) 1.00**
Forage Cowpea	6	EC-4216	MPKV, Rahuri; BAIF, Urulikanchan; ICAR-IGFRI, Jhansi	1978	9.55	9.55	8.05	-	(-) 1.50
	7	UPC-8705	GBPUA&T, Pantnagar	1996	0.5	0.5	0.50	-	-
	8	Bundel Lobia 2	ICAR-IGFRI, Jhansi	1994	2.00	2.00	0.75	-	(-) 1.25
	Total				**12.05**	**12.05**	**9.30**	**-**	**(-) 2.75**
Grand Total					**87.94**	**87.94**	**82.55**	**123.5**	**(+) 118.1**

Table BSP 3: Additional seed produced –Breeder seed of forage crops

Location	Crop	Variety	DAC Indent (q)	Quantity produced (q)
ICAR-IGFRI, Jhansi	Cowpea	Bundel Lobia 1	0	0.10
	Cowpea	Kohinoor	0	0.50
	Guar	Bundel Guar 1	0	2.70
			Total	**3.30**
PAU, Ludhiana	Guar	HG 365	0	0.30
	Guinea grass	PGG 518	0	0.30
	Cowpea	CL 367	0	0.20
	Cowpea	FBC-16	0	0.51
	Pearl millet	PCB 164	0	1.64
			Total	**2.95**
			Grand Total	**6.25**

FORAGE TECHNOLOGY DEMONSTRATIONS

To popularize the forage production technologies and make the farmers aware about various new fodder crop varieties, a total of 715 FTD's were allocated to AICRP coordinating and co-operating centres during *Kharif* 2018 for the crops *viz*., BN hybrid, sorghum (including multicut and perennial), rice bean, maize, pearl millet, guar, setaria, Para and guinea grass. Out of 715 FTD's, 360 were allocated to BN Hybrid, 25 to Rice bean, 105 to Maize, 60 to forage sorghum, 45 to Pearl millet, 50 to Cowpea, 10 to guinea grass, 20 to Congo-signal grass and 40 to Setaria grass. FTDs are being conducted in the new villages every year so that the technologies can be spread in large areas. No extra financial support was provided due to paucity of funds. However, most of the centers conducted FTDs out of their own resources.

FTDs allocated to AICRP coordinating and co-operating centres Kharif 2017 (numbers)

Centre	BN hybrid	Rice bean	Maize	Bajra	Cow pea	Sorg hum	Guinea grass	Congo signal grass	Seta ria	Total
Jorhat	10							20	20	50
Bhubaneswar	15		10							25
Kalyani	10	20	10							40
Ranchi	10		10				10			30
Faizabad				5						5
Jabalpur	5	5	5							15
Anand	10		10							20
BAIF	10			10	5					25
Bikaner	5			5	5					15
Ludhiana	200									200
Hyderabad	10			10		10				30
Mandya	10		10	10	10	10				50
Rahuri	20									20
Palampur	20								20	40
Srinagar			20							20
Imphal			10			10				20
Raipur			10							10
Vellayani	15				5					20
Pantnagar			10	5	5	10				30
Coimbatore	10				5	5				20
Hisar					15	15				30
Total	360	25	105	45	50	60	10	20	40	715

Forage In-house Breeding Activities - *Kharif* 2018

AICRP (FC&U), PAU, Ludhiana

New germplasm acquired: A total of five genotypes of *Moringa oliefera* were received from RRS, Ballowal Saunkhri, Punjab and are being multiplied and will be evaluated for fodder potential.

Germplasm available

S. No.	Crop	Number of accessions
1.	Pearl millet Inbreds	225
2.	Pearl millet CMS lines	75
3.	Napier grass	31
4.	Cowpea	240
5.	Cluster bean	84
	Total	**655**

Varieties developed

Varieties released at Central or State level (in last four years): **12**

Crop	Variety	Year of release	State/Central release
Oats	OL 10	2014	State
	OL 1802	2016	CZ
	OL 1804	2016	NEZ
	OL 11	2017	State
	OL 1802-1	2017	NWZ
	OL 1760	2017	SZ
	OL 1769-1	2017	CZ
	OL 12	2018	State
Berseem	BL 43	2017	State
Sorghum	PSC 4	2015	State
Bajra Napier Hybrid	PBN 346	2016	State
	PBN 342	2017	NWZ, NEZ and SZ

Entries in AICRP (FC) trials and their status

Trial	entry	Remarks
VTNB-Perennial (2015)	PBN 351	Trial will continue up to *Kharif* 2018
IVTPM	FBL2, FBL3	Trial concluded
IVTC	PFC39, PFC 40	Trial concluded

New crosses attempted

- **Pearl millet:** A total of 25 new crosses (forage specific) were developed using hand pollination method.
- **Cowpea:** A total of **eighteen** new crosses were synthesized by crossing lines selected on the basis of erectness, virus resistance, late flowering and high GFY.
- **Bajra x Napier hybrids:** A new set of crosses is being attempted (about 50) using elite Bajra forage lines as female and superior Napier grass as male lines.

Breeding material maintained/handled/generated

Pearl millet

- Maintenance and development of male sterile lines: 75
- Inbred lines (B&R) maintained: 225
- Seventy five male sterile lines from all the seven different sources of male sterility

Male sterile lines being maintained / developed in different sources

Source	No. of MS lines	Source	No. of MS lines
A1	41	A2	3
A3	4	A4	15
A5	6	Gero	2
Vio	3	AG	1

Cowpea

- Breeding material consisting of F_1 Crosses (18), F_2 (11), F_3 (10), F4 **(6)**, F5 (**5**) and F6 (4) was maintained.

Local trials conducted during *Kharif* 2018

Trial	Entries	Promising entries
Station trial of Bajra x Napier hybrid	16 + 4 (c)	PBN 351, PBN 342, PBN 408, PBN 407, PBN 414 and PBN 402
Station trial -Maize hybrids (*Kharif*)	7+1 (c)	-
Station trial -Maize composites (*Kharif* (Multilocation)	7+ 1(c)	PFM 9
Station trial-Cowpea I	11+1(c)	PFC 12,PFC 31,PFC39 and PFC 44
Station trial-Cowpea II	11+1(c)	PFC 47
Station trial -Pearl millet	20 + 4 (c)	PHBF 4, FBL 2, FBL 3 and FBL 4

Station trials

Pearl Millet: One hybrid PHBF 4 and composites FBL 2, FBL 3 and FBL 4 exhibited more than 5% GFY superiority over the local checks FBC 16 and PHBF 1. FBL 2 exhibited > 5% GFY superiority over the national checks Giant bajra and RBC 2.

Bajra Napier hybrid: A trial of NBH was established this year and sixteen Bajra Napier hybrids were evaluated. Seven hybrids viz; PBN 351, PBN 342, PBN 408, PBN 407, PBN 414 and PBN 402were found to be superior by more than 10% over the best local checks PBN 233 and PBN 342.

Cowpea: Two trials consisting of twelve genotypes each were conducted at Ludhiana and the entries PFC 12, PFC31, PFC39, PFC44 and PFC47 out-performed on the basis of green forage yield and dry matter yield by more than 5% over the best local check CL 367.

Maize: Two local trials were conducted during *Kharif* season. First trial consisted of seven hybrids from private sector which were evaluated against the check J 1006. None of the hybrids could exceed J 1006 for green fodder yield, dry matter yield and silage quality. In the second trial, seven newly developed composites were evaluated against the check J 1006 over two locations and the entries namely PFM 9 and PFM 10 out yielded the check J 1006 by 9.0% and 12.5% respectively.

AICRP (FC&U), TNAU, Coimbatore

Fresh crosses made in BN hybrids: A total of 24 fresh crosses were made during *Kharif*, 2018 involving elite bajra parents collected from ICRISAT, Hyderabad with an objective of evolving high yielding and quality BN hybrids. These crosses are under observation from *Rabi*, 2018 onwards.

Fodder Bajra x Napier grass

SN	Name of the cross	SN	Name of the cross	SN	Name of the cross
1.	CO 8 x FD 465	9.	CO 8 x FD 438	17.	PT 6202 x FD 461
2.	CO 8 x FD 433	10.	CO 8 x FD 466	18.	PT 6140 x FD 463
3.	CO 8 x FD 458	11.	CO 8 x FD 453/1	19.	PT 6202 x FD 464
4.	CO 8 x FD 452	12.	CO 8 x FD 431	20.	PT 05222 x FD 463
5.	CO 8 x FD 438	13.	PT 5752 x FD 453	21.	PT 05666 x FD 463
6.	CO 8 x FD 453	14.	PT 5752 x FD 453/1	22.	PT 1608 x FD 463
7.	CO 8 x FD 441	15.	PT 6202 x FD 468	23.	PT 1616 x FD 485
8.	CO 8 x FD 432	16.	PT 6202 x FD 456	24.	PT 22269 x FD 463

Fresh crosses made in fodder cowpea: A total of 23 fresh crosses were made during *kharif*, 2018 involving high yielding released varieties as parents with an objective of evolving high yielding and quality types. These crosses will be evaluated from *Rabi*, 2018 onwards.

List of fresh crosses made in Fodder cowpea

SN	Name of cross	SN	Name of the cross	SN	Name of the cross
1.	CO 9 × EC 240687	9.	CO 9 × 1273	17.	CO (FC) 8 × 1023
2.	CO 9 × CL 88	10.	CO 9 × 1332	18.	CO (FC) 8 × 1269
3.	CO 9 × N 271	11.	CO (FC) 8 × UPC 951	19.	CO (FC) 8 × 1287
4.	CO 9 × N 311	12.	CO (FC) 8 × CL 348	20.	CO (FC) 8 × 8903
5.	CO 9 × UP 219	13.	CO (FC) 8 × IFC 9304	21.	CO (FC) 8 × CP-4
6.	CO 9 × 8903	14.	CO (FC) 8 × CS 98	22.	CO 5 × IFC 95/03
7.	CO 9 × 928	15.	CO (FC) 8 × UP 9001	23.	CO 5 × IFC 1348
8.	CO 9 × 1023	16.	CO (FC) 8 × 1004		

Characterization of *Moringa* for fodder yield and quality: An exploration was conducted in major *Moringa* growing districts of Tamil Nadu like Karur, Dindigul, Theni and Madurai during *Kharif* 2018. A total of 24 germplasm lines were collected and the pool comprising of annual and perennial types. The pool was planted during June last week in a randomized block design for assessing the forage yield potential. First harvest was done four months after planting. The health impact of *Moringa* feeding on milch animals in terms of body weight gain and haemoglobin status was analysed. The feeding showed positive impact of milk yield and quality. The result of continuous feeding on long term basis will be ascertained. The nutrient status of germplasm *viz*., N, P, K, Fe, Mg *etc*., was quantified. Discernible variations for nutrient contents were noticed. The yield on repeated harvests will be ascertained by the end of May 2019.

Characterization of tree fodders for yield and its component traits

Plant samples collected from tree fodder bank, FC&RI, Mettupalayam were analyzed for quality parameters at Dept. of Forage Crops, Coimbatore during 2016-17 and fodder yield of these trees were recorded at FC&RI, Mettupalayam during 2017-18 (Table 1).

Among them, *Dalbergia sissoo* (North Indian Rosewood/Sisoo) has recorded the highest green fodder yield of 690.40 t/ha/yr followed by *Leucaena leucocephala* (617.30 t/ha/yr). *Pterocarpus santalinus* (Red sandal) recorded highest dry matter content (57.43 %) followed

by *Pithecellobium dulce* with 50.61 %. In case of crude protein content, *Leucaena leucocephala* (Subabul) recorded highest crude protein content of 21.70 % followed by *Sesbania grandiflora* (Agathi) with 21.35 %.

Table 1 Fodder yield and quality performance of different tree fodders

SN	Name of the tree	Fodder yield (t/ha/yr)	DM (%)	Crude protein (%)	Crude fibre (%)	Crude fat (%)
1.	*Dalbergia sissoo* (Rosewood/Sisoo)	690.40	42.93	16.52	18.50	4.39
2.	*Leucaena leucocephala* (Subabul)	617.30	43.00	**21.70**	16.50	3.02
3.	*Leucaena diversifolia* (Subabul)	580.10	37.28	20.34	16.00	2.35
4.	*Gliricidia sepium* (*Gliricidia*)	532.50	23.80	16.14	12.50	1.34
5.	*Moringa oleifera* (Drumstick)	491.50	32.57	20.62	12.50	2.68
6.	*Sesbania grandiflora* (Agathi)	367.80	21.07	21.35	16.50	1.67
7.	*Neolamarckia cadamba* (Vellaikadambam)	279.60	26.27	16.35	11.00	2.60
8.	*Holoptelea integrifolia* (Aaya maram)	259.70	44.72	11.90	15.00	3.03
9.	*Pithecellobium dulce* (Kodukkaipuli)	230.10	50.61	20.16	20.00	3.36
10.	*Albizia lebbeck* (*Vaagai*)	193.10	45.30	17.08	24.50	3.03
11.	*Melia dubia* (Malai vembu)	146.60	32.06	19.43	16.00	2.69
12.	*Thespesia populnea* (Puvarasu)	123.90	34.45	13.06	10.50	2.68
13.	*Morus indica* (Mulberry)	26.30	45.38	12.04	16.50	2.01
14.	*Bauhinia variegata* (*Sem*-Mantharai)	178.60	46.29	12.71	32.00	2.34
15.	*Hibiscus tiliaceus* (Malai Puvarasu)	40.60	40.00	12.60	21.00	2.70
16.	*Ficus benghalensis* (Banyan tree)	86.00	44.60	9.07	25.00	2.68
17.	*Terminalia arjuna* (*Maruthu*)	18.30	48.89	8.95	14.00	4.05
18.	*Melia composita* (Malai vembu)	30.00	43.90	15.02	14.50	3.02
19.	*Pterocarpus santalinus* (*Red sandal*)	8.30	**57.43**	11.66	26.50	2.00
20.	*Ficus religiosa* (*Peepal tree / Arasu*)	-	40.28	10.82	22.50	4.70
21.	*Ceiba pentandra* (Kapok)	-	35.85	9.66	22.50	3.71

Based on fodder yield and quality, five promising tree fodders *viz., Dalbergia sissoo, Gliricidia sepium, Moringa oleifera, Sesbania grandiflora* and *Neolamarckia cadamba* were identified and raised in nursery at FC&RI, Mettupalayam for further evaluation.

AICRP (FC&U), JNKVV, Jabalpur

Crop	existing accession	new collection	total accession	source
Soybean	44	7	51	NRC Indore & Sehore
Rice bean	36	5	42	NBPGR., New Delhi

Generation of materials/entries/crosses made during – Kharif 2018

Crop	Cross made	Cross advanced	Selection made
Ricebean	6	$4F_1$	-
		$6F_2$	23
		$4F_3$	14
		$4F_4$	06
		$2F_5$	04

- Single plant progenies and promising genotypes were also evaluated for different fodder traits.
- Five new accessions were obtained by NBPGR, New Delhi
- Selections were made for different fodder traits in the mutation derived populations of Bidhan -1 (EMS 0.4% and 0.8% for 1, 2 and 4hrs treatments)

Soybean:

- Single plant selections were made using different fodder traits.
- Five new accessions were obtained by NRC, Indore

AICRP (FC&U), MPKV, Rahuri

Germplasm holding

SN	Species	Nos.
1.	Napier (*Pennisetum purpureum*)	33
2.	Guinea grass (*Panicum maximum*)	11
3.	Marvel (*Dichanthium spp.)*	48
4.	Madras Anjan (*Cenchrus spp.)*	44
5.	Dongari *(Chrysopogon fulvus)*	13
6.	Stylo (*Stylosanthes* spp.) *S. seabrana* : 35; *S. scabra:5; S. Viscosa:1; S.seca:1; S. hamata:2*	44
7.	Gokarn/Butterfly pea (*Clitoria ternatea*)	25
8.	Rhodes grass (*Choris gayana*)	7
9.	Dinanath (*Pennisetum pedicellatum*)	5
10.	Moshi (*Iseilema wighttii*)	3
11	Ber *(Ischiemum aristanum)*	3
	Total	**236**

Hybridization

Sorghum x sudan grass: Forty five individual plants were selected from F_2 generation of nine sorghum x sudan grass crosses during kharif-2018 as given below. These selections will be evaluated during kharif-2019.

SN	Cross	IPS	SN	Cross	IPS
Sorghum x sudan grass					
1.	Ruchira x IS-3225	5	5.	Phule Godhan x IS-3261	9
2.	Ruchira x IS-3261	2	6.	Phule Godhan x IS-3277	1
3.	Phule Amruta x IS-3277	1	7.	Phule Godhan x IS-3309	11
4.	Phule Amruta x IS-3309	-			
Sudan grass x sorghum					
1.	IS-3323 x Ruchira	9	2.	IS-3225 x Ruchira	7
Total		**45**			

Bajra x Napier Grass: Fourteen heterotic clones were selected from four crosses during kharif 2018. Selected clones are multiplied for evaluation in PYT during kharif 2019

SN	Name of cross	Clones selected
1.	Giant Bajra x GBN-2001-5	02
2.	Giant Bajra x FD-437	05
3.	Giant Bajra x FD-473	04
4.	Giant Bajra x FD-483	03

Seventeen Bajra x Napier crosses were effected at Grass Breeding Scheme during Rabi, 2018-19. These 17 crosses will be sown during Kharif, 2019 for isolating heterotic clones for green forage yield and other attributes.

SN	Female	Male		Female	Male
1.	Giant Bajra	FD-444	10.	Giant Bajra	FD-472-1
2.	Giant Bajra	FD-468-1	11.	Giant Bajra	FD-453
3.	Giant Bajra	GBN-2001-1	12	Giant Bajra	FD-477-2
4.	Giant Bajra	GBN-2001-3	13.	Giant Bajra	PT-1890 X 443-317
5.	Giant Bajra	GBN-2001-4	14.	Giant Bajra	FD-407-1
6.	Giant Bajra	GBN-2001-6	15.	Giant Bajra	FD-472-2
7.	Giant Bajra	GBN-2001-7	16.	Giant Bajra	FD-436
8.	Giant Bajra	GBN-2001-8	17.	Giant Bajra	FD-477-1
9.	Giant Bajra	FD-482			

AICRP (FC&U), SKRAU, Bikaner

VARIETIES RELEASED AND NOTIFIED IN LAST FIVE YEARS

Crop/ variety	Variety	Year of release
Pearl millet	Raj Bajra-1	2015
Lucerne	Krishna	2016
Cenchrus ciliaris	Bikaneri Dhaman	2015
Lasiurus sindicus	Jaisalmeri Sewan	2016

Germplasm maintenance, evaluation and collection

SN	Range grass/ fodder crop	No. of accessions
1	*Lasiurus sindicus*	270
2	*Cenchrus ciliaris*	50
3	*Cenchrus setigerus*	50
4	Pearl millet	30

PASTURE GRASSES

- Some promising entries of the three range grasses were evaluated in RBD. Entries were 10 for *Lasiurus sindicus* and 12 for *Cenchrus setigerus*. 10 promising entries of *Cenchrus ciliaris* were evaluated in large plots of 100 m^2 size. During Kharif-2018, two entries of *Cenchrus ciliaris* were tested at national level in coordinated trial in the fourth year, which have been contributed from Bikaner centre. Three entries of *Cenchrus setigerus* contributed from Bikaner centre were tested in the fourth year in coordinated trial.

PEARL MILLET

- Besides the work for range grasses, one pearl millet entry contributed by Bikaner centre was tested in Initial Varietal Trial at national level during Kharif-2018. Available germplasm of pearl millet was evaluated. New crosses were made among plants of RBC-2, Giant Bajra, RBB-1, AVKB-19, RBB-2, RBB-4, RBB-6 and RBB-7. Selection of superior plants was also done to make a better composite. Material in hybridization nursery was evaluated for selection of superior plants.

AICRP (FC&U), KAU, Vellayani

Evaluation of BN Hybrid cultures for yield and quality: The cultures will be evaluated for three years. (2018-2021)
Cultures: BN culture-1, BN culture-2, Suguna
Treatments: 3 **Plot size:** 3x3 m^2 **Replication:** 5 **Design:** RBD

Evaluation of Guinea grass cultures for yield, quality and flowering nature: The cultures will be evaluated for three years.(2018-2021)
Cultures: GG Culture-1, GG Culture-2, Harithasree
Treatments: 3 **Plot size:** 3x3 m^2 **Replication:** 5 **Design:** RBD

The two mutant cultures were obtained from PhD thesis work entitled 'Induced mutagenesis for delayed flowering and high tillering in guinea grass (*Panicum maximum* Jacq.). The preliminary evaluation trials along with the released check showed that the cultures have delayed flowering and in some instances no flowering after the first and second cut.

Evaluation of fodder cowpea cultures for yield, forage quality & ratooning ability: To evaluate yield, forage quality and ratooning ability of fodder cowpea cultures. The cultures will be evaluated for one year.
Cultures : 7 - culture-1,culture-2, culture-3, culture-4, culture-5, Aiswarya, EC-4216
Treatments: 7 **Plot size:** 2x2m^2 **Design:** RBD **Replication:** 3

The Five cultures will be evaluated for yield and quality. These cultures were obtained from an ongoing Ph.D. study where the initial field trials showed that these cultures were promising with respect to yield and ratooning ability compared to the control. The above cultures are compared with the local checks and the national check. There is no variety at present which can be ratooned.

AICRP (FC&U), BAU, Ranchi

Rice bean

- Five crosses made during Kharif 2018 for high biomass/fodder yield earliness and drought tolerant.
- During Kharif-2018, F_1 seed were obtained in Rice bean i.e RBL-6 x JOR-17-1, JOR - 17-1 x RBL-6 and JOR-16-2 x JOR-17-1.

Dinanath Grass

- Six crosses made during Kharif 2018 for high biomass/fodder yield earliness and drought tolerant.
- **Station trial**: Out of ten entries tested in Dinanath trial, the entry BAU DN-103-18-2 (988 q/ha) was found high yielder followed by BAU-DN-109-18 (958 q/ha) and BAU DN-106-18-1 (940 q/ha).

Maize

- Eleven local land races of maize were maintained.
- **Identification of maize lines for development of composite forage maize variety**: 35 maize germplasm were selfed to obtained the inbred lines.

Cowpea

- **Under segregating generation of Cowpea** UPC-625 x Bundel Lobia-1 and UPC-5287 x Bundel Lobia-1 were in F-5 generation.

AICRP (FC&U), BAIF, Uralikanchan

B x N hybrid

- **Evaluation of B x N hybrids:** A station trial was established in randomized block design during *Kharif*-2017 for evaluation of 4 promising progenies developed from three crosses namely BAIF Inc Bajra-14 x BRN 01, BAIF Inc Bajra-20 x FD 440 and BAIF Inc Bajra-25 x BRN 01. Assessment was done for growth, yield and quality parameters in comparison to national check BNH-10. Data on all the parameters was generated for five cut.
- **Crossing programme:** Following fresh crosses were attempted involving the promising lines of pearl millet and Napier grass.

SN	Name of cross	SN	Name of cross
1	ICMV 1607 x BRN 01	7	ICMV 1607 x FD 444
2	ICMV 1622 x BRN 01	8	ICMV 1622 x FD 444
3	ICMV 1613 x BRN 01	9	ICMV 1613 x FD 444
4	ICMV 05777-1 x BRN 01	10	ICMV 05777-1 x FD 444
5	ICMV 1608 x BRN 01	11	ICMV 1608 x FD 444
6	ICMV 1608-1 x BRN 01	12	ICMV 1608-1 x FD 444

Pearl millet

- **Characterization of germplasm:** Study was conducted to characterize the available 53 germplasm lines as per the DUS guidelines. BAIF Bajra-1 and ICTP 8202 varieties were used as check for comparison.
- **Crossing programme:** Ten promising parental lines were selected from the germplasm for development of new crosses. Following crosses were attempted manually.

SN	Name of cross	SN	Name of cross
1	ICMV 05777 x BAIF Inc Bajra 8-1	9	ICMV 05555 x BAIF Bajra -1
2	ICMV 1605 x BAIF Inc Bajra 8-1	10	ICMV 1608 x BAIF Bajra -1
3	ICMV 1610 x BAIF Inc Bajra 8-1	11	ICMV 05777 x BAIF Inc Bajra 34
4	ICMV 05555 x BAIF Inc Bajra 8-1	12	ICMV 1605 x BAIF Inc Bajra 34
5	ICMV 1608 x BAIF Inc Bajra 8-1	13	ICMV 1610 x BAIF Inc Bajra 34
6	ICMV 05777 x BAIF Bajra -1	14	ICMV 05555 x BAIF Inc Bajra 34
7	ICMV 1605 x BAIF Bajra -1	15	ICMV 1608 x BAIF Inc Bajra 34
8	ICMV 1610 x BAIF Bajra -1	16	BAIF Bajra-04 x BAIF Inc Bajra- 21

- **Evaluation of crosses:** Three crosses namely ICMV 1605 x BAIF Bajra-1, ICMV 1610 x BAIF Bajra-1 and BAIF Bajra-4 x BAIF Bajra-1 were developed during the *summer*- 2018. Crossed seeds of these crosses were grown to evaluate them for fodder characters and further breeding programme.

Cenchrus ciliaris

A station trial was established to evaluate four new cultures of BAIF namely BCC-1, BCC-2, BCC-3 & BCC-4 along with national check IGFRI 3108 to study the performance for forage yield and quality traits.

AICRP (FC&U), UAS (B), ZARS Mandya

Forage Maize

Forwarding of stabilized and promising populations **DOS: 20-7-2018**

SN	Cross Combinations	Populations	SN	Cross Combinations	Populations
1.	African Tall x J-1006	07 Populations	**4.**	African Tall x Sujay 121	02 Populations
2.	African Tall x Sujay 267	28 Populations	**5.**	African Tall x NAC6004	03 Populations
3.	African Tall x Sujay 267-2	04 Populations			

- White seeded fodder type genepools : 08
- Orange seeded fodder type genepools : 34
- Yellow seeded fodder type genepools : 09

Evaluation of new crosses with selected disease resistant maize inbred lines with good fodder traits. **DOS: 20-7-2018**

SN	Cross Combinations	Populations	SN	Cross Combinations	Populations
1.	African Tall x CAL 1443	06 Populations	**5.**	MAI 27 x African Tall	02 Populations
2.	J 1006 xCAL 1443	02 Populations	**6.**	MAI 13 x African Tall	02 Populations
3.	African Tall x MAI 769	01 Population	**7.**	MAI 8 x African Tall	01 Population
4.	MAI 316 x African Tall	03 Populations			

Generation of new crosses with resistant inbred lines:

SN	Cross Combinations	SN	Cross Combinations
1.	MAI 2 x African Tall	**4.**	MAI 1 x African Tall
2.	MAI 12 x African Tall	**5.**	331188 x African Tall
3.	MAI 11 x African Tall	**6.**	40013 x African Tall

Remarks

- The MAI lines serial No. 1 to 12 are resistant inbreds obtained from AICRP on Maize, Mandya centre.
- CAL 1443 is a inbred line obtained from CIMMYT good with fodder traits i.e more no. of leaves with broad and stay green type.
- CM 202, P 8 & P 12 are best combiners with good combining ability and hence used as testers in the breeding programme.

Generation of new crosses for improving disease resistance and development of inbreds with good fodder traits **DOS: 20-07-2018**

Method: L X T **Lines:** 50 lines **Testers:** 4 (P8, P12, CAL1443 and CM202)

Remarks: Crop is harvested and observation being recorded.

Forage Cowpea

Forwarding of F_2 generation **DOS: 20-07-2018** 82

F_2 crosses with 13 parents were evaluated in 2 rows each during kharif-2018 & individual plant selections were made in each F_2 based on fodder traits like early vigor, flowering, disease incidence, branching pattern and plant type.

- The following crosses were forwarded to F_3 generation.

1.	MFC-09-1 X BL-1	2.	KBC-9 X BL-1	3.	EC-170578-1-1 X KBC-9
4.	EC-170578-1-1 X BL-1	5.	Goa Local X KBC-2	6.	KBC-9 X MFC-09-13
7.	Goa Local X EC-170578-1-1				

Multiplication and maintenance of elite breeding material generated at Mandya centre

1	MFC-08-14	**8**	MFC-09-11	**15**	MFC-09-18
2	MFC-09-1	**9**	MFC-09-12	**16**	MFC-09-19
3	MFC-09-3	**10**	MFC-09-13	**17**	MFC-09-20
4	MFC-09-6	**11**	MFC-09-14	**18**	MFC-09-21
5	MFC-09-7	**12**	MFC-09-15	**19**	MFC-09-22
6	MFC-09-8	**13**	MFC-09-16	**20**	MFC-09-23
7	MFC-09-9	**14**	MFC-09-17	**21**	MFC-09-24

Multi-location evaluation of promising BXN Hybrid lines

No. of Locations : 03 (FRS, Kunigal, GKVK, Bengaluru & Mandya)
No. of Entries : 12
No. of Replications : 3
Design : RBD
Plot Size : 5.0m X 5.4m
Date of Planting : 12/06/2018

SN	Entries	SN	Entries	SN	Entries
1	BNH-10	5	Co-4	9	BH-9
2	Co-3	6	Co-5	10	BH-18
3	NB-21	7	DHN-6	11	APBN-1
4	PBN-342	8	RBN-2011-12	12	Suguna

Inference: Among the entries evaluated PBN-342 found with highest yield of 342.25 q/ha followed by Co-3 (338.55 q/ha) and Giant Napier (307.10 q/ha)

Multi-location evaluation of promising Guinea genotypes

No. of Locations : 03 (FRS, Kunigal; GKVK, Bengaluru & Mandya)
No. of Entries : 7
No. of Replications : 3
Design : RBD
Plot Size : 5.0m x 5.4m
Date of Planting : 12/06/2018

SN	Entries	SN	Entries	SN	Entries	SN	Entries
1	JHGG-08-1	**3**	DGG-1	**5**	Guinea Mutant	**7**	Grazing Guinea
2	Macueni	**4**	Hamil	**6**	Riversdale		

Inference: Among the entries evaluated Guinea Mutant found with highest yield of 129.00 q/ha followed by JHGG-08-1 (111.00 q/ha).

Multiplication & Demonstration of important perennial fodder genotypes

Centres:

1. Zonal Agricultural Research Station, Mandya (Mandya district)
2. Organic Farming Research Station, Naganahalli (Mysuru district)
3. Agricultural Research Station, Gunjevu (Hassan district)
4. Agricultural Research Station, Madenuru (Hassan district)
5. Agricultural Research Station, Balagigapade (Chikkaballapura district)
6. Main Agricultural Research Station, Hebbal, Bengaluru (Bengaluru urban district)
7. Zonal Agricultural Research Station, GKVK, Bengaluru (Bengaluru urban district)
8. Krishi Vigyan Kendra, Haradanahalli, (Chamarajanagara district)
9. Krishi Vigyan Kendra, Kandali, (Hassan district)
10. Krishi Vigyan Kendra, Hadonahalli, (Chikkaballapura district)

11. Krishi Vigyan Kendra, Magadi, (Ramanagara district)
12. Agricultural Research Station, Kunigal (Tumkur district)
13. Agricultural Research Station, Tiptur (Tumkur district)
14. College of Agriculture, Hassan, (Hassan district)
15. Zonal Agricultural Research Station, Navile, Shivamogga (Shivamogga district)

Quality seed production in *Kharif* 2018 (q)

SN	Crop	Variety	Class of seed	production
1	Forage Cowpea	MFC-09-1	FS	10.0
2	Forage Cowpea	MFC-08-14	FS	10.0

AICRP (FC&U), BCKV, Kalyani

Study on gamma ray induced mutagenesis in Bidhan Rice Bean 1

M2 generation **Design:** RBD **Replication:** 3

Rationale: To find out any morphological mutants in regards to forage quality (high protein or fibre), photo insensitivity, early flowering, bushy types (without the trailing habit) *etc* or any other agro-economic traits. Variants serving dual purpose character (seed + green forage) could be a good finding which may be of two types- (i) Green forage yielder after proper harvesting of seeds: in that case early flowering mutants will be selected; (ii) Green forage yielder before the harvesting of the seeds, here late flowering may be selected. M1 generation is over. Now, M2 generation is going on. The selected plants from the M2 generation will be evaluated in the M3 generations for confirmed selection of desired mutants.

Germplasm maintained

Crop	Total number of lines
Rice bean	250
Coix	3

- Twenty (20) germplasm lines of ricebean were evaluated against two checks *viz*., Bidhan ricebean 1 and Bidhan ricebean 2 as Large Scale Trial (LST) for fodder production.

Nucleus and Breeder seed production

- Rice bean (Bidhan Rice bean 1)
- Rice bean (Bidhan Rice bean 2)
- Rice bean (Bidhan Rice bean 3)
- Coix (Bidhan Coix 1)

Multiplication and management of BN hybrid

- CO 3, CO 4 & CO 5

Multiplication and management of guinea grass (like cv. G CO3)

Seed production of KRB 63 and KRB 65 (promising lines of rice bean)

Management and Cultivation of Drum Stick.

AICRP-FC&U SKUAST-K, Srinagar

Germplasm Collection

Crop	Collections	Source
Maize	10	CIMMYT Mexico
Cowpea	25	USDA
Sorghum	6	DSR, Hyderabad
Alfalfa (Medicago *falcata*, M. *sativa* , M. *varia*)	27	Canada, USA and Ladakh region

Maize

- The population crosses made during *Kharif*-2016 were advanced by random mating and also evaluated for various forage and quality traits during *kharif*-2018.
- Third cycle of random mating was completed during *kharif* season-2018.In addition to this various forage pools of maize were maintained by bulk/chain sibbing in white background.
- Three entries have been contributed to initial varietal trial (IVT) on forage maize.
- Local land race collection showing promising in forage related traits have been collected and are maintained.
- KDFM-1(Shalimar fodder maize-1) has been identified for release at State level.
- 328 Lines of forage maize have been received from Division of Germplasm Conservation, ICAR-NBPGR, New Delhi for augmenting the Forage Genetic Resources.

AICRP (FC&U), Assam Agricultural University, Jorhat

Germplasm Collection: During *Kharif* 2018, 13 germplasm were collected from different locations of Assam.

Crop	Total no. Collected	Collected from
Cowpea	7	Manipur, Assam
Rice bean	6	Assam
Total	**13**	

Evaluation of Rice bean Germplasm: 14 rice bean germplasm including checks were evaluated for their earliness, productivity, quality and disease and pests resistance. Promising entries were selected.

National hybridization programme on Rice bean: The performances of selected progenies were evaluated during *kharif* 2018.

Hybridization programme in Rice bean: In *kharif* 2017 diallel cross was made (without reciprocal) among 7 selected entries to develop a variety with high biomass. The F1 progenies were evaluated in kharif 2018

Rice bean seeds: Study on effect of seed size, shape and colour of the Rice bean seeds on forage yield and quality.

AICRP (FC&U), Anand Agricultural University, Anand

Contribution of entry in AICRP trial

Name of Crop	Name of entry	Name of trial
Pearl millet	AFB-3	IVTPM, AVTPM-2, AVTPM-2 (Seed)
	AFB-38	IVTPM

Maintenance of germplasm

SN	Crop	No. of Lines
1.	Sorghum	591
2.	Maize	198
3.	Pearl millet	115
4.	Cowpea	42
5.	Sorghum Sterile line & its maintain	8
6.	Pearl millet Sterile line & its maintain	4
7.	Clitoria	24

New Germplasm collection

SN	Crop	Total numbers	Source
1.	Sorghum	2	South Gujarat

Forage Maize

(a) Population improvement: Four populations were raised, seeds will be collected in next season

A	B	C	D
AFM-1	AFM-5	Pratap Makka Chari	GWC-0803
AFM-2	AFM-6	GWQPM-68-3	GWC-0609
AFM-3	AFM-7	GWC-0320	Narmada Moti
AFM-4	AFM-8	GWC-0801	GWC-0400
African Tall	African Tall	African Tall	African Tall

Eight populations made previously *viz.* AFM-1, 2, 3, 4, 5, 6, 7 & 8 were raised and will be collected in next season.

(b) Segregating materials

Generation	Sown	Generation	Sown	Generation	Sown
F_1	12	F_3	40	F_6	19
F_2	20	F_4	25		

Forage Bajra

a) Population improvement: Two populations were raised

	A		B
1.	AFB-3	1.	RBC-2
2.	Giant Bajra	2.	AFB-32
3.	BAIF Bajra	3.	AFB-37
4.	GFB-1	4.	AFB-38
5.	Bajra Bawal	5.	AFB-3

b) Segregating materials

Generation	Sown	Generation	Sown	Generation	Sown
F_1	11	F_3	17	F_5	11
F_2	19	F_4	16		

Forage Sorghum Segregating materials

Generation	Sown	Generation	Sown	Generation	Sown
F_1	9	F_3	7	F_6	15
BC_3	43	F_4	56	F_7	14
F_2	4	F_5	19		

*** Progeny of 15 selected tall plants were sown**

AICRP (FC&U), CCS HAU, Hisar

Fodder Cowpea

- Collection, maintenance and evaluation of genetic stock of forage cowpea
- Evaluation of promising cowpea genotypes for fodder yield and quality
- Development of genotypes with high green fodder yield and Cowpea Yellow Mosaic Virus (CYMV) resistance in forage cowpea.

Fodder Pearl millet

- Collection, maintenance and assessment of genetic stock of forage pearl millet

Teosinte

- Evaluation of Teosinte genotypes for fodder yield and quality

Fodder Cowpea

Evaluation of germplasm: Twenty germplasm lines of fodder cowpea were evaluated during *kharif*2018. The germplasm lines revealed a wide range of variation for GFY (120-700 gm/plant), DMY (35-140 gm/plant), plant height (110-250 cm), branches/plant (2.0-5.0) leaf: stem ratio (0.3-0.6) and days to 50% flowering (50-80 days). The genotypes HFC 17-3 (700 g/plant) for GFY, HFC 17-9 (140 gm/plant) for DMY, HFC 17-2 (250 cm) for plant height, HFC 17-3 (5.0) for branches/plant, HFC 17-9 (0.6) for leaf: stem ratio and HFC 17-2 (80 days) for days to 50% flowering were found promising.

Table : Promising genotypes of forage cowpea

Characters	Range	Promising genotypes
Plant height (cm)	(110-250)	HFC 17-2 (250), HFC 17-3 (250), HFC 17-9 (245)
Branches/plant	(2.0-5.0)	HFC 17-3 (5.0), HFC 17-6 (4.5), HFC 17-15 (4.5)
L:S ratio	(0.3-0.6)	HFC 17-9 (0.6), HFC -17-17 (0..5), HFC 17-2 (0.5)
Days to 50% Flowering	(50-80)	HFC 17-2 (80) HFC 17-3 (75), HFC 17-10 (72)
GFY/plant (g)	(120-700)	HFC 17-3 (700) HFC 17-10 (650), HFC 17-9 (645)
DMY/plant (g)	(35-140)	HFC 17-9 (140), HFC 17-2130), HFC 117-7 (120)

Evaluation of varietal trials for fodder yield and its components: Seven genotypes were evaluated against the check CS-88. The genotype HFC 16-3 (374.9 qtl/ha) out yielded the check CS-88 (334.9 qtl/ha) by 11.9% for green fodder yield and 6.97% for dry matter yield.

Table 2: Evaluation of promising cowpea genotypes for fodder yield

Genotypes	GFY(q/ha)	%increase over check	DMY(q/ha)	%increase over check
HFC 16-1	339.2	-	64.4	8.2
HFC 16-2	341.7	-	68.2	14.6
HFC 16-3	374.9	11.94	63.8	6.97
HFC 16-4	347.5	3.75	62.6	7.2
HFC 16-5	344.2	-	55.1	-
HFC 16-6	330.5	-	56.2	-
HFC 16-7	333.2	-	53.3	-
CS 88 (c)	334.9	-	59.5	-

Special breeding programme in fodder cowpea

Generations were advanced and desirable single plants/progenies were selected (table 4). Uniform progenies in F5/F6 generations were bulked for further evaluation.

Table: Fresh crosses attempted during *kharif* 2018

1	CS 88 x CO 5	5	EC 4216 x BundelLobia 2
2	CS 88 x Tvv 92-2	6	BundelLobia 2 x EC 4216
3	Bundel Lobia-1 x CS 88	7	UPC 5286 x CO 5
4	UPC 5286 x CS 88		

Fodder Pearl millet

Maintenance of germplasm: Twenty germplasm lines of fodder pearlmillet were evaluated during *kharif* 2018. The germplasm lines revealed wide range of variation for GFY (30-240 gm/plant), DMY (7-56 gm/plant), plant height (120-190 cm), tillers/plant (3-5) leaf: stem ratio(.2-.6) and days to 50% flowering (50-75 days). The genotypes FB 17-5 (240 g/plant) for GFY, FB 17-4 (56 gm/plant) for DMY, FB 17-10 (190 cm) for plant height, FB 17-4 (5.0) for tillers/plant, FB 17-4 (0.6) for leaf : stem ratio and FB 17-5 (75 days) for days to 50% flowering were found promising.

Table 4: Promising genotypes of forage pearl millet

Characters	Range	Promising genotypes
1) Plant height (cm)	(120-190)	FB 17-10 (190.0), FB 17-4 (180.0), FB17-4 (175.0)
2) Tillers/plant	(3-5)	FB 17-4 (5.0), FB 17-5 (4.0), FB 17-7 (4.0)
3) L:S ratio	(0.2-0.6)	FB 17-4 (0.6), FB-17-8 (0.6), FB 17-5 (0.5)
4) Days to 50% Flowering	(50-75)	FB 17-5 (75) FB 17-4 (72), FB 17-10 (70)
5) GFY/plant (g)	(30-240)	FB 17-5 (240) FB 17-14 (220), FB 17-7 (220)
6) DMY/plant (g)	(7-56)	FB 17-4 (56), FB 17-9 (50), FB 17-7 (38)

Teosinte:

- **Evaluation of Teosinte genotypes for fodder yield and quality:** Four genotypes were evaluated against the check 'Improved Teosinte'. The genotypes ITS-3 (433.2 q/ha) and ITS-4 (458.3 q/ha) out yielded the check improved teosinte by 4.63 and 10.7%, respectively.

Table: Teosinte genotypes evaluated in Large Scale Trial (LST) during *kharif*2018

SN	Genotypes	GFY q/ha	% increase over check	Rank
1	**ITS-3**	433.2	4.63	2
2	**ITS-4**	458.3	10.70	1
3	**ITS-5**	383.3	-	4
4	**ITS-6**	377.5	-	5
5	**Improved Teosinte (check)**	414.0	-	3
	CD at 5%	9.5		
	CV (%)	7.60		

AICRP (FC&U), CSKHPKV, Palampur

Germplasm addition during the period of report

Crop	No. of collections	Source
Black spear grass (*Heteropogon contortus*)	**4**	**Distt. Kangra (HP)**
Golden beard grass (*Chrysopogon gryllus*)	**3**	**Distt. Kangra (HP)**

Germplasm Holding

Crop	No. of collections
Setaria grass (*Setaria anceps*)	40
Maize (*Zea mays*)	20

Promising Germplasm

Crop	**Entries**
Setaria grass	
Low oxalates	S-6, S-7, S-10, S-13, S-17, S-30, S-33, S-18 and S-20
Crude protein content	S-6 and S-12
Leaf-stem ratio	S-9,S-18, S-20 and S-39
Tillers/plant	S-21

Breeding work

Setaria grass

- Polycross progenies of 10 diverse parents namely PSS-1, PS-2, PS-3, PS-4, PS-5, S-92, PS-7, PS-8, PS-25 and PS-10 were evaluated for forage attributes. Entries PS-4, PS-8, PS-9 and PS-10 were good general combiners for most of the traits.
- Genotypes S-6, S-25, S-17, S-92, S-21, S-27, PSS-1, S-16 and S-11 exhibited maximum diversity on the basis of D^2 statistic and SSR markers.
- Evaluation of clonal selections of Setaria over years revealed superiority of selection S-6 for fodder yield and other traits.
- Four new clonal selections were also made in the existing populations.
- Three entries of Setaria grass are under testing in coordinated trials.

Maize

- Twenty land races/populations of maize were maintained. Eight land races gave significantly higher green fodder yield as compared to African tall. However, entry PMG 97 gave significantly higher green fodder as well as seed yield.

Bajra Napier hybrid programme

- Evaluation of sixteen hybrids revealed superiority of hybrid CO7 x FD 464 for fodder yields.

AICRP (FC&U), PJTSAU, Hyderabad

Germplasm Holding

SN	Crop	Number	Source
1.	Fodder Cowpea *(Vigna unguiculata)*	60	1. NBPGR, Regional Station, Hyderabad 2. RARS, ANGRAU, Tirupathi 3. Local collections
2.	Fodder Maize *(Zea mays)*	30	1.Winter Nursery, DMR, Hyderabad 2.NBPGR , New Delhi
3.	Fodder Bajra *Pennisetum glaucum* *Pennisetum Orientale*	56 48 8	ICRISAT, Hyderabad.
4.	Napier *(Pennisetum purpureum)*	15	TNAU, Coimbatore.
5	Lucerne *(Medicago sativa)*	12	Local collections from Gujarat and Maharashtra
6	Hedge lucerne	8	Local Collections
7	Perennial Sorghum	4	Local collection
8	Para grass	3	*Bracharia mutica, B. brizzantha, B. ruzzivensis*

- Eight local germplasm with red kernel in sorghum are evaluated during Kharif, 2018

Entries proposed for minikit testing in the state of Telangana

- Fodder Maize entry TSFM 15-2
- Fodder Bajra entry TSFB 14-10

Station Trials

Forage maize : Among three entries evaluated in PVT, Kharif 2018 station trial , The entry TSFM 18-2 has recorded 18.7% and 25.6% superior yields for green fodder (520 q/ha) and dry fodder yield (68.6 q/ha) respectively over check African tall (438q/ha and 54.6 q/ha respectively)

Fresh crosses attempted

- African Tall x EC 232186
- J1006 x EC 232186
- African tall x IC 83200
- African Tall x IC 83200

Forage bajra: Out of five entries tested in PVT, Kharif 2018 station trial, the two entries TSFB 18-6(485q/ha & 104.3q/ha) and TSFB 18-10(472.0 q/ha & 99.1q/ha)are found to be promising with 16.9% and 13.7% superiority for green fodder respectively and 13.7% & 12.6% respectively for dry fodder yields over the best check Motibajra (415q/ha and 88.0q/ha respectively).

Forage cowpea: Between two entries evaluated in PVT, Kharif 2018 station trial, the entry TSFC 18-16 has recorded high green fodder yield (256 q/ha) with 21.9% superiority over the best check Bundel Lobia-1(210q/ha). For dry fodder (57q/ha) the entry has shown 29.2% increase over Bundel Lobia - 1 (210 q/ha).

Fresh crosses attempted in Cowpea:

SN	Cross Combination	SN	Cross Combination
1	APFC 10-1 X CS 88	**5**	SK 55 X EC 4216
2	SK 55 X NDFC 6	**6**	B.L X Selection local
3	SK 58 X CO4	**7**	CN 8076 X Vijaya
4	APFC 10-1 X UPC 5286	**8**	SK 55 X B.L

Bajra Napier Hybrids: The two hybrids namely TSBN 15-8 (Giant Bajra x FD 435) and TSBN 15-15 (ICMV 05 555 X FD 461) are found to be promising with 18.2% and 14.5% respectively over the best check CO-4 in 3rd year of testing, Kharif 2018.The two entries will be proposed for testing in Coordinated trial, Kharif 2019.

Development of inbred lines in Forage Maize: During Kharif 2018, selfing in the selected plants (selection criteria is long plant height, early duration) raised in ear to row planting from second cycle of inbreeding population was taken up.

AICRP (FC&U), IGKV, Raipur

Breeding material collection, generation, handled and crosses attempted

- Evaluation of 46 Land races in Cowpea (Trait specific germplasm characterization and identification for forage type)
- Dose optimization in Rice bean for Physical mutation and growing M_1 generation.
- Evaluation of Cowpea (*Vigna unguiculata* (L.) Walp.) : **State Multi Location Trial**, **(3)** location Raipur (Plane Zone/Representative centre), Ambikapur (North Zone) and Jagdalpur (Platue Zone). Promising lines (5 entries + 2 checks BL-1 and UPC 5286).

Table 1 : Mean yield performance for GFY (q/ha) and DMY (q/ha) forage cowpea

	GFY (q/ha)			DMY (q/ha)		
	RAIPUR	AMBIKAPUR	JAGDALPUR	RAIPUR	AMBIKAPUR	JAGDALPUR
CGCFS-43	97.06	76.65	86.06	36.03	16.43	30.44
CGCFS-46	106.41	126.05	124.17	28.43	33.36	33.30
CGCFS-48	95.23	89.17	92.36	30.93	33.81	26.88
CGCFS-52	102.34	39.69	44.21	23.22	26.77	18.46
BL-1	101.69	96.07	98.94	23.54	20.77	27.54
UPC-5286	108.15	126.48	119.44	30.56	28.46	33.19
CGCFS-65	125.26	103.03	112.50	23.82	31.03	29.79

Evaluation of Maize (*Zea mays*) : State Multi Location Trial, (3) location Raipur (Plane Zone/Representative centre), Ambikapur (North Zone) and Jagdalpur (Platue Zone). Promising lines (6 entries + 2 checks African Tall and J-1006)

Table 2 : Mean yield performance for GFY (q/ha) and DMY (q/ha) forage Maize

	GFY (q/ha)			DMY (q/ha)		
	RAIPUR	AMBIKAPUR	JAGDALPUR	RAIPUR	AMBIKAPUR	JAGDALPUR
IAFM- 2015-15	185.19	525.93	513.89	66.64	199.36	197.06
IAFM-2015-26	296.30	535.65	426.06	74.39	175.09	188.79
IAFM-2015-38	194.44	528.70	562.96	103.16	208.78	212.86
IAFM-2015-48	195.60	545.83	558.33	59.62	211.69	258.11
CGMFS-1	189.81	492.59	493.52	64.93	114.18	106.03
CGMFS-2	175.93	585.65	598.61	74.29	171.66	193.77
African Tall (C)	245.37	524.07	509.63	78.60	132.17	128.45
J-1006 (C)	212.96	543.98	514.63	67.56	127.77	123.85

Evaluation of local Marvel Grass (*Dichanthium annulatum*) collections : State Trial at station 1 location with checks GAM Grass-2.

Table. 3 Mean performance of GFY yield (q/ha), DMY yield (q/ha) and Protein %

	GFY (q/ha)	DMY (q/ha)	Protein %
GAM Grass-2 (c)	200.0	70.0	
CG Marvel Forage 1	220.0	76.0	9-11 %
Marvel-7 (c)	233.0	72.0	
CG Marvel Forage 1	226.0	69.0	7-10 %

Multiplication of seed for propagation.

AICRP (FC&U), NDUAT, Faizabad

Germplasm collection, evaluation & maintenance:

Crop	Existing accessions	New Collections	Total accessions	Source
Forage Bajra	40	05	45	Farmer's field of Barabanki, Lucknow, Ghazipur
Forage cowpea	08	02	10	Farmer's field of Barabanki

Breeding Programme in Forage Bajra: Ten new crosses were made during Kharif 2018

S.N.	Cross combinations	S.N.	Cross combinations
1	NDFB 926 x AFB-4	6	NDFB 1502 x BAIF Bajra
2	NDFB 926 x AFB-3	7	NDFB 1502x AFB-4
3	NDFB 1801 x BAIF Bajra	8	NDFB 1502 x AFB-3
4	NDFB 1801x Giant Bajra	9	NDFB 1502 x Giant Bajra
5	NDFB 1801 x AFB-4	10	NDFB 1801x AFB-3

Segregating generations :

- F_1 = 11
- F_2 = 09
- F_3 = 05
- Advance lines = 10

Station Trial:

- One station trial viz., VT Station on Forage Bajra was conducted. Fourteen genotypes were tested against two checks viz., NDFB-2 and NDFB-3.

AICRP (FC&U), GBPUAT, Pantnagar

Cowpea germplasm evaluation: Cowpea germplasm of 300 lines comprising indigenous & exotic lines and improved genetic stocks have been planted in 1-5 m long rows spaced 1.0 m apart for the evaluation and maintenance.

Multiplication/Maintenance of Improved Genetics Stock / Released Varieties: Multiplication/ increase of following twenty two improved genetic stocks / released varieties were undertaken during the season for their seed harvest for use in the Station evaluation/ National Coordinated Trials.

SN	Improved lines	SN	Improved lines	SN	Improved lines
1.	UPC 801	**2.**	UPC 802	**3.**	UPC 803
4.	UPC 804	**5.**	UPC 805	**6.**	UPC 626
7.	UPC 631	**8.**	UPC 953	**9.**	Pr 1
10.	UPC 5286	**11.**	UPC 287	**12.**	UPC 8705
13.	UPC 9202	**14.**	UPC 621	**15.**	UPC 618
16.	UPC 607	**17.**	UPC 622	**18.**	UPC 4200
19.	UPC 628	**20**	UPC 625	**21.**	UPC 5287
22.	PL- 1				

Breeder Seed Production: 50 kg of Breeder seed was produced of forage cowpea variety UPC 8705 as per BSP-I indent for *Kharif*- 2018.

Other Activities Kharif-2018

AICRP (FC&U), PAU, Ludhiana

Research papers in journals

Goyal M, Kaur H, Singh DP and Tiwana US (2017). Evaluation of nutritional quality and yield of winter forages prevalent in Punjab. ***Range Mgmt. & Agroforestry*. 38 (2):** 249-253.

Goyal Meenakshi and Kaur Navreet (2018). Low temperature induces oxidative stress tolerance in oats (*Avena sativa* L.) genotypes. ***Indian J Plant Physiol* 23 (2):** 316-324.

Kapoor Rahul (2018). Inter-relationship of green fodder yield with yield contributing and quality traits in *Avena sativa*. ***Forage Res*. 43 (4):** 330-333

Kapoor Rahul and Singh Gagandeep (2017). An attempt to produce oat haploids using oat x maize hybridization technique. ***Int. J Pure App Biosc* 5 (5):** 234-240.

Kaur Ajinder, Kaur Kamal Preet, Kalia Anu, Rani Upasana, Kahlon Jagroop Gill, Sharma Rajesh, Malaviya Devendra, Kapoor Rahul and Sandhu Jagdeep Singh (2017). Generation of interspecific hybrids between *Trifolium vesiculosum* and *T. alexandrinum* using embryo rescue. ***Euphytica* 213:** 253.

Kaur Navreet and Goyal Meenakshi (2018). Phytohormones influence biochemical metabolites and quality traits of oats (*Avena sativa* L.) genotypes. ***Agric Res J* 55:** 224-229

Kaur Rajvir, Kapoor Rahul, Vikal Yogesh and Kaur Kamalpreet (2018). Assessing genetic diversity in dual purpose oat (*Avena sativa* L.) cultivars based on morphological and quality traits. ***Int. J. Curr. Microbiol. App. Sci. 7*(5).**

Kaur Rupinder, Goyal Meenakshi and Tiwana US (2017). Yield and quality attributes with seasonal variation in Napier Bajra hybrid (*Pennisetum purpureum* × *P. glaucum*) under different nitrogen environments. ***Journal of Applied and Natural Science* 9 (3):** 1350 - 1357.

Rani Meena, Singh Sukhpreet, Tiwana U S, Sarlach R S and Goyal Meenakshi (2017). Effect of plant growth regulators on yield and quality of berseem (*Trifolium alexandrinum* L.) seed. ***Forage Research* 42 (4):** 243-247.

Singh R, Tiwana U S and Goyal M (2018). Fodder productivity and quality of Napier Bajra Hybrid (*Pennisetum purpureum* × *Pennisetum glaucum*) and summer fodder intercrops with different seed rates. ***Forage Research* 43:** 299-303.

Tiwana US, Chaudhary DP and Singh Pritpal (2017). Sustaining quality, nutrient uptake and soil fertility through integrated nutrient management in food –Forage cropping system. ***Forage Res.* 43 (3):** 231-234

Tiwana US, Rani Upasana, Singh Pritpal and Singh Sukhpreet (2017). Effect of nitrogen on the fodder yield and quality of multicut oats varieties and their compatibility with berseem under different seed rates. ***Progressive Research – An International Journal* 12 (2):** 137-140

Toor AK, Kumar Ashok and Kapoor Rahul (2017). Evaluation of napier bajra hybrids for yield and other parameters. ***Int. J. Genet.* 9(7):** 287-291.

Papers presented in Symposia/Workshops

Ashlesha, Kumar Ravinder and Tiwana US (2018). Endophytes as biocontrol agents against *Sclerotinia* stem rot in berseem (*Trifolium alexandrinum* L.). *Souvenir*. All India Coordinated Research Project on Forage crops & Utilization, National group meet, Kharif 2018, April 6-7, 2018 held at TNAU, Coimbatore, Tamil Nadu, pp 30-32.

Ashlesha, Oberoi Harpreet Kaur and Tiwana US (2017). Integrated management of maydis leaf blight of fodder maize. *Plant Disease Research* 32 (2): 267.

Kapoor Rahul (2017). Pre breeding and germplasm enhancement in Oats, Centre of Advanced Faculty Training in Genetics and Plant Breeding (ICAR), Department of Plant Breeding and Genetics, PAU, Ludhiana, August 7-27, 2017 held at PAU, Ludhiana, Pp. 235-242

Kapoor Rahul (2018). Designer fodder crops: addressing animal nutrition: In Souvenir National Group Meet of All India Coordinated Research project on Forage Crops-*Kharif* 2018, April 6-7, 2018, TNAU, Coimbatore, pp 33-41.

Kapoor Rahul (2018). Genetic variability and association studies in Guinea grass (*Panicum maximum* Jacq.) AP-43; In: 21st Punjab Science Congress, PAU, Ludhiana, 7 – 9 February, 2018.

Book Chapters/ Souvenir articles

Ashlesha and Cheema Harpreet Kaur (2018). Disease and Insect Pest management in Fodder crops. *Fodder Crops- Approaches for Value Addition and Enhancing Income*. (ISBN: 9789384922771) Pages 123-135.

Ashlesha, Rani Upasana and Tiwana US (2017). Maize as fodder crop and its important diseases. *Souvenir*: National Group Meet, *Kharif* 2017 of All India Coordinated Research Project on Forage Crops and Utilization, April 23-24, 2017 held at CSKHPKV, Palampur (pp 84-86).

Kumar Ravinder and Singla Ashlesha (2017). Management aspects of insect pests and diseases in forage Pearl Millet. *Souvenir*: All India Coordinated Pearl Millet Improvement Project, 52nd Annual Group Meet, April 28-30, 2017 held at PAU, Ludhiana (pp 100-107).

Students guided: M. Sc.: 5 ; Ph.D. : 2

FTDs conducted: Napier Bajra Hybrid (PBN 346) = 100

TV/Radio talks: TV (2) ; Radio (2)

Details of seed/Planting material sold

Crop	Variety	B/S (q)	F/S (q)	C/S (q)	TL (q)	Total (q)
Cowpea	CL 367	0.20	--	--	6.5	**6.70**
Guinea grass	PGG 518	0.20	--	--	3.0	**3.20**
Maize	J 1006	35.0	178.0	2320.0	--	**2533.0**
Bajra	FBC 16	0.20	0.60	--	45.0	**45.80**

AICRP (FC&U), TNAU, Coimbatore

Awards and Honours

- '**Best Seed production centre**' award in TNAU from DG, ICAR during the 48th TNAU foundation day held on 02.07.2018. This award has been conferred for the strenuous effort taken for the production and distribution of forage seeds/vegetative propagules in a big way.

- Three **'Appreciation Certificates'** from AICRP on FC &U, ICAR-IGFRI, Jhansi for the release of three forage varieties (Fodder Sorghum CO 31, Fodder cowpea TNFC 0926 & CO 9) at National/state level during the period from 2016-2018 in the NGM, *Rabi* 2017-18 held at CCS HAU, Hisar on 07.09.2018 & 08.09.2018.

Research papers in journals

Karthikeyan Balasamy Jayaraman, Babu Chakrapani and Amalraj John Joel. (2017). Exploring the diversity of cyanogenic potential in Sorghum (*Sorghum bicolor* (l.) Moench) at different Growth stages through trend analysis. ***Forage Res.* 43 (3):** 187-196.

Swathi L, Babu C, Iyanar K, Prabakaran AJ and Saravanan NA (2018). Assessing the chromosomal stability during cell division in the interspecific hybrids of pearl millet × Napier grass hybrid CO (BN) 5. ***Journal of Pharmacognosy and Phytochemistry*. 7(5):** 962-964

Thomas Anusha Mariam, Babu C and Iyanar K (2018). Genetic variability and association studies in pearl millet for green fodder yield and quality traits. ***Electron J Plant Breed.* 9 (3):** 1263 - 1271.

Book

Babu C, Iyanar K, Sivakumar SD and Ganesamurthy K (2018). *Forage Crops and Dairying*. TNAU offset Press, Coimbatore - 3 (ISBN: 978-93-83799-91-6).

Book Chapters: 2

Babu C, Sudhagar R, Sivakumar SD and Pavithra N (2018). Evolution of Bajra Napier Hybrids in India. In: *Fodder Crops – Approaches for Value Addition & Enhancing Income*. Pp. 30-39 (ISBN: 978-93-84922-77-1).

Sivakumar SD, Babu C, Sudhagar R, and Thenmozhi P (2018). Drip fertigation in Bajra Napier Hybrid Grass CO (BN) 5. In: *Fodder Crops – Approaches for Value Addition & Enhancing Income.* Pp. 214-216 (ISBN: 978-93-84922-77-1).

Papers presented in Symposia/Workshops: 5

Babu C, Sivakumar SD and Pavithra N (2018). Sustainable fodder production under integrated watershed management programme for up-liftment of rural livelihood in Tamil Nadu. In: Training manual on "Advances in Integrated Watershed Management for Rural Livelihood" organized by ICAR-IISWC, Ooty, Tamil Nadu.

Babu C, Kalamani A, Sudhagar R and Sivakumar SD (2018). A promising *Cenchrus setigerus* culture FDC 265. In: National Seminar on "Forage and livestock based technological innovations for doubling farmers' income". UAS, Dharwad. Dec 13-14, 2018. P: 2.

Kumaran Navaselvak T, Babu C, Sudhagar R and Backiyalakshmi C (2018). Analysis of genetic diversity in fodder cowpea (*Vigna unguiculata* L. Walp). **In:** National Seminar on "Forage and livestock based technological innovations for doubling farmers' income". UAS, Dharwad. Dec 13-14, 2018. P: 14.

Sivakumar SD and Babu C (2018). Effect of drip fertigation on growth and yield of Bajra Napier hybrid grass CO (BN) 5. **In:** National Seminar on "Forage and livestock based technological innovations for doubling farmers' income". UAS, Dharwad. Dec 13-14, 2018. P: 70.

Sudhagar R, Premachandran M, Babu C and Sivakumar SD (2018). Evaluation of intergeneric hybrids between sugarcane and *Tripsacum* for fodder value. **In:** National Seminar on "Forage and livestock based technological innovations for doubling farmers' income". UAS, Dharwad. Dec 13-14, 2018. P: 104.

Important persons visit

- Dr. M. Ramasami, Chairman, Rasi Seeds
- Dr. Mareen Abraham and Dr. Usha Thomas, KAU, Vellayani
- Dr. I. S. Solanki, ADG (FFC), ICAR, New Delhi
- Dr. A. K. Roy, Project Coordinator AICRP on Forage Crops and Utilization
- Dr. R.V. Kumar, Director, ICAR- IGFRI, Jhansi
- Dr. A. H. Sonone, and Dr. A. B. Tambe, MPKV, Rahuri

Student(s) guided: M.Sc. (Agri.) in PBG – 1; Ph.D. in PBG – 1
No. of FTDs conducted: 15
TV/ Radio talk delivered by AICRP-FC staff/ extension activities: 1

Trainings conducted to Veterinary Assistant Surgeons (2017-18)

Title of training	No. of trainees	Date	Districts
Improved varieties and technologies in forage crops	I batch (50)	12.12.2017 to 14.12.2017	From all 32 districts of Tamil Nadu
	II batch (50)	26.12.2017 to 28.12.2017	
	III batch (50)	23.01.2018 to 25.01.2018	
	IV batch (50)	29.01.2018 to 31.01.2018	
Total	**200**	**12 days**	
Funding Agency	Directorate of Animal Husbandry & Veterinary Services, Govt of TN, Chennai.		
Budget	Rs. 10.40 lakhs		

Externally funded project: 1

Title of the Scheme	Sponsors	Duration	Outlay	PI/Co-PI
Development of pearl millet forage hybrids and pearl millet – Napier (PN) hybrids for high biomass and quality suited for different agro climatic zones of India.	CGIAR- Dry land Cereals – Competitive Grants 2015	2015-17	50,000 USD	PI

Forage crops seed production details (2017-18)

S. No.	Crop/ variety	Class of seeds	Quantity produced	Quantity supplied	Balance	Expected production (2018-19)	Total quantity
I	**SEEDS (kg)**						
1.	Multicut Fodder sorghum CO (FS) 29	BS	146.00	146.00	Nil	145.0	145.0
		TFL	44.125	44.125	Nil	100.00	100.00
2.	Fodder sorghum CO 31	BS	-	-	Nil	100.00	100.00
		TFL	39.85	39.85	Nil	100.00	100.00
3.	Maize African tall	TFL	-	-	Nil	200.00	200.00
4.	Fodder cowpea CO 9	TFL	6.2	6.2	Nil	200.00	200.00
5.	*Desmanthus*	TFL	385.15	385.15	Nil	150.00	150.00
6.	Agathi	TFL	54.4	54.4	Nil	50.00	50.00
Total			**675.725**	**675.725**	**Nil**	**2,895.00**	**2,895.00**
II	**PLANTING MATERIAL (Nos.)**						
1.	CN hybrid CO (BN) 5 stem cuttings		8,63,168	8,33,168	30,000	3,00,000	3,30,000
2.	Guinea grass CO (GG) 3 rooted slips		7,730	6,730	1,000	25,000	26,000
3.	*Cenchrus* CO 1 rooted slips		2,150	1,650	500	5,000	5,500
Total			**8,73,048**	**8,41,548**	**31,500**	**15,30,000**	**15,61,500**

AICRP (FC&U), NDUAT, FAIZABAD

Research papers in journals

Kumar M, Singh RP, Pandey VK, Singh A, Singh V, Tiwari A and Yadav RS (2018). Effect of nitrogen levels and weed management practices on weed flora, yield and nutrient uptake by wheat grown in zero-till condition. ***International Journal of Chemical Studies*** **6(6):**2084-2087.

Nand V, Gupta RK, Yadav RS, Singh KD, Yadav RK and Srivastav AK (2018). Impact of integrated nutrient management (INM) on growth of Berseem (*Trofolium alexandrinum* L.) at various cutting stages. ***Journal of Pharmacognosy and Phytochemistry*** **Spl 4:**254-258.

Pal P, Kumar S, Zaidi SFA, Yadav RS, Chandra S, Bharose R and Chand R (2018). Response of phosphpgypsum to various cultivars of fodder oat (*Avena sativa* L.) in sodic soils. ***Multilogic in Science*** **VIII Spl (E):** 350-352.

Participation in Seminar/Symposia/Winter school: 1

Linkage with departments:

- Department of Animal Husbandry, NDUAT, Faizabad.
- Department of Agroforestry, NDUAT, Faizabad

Courses taught:

- Agron 311(H) N-UG-Organic Farming
- Agron 516 (M.Sc.Ag) –Forage and Fodder Crops
- Agron 516 (M.Sc.Ag) –Agronomic Field Experimentation

Students Guidance:

M.Sc. (Ag.) Student: Ankit Singh Id.No.-A6414/12/17
Ashutosh Pratap Singh Id.No.-A9971/17
Suryabhan Id.No.-A7819/14//18
Lalit Babu Patel Id.No.-A7761/14//18

Ph.D. student: Shrimannarayan Dubey Id.No.-A7522/13//18

FTD conducted: Forage bajra-NDFB-2 -5

Radio Talks: 3

AICRP (FC&U), SKRAU, Bikaner

Research papers in journals

Sanadya SK, Shekhawat SS, Sahoo Smrutshree, Kumar Anil and Kumari Neelu (2018). Metroglyph analysis in sewan grass (*Lasiurus sindicus* Henr.) accessions. ***Forage Res*. 44(2):** 86-89.

Sanadya SK, Shekhawat SS, Sahoo Smrutshree and Kumar Anil (2018). Variability and inter-relationship of quantitative traits in sewan grass (*Lasiurus sindicus* Henr.) accessions. ***International Journal of Chemical Sciences* 6 (6):** 1843-1846.

Shekhawat DK and Shekhawat SS (2018). Quality improvement in green fodder crops and pasture grasses of arid region of Rajasthan state of India. Paper presented in International Workshop and Symposium on Green Chemistry and Technology (IWSGCT-18) held at Dungar College (MGS University), Bikaner during October 15-17, 2018.

Souvenir/ book chapter

Shekhawat SS. (2018). Genetic improvement research at Bikaner centre for forage crops and grasses of arid region of Rajasthan. In: *Fodder Crops: Approaches for Value Addition and Enhancing Income*; edited by Y. Jindal, A. K. Chhabra and A. K. Roy; Earth Vision Publications, Gurugram (Haryana); ISBN: 978-93-84922-77-1.

Seminar, conference, symposium – Dr SS Shekhawat participated in

- Workshop on "Gender Sensitization at Work Place" at, SKRAU, Bikaner - July 20, 2018.
- Interaction meeting with the Director General, ICAR, New Delhi on October 01, 2018 at Central Institute of Arid Horticulture, Bikaner.
- As resource person in Agrifest – 2018 on October 02, 2018, organised by National Research Centre on Camel and ATMA, Bikaner.

List of important persons visited to AICRP- FC centre

Dr. Rahul Kapoor, PAU, Ludhiana and Dr. Mukesh Chaudhary, IGFRI, Jhansi.

Student (s) guided and teaching work - Dr. SS Shekhawat

- Additional charge of University Head of Department of Plant Breeding and Genetics.
- Guided one Ph.D. student as Major Adviser for thesis work.
- PG courses:
  - PBG-532 (Heterosis Breeding)
  - PBG-614 (Advanced Biometrical and Quantitative Genetics)

FTDs conducted: 10 fodder demonstrations were conducted during Kharif-2018, which included cluster bean, hybrid bajra napier and guinea grass.

Training conducted for farmers/ NGO/Govt. Officials – Lectures by Dr. SS Shekhawat

- Two lectures in the ICAR sponsored Winter School on "Fodder management strategy for suitable livestock production under climate change scenario" organized during Sept. 02-22, 2018 at IABM, SKRAU, Bikaner on the following topics:
  1. Fodder research network in India
  2. Management of lucerne and berseem for quality fodder production
- One lecture in the ICAR sponsored Winter School on "Soft and entrepreneurial skills for development of agricultural sciences" organized during Nov. 13 - Dec. 03, 2018 at IABM, SKRAU, Bikaner on the topic:Scientific forage management for profitable animal husbandry
- Lecture to farmers of Phalodi area of western Rajasthan on green fodder production and pasture establishment under the training sponsored by ATMA, Jodhpur on August 08, 2018.

- Lecture to agriculture input dealers on the topic "Improved varieties of fodder and other Kharif crops" in a training of Diploma in Agricultural Extension Services for Input Dealers-2018 (DAESI) on Sept. 02, 2018. The training was organised by KVK, Bikaner and sponsored by State Institute of Agriculture Management (SIAM), Jaipur.

Details of seed/ planting material sold

Green and dry fodder sale: Approx. Rs.20000/-

Other projects: Dr. R. C. Bairwa - One RKVY project – PI; one station trial on mustard; one PVT on cumin; Hostel warden (PG hostel)

Other works - Dr. S. S. Shekhawat

- Member of Academic Council of SKRAU, Bikaner.
- Breeder Incharge of seed production at KVK, Abusar, Jhunjhunu.
- Member of Board of Studies of Faculty of Agriculture of SKRAU, Bikaner.
- Member of Advisory Committee for RAWE at College of Agriculture, SKRAU, Bikaner.
- Conduct all examinations of Department of Plant Breeding and Genetics due to being the University Head. He also conducted some practical examinations as external examiner.
- As paper setter of one course of IGKVV, Raipur.
- As paper setter of one course of SKRAU, Bikaner.

AICRP (FC&U), JNKVV, Jabalpur

Research papers in journals

Kujur Monica Jyoti, Bilaiya SK and Mehta AK (2017). Character association study among components of green fodder yield in ricebean. ***Indian Journal of Agricultural Research* 51 (4):** 370-374.

Kujur Monica Jyoti, Bilaiya SK, Mehta AK and Meena V (2017). Genetic divergence in fodder ricebean (*Vigna umbellata*) ***Forage Research* 43 (2):** 106-109

Important Persons visit

- Board Members of Vishwa Vidyalaya.
- Hon'ble Agriculture Minster
- High power committee of M.P. and MLAs
- Dr US Tiwana PAU Ludhiana and Dr Yogesh Jindal HAU, Hisar
- Dr. SK Rao Hon'ble Vice chancellor RVSKVV ,Gwalior

Students guided: M. Sc. - 1

FTDs conducted: 15 on Maize (African Tall), Rice bean, BxN Hybrid

TV/Radio talks: Radio talks = 1

AICRP (FC&U), UAS (B) ZARS Mandya

Awards and Honours:

- Received best poster presentation award in National Symposium on National Symposium on Forage and Livestock based Technological Innovations for doubling farmers income, organized by RMSI, IGFRI, Jhansi held on 13th & 14th of December-2018 at UAS, Dharwad- Karnataka,

- Received best demonstration award for live demonstration of different forage crops and technologies established at held at Zonal Agricultural Research Station, V C Farm, Mandya during Krishimela-2018 held on 24th & 25th of November-2018.

Research papers in journals

Shekara BG, Prakash P, Mahadevu P, Manasa N and Chikkarugi NM (2018). Agro Techniques for enhancing green forage yield and quality in Signal Grass (*Bracharia ruziziensis*) under rainfed ecosystem. ***Res. Jr. of Agril. Sci.* 10(1):** 18-21

Papers presented in Symposia/Workshops

Mahadevu P, Shekara BG, Chikkarugi NM and Manasa N (2018). Performance of fodder maize varieties in southern dry zone of Karnataka, Book of Abstract, 1st National Genetic Congress, held at IARI, New Delhi, December 14-16, 2018, P:109.

Mahadevu P, Shekara BG, Chikkarugi NM and Manasa N (2018). Performance of fodder Pearl millet varieties in southern dry zone of Karnataka, Book of Abstract, 1st National Genetic Congress, held at IARI, New Delhi, December 14-16, 2018, P:110.

Mahadevu P, Shekara BG, Chikkarugi NM and Manasa N (2018). Performance of promising fodder oat variety RO-11-1 in southern Karnataka, National Symposium, Souvenir & Abstract, Published by RMSI, Jhansi. P:53

Mahadevu P, Shekara BG, Lohithswa HC, Chikkarugi NM and Manasa N (2018). New forage cowpea variety MFC-09-3 for enhancing livestock productivity in Karnataka, National Symposium, Souvenir & Abstract, Published by RMSI, Jhansi. P:103.

Shekara BG, Mahadevu P, Chikkarugi NM and Manasa N (2018). Intensive forage production through Agase (*Sesbania grandiflora*) based cropping system under protective irrigation, National Symposium, Souvenir & Abstract, Published by RMSI, Jhansi. P:71

Shekara BG, Mahadevu P, Chikkarugi NM and Manasa N (2018). Studies on sustainable year-round green fodder production under irrigated conditions, National Symposium, Souvenir & Abstract, Published by RMSI, Jhansi. P:72

Extension articles /Folders in Kannada

Mahadevaiah, Dinakar HP and Shekara BG (2018). Methods for estimating the body weight of the cross breed cows.

Shekara BG, Mahadevu P and Manasa N (2018). Fodder Crops Suitable for Sheep & Goat farming.

Shekara BG, Mahadevu P, Chikkarugi NM and Manasa N (2018). Hydroponics fodder Production.

Presentations in Conferences / Symposium / Seminars / other forum: **1**

Important persons visit

- Shri. N H Shivashankar Reddy, Hon'ble Minister of Agriculture, Govt of Karnataka.
- Shri. D C Thamanna, Hon'ble Minister of Transport, Govt of Karnataka.
- Shri. C S Puttaraju, Hon'ble Minister of Minor irrigation, Govt of Karnataka
- Board Members of UAS, GKVK, Bengaluru.
- Vice chancellor. UAS, GKVK, Bengaluru.
- Director of Research, UAS, GKVK, Bengaluru.
- Managing Director CADA, Govt of Karnataka

Student(s) guided:

- **M.Sc.** (Agri.) in GPB – 2
- **M. Sc.** (Agri.) in Agronomy- 2
- **Ph.D.** (Agri.) in Agronomy- 1

No. of FTDs conducted: 50

Training conducted for farmers/ NGO/ Govt. officials: 3-Training & **1**-Field days

TV/ Radio talk delivered by AICRP-FC staff/ extension activities:

- **TV :02 Radio talk :02**

Details of seed/ planting material sold

S. No.	Crops	Root Slips Sold (In Lakhs)
1.	Napier Bajra Hybrid (Co-3)	0.20
	Napier Bajra Hybrid (BNH-10)	0.50
2	Guinea grass (JHGG-08-1)	0.20
3	Rhodes grass (Selection)	0.20
4	Signal grass(Selection)	0.30

Externally funded projects: 01

- Augmenting Fodder Production and establishing fodder seed bank at University of Agricultural Sciences, Bangalore (2013-14) (RKVY project) with budget outlay of **100 lakhs**. (**RKVY**)

AICRP (FC&U), KAU, Vellayani

Research papers in journals

Akhila CT and Thomas Usha C (2018). Effect of Magnesium levels and growing conditions on nutrient uptake of hybrid napier. ***Forage Res.*** **44(1):**52-55

Chacko A, Abraham Mareen and Shahiba AM (2018). Stability analysis in Hedge Lucerne (*Desmanthus virgatus* (L.) Willd) for yield and quality. ***Int. J. Pure App. Biosci.*** **6(5):** 631-636

Fayique AC and Thomas Usha C (2018). Effect of spacing and nutrient levels on the quality and yield of fodder ricebean. ***Forage Res.*** **44(2):** 130-133

Fayique AC and Thomas Usha C. (2018). Secondary metabolites in forage crops- a review. ***Ind. J. Pure App. Biosci.*** **6(3):** 490-495

Ishrath PK, Thomas Usha C and Dhanya Ganesh (2018).Effect of cutting intervals on yield and quality fodder production in hybrid napier. ***Forage Res*** **44(2):**137-140

Book Chapters/ Souvenir articles

Usha CT, Abraham Mareen, Ishrath PK, Fayique AC and Arun C (2018). Coconut based fodder production systems in Kerala. *Fodder crops- Approaches for value addition and enhancing income.* Pp.217-220. ISBN No: 978-93-84922-77-1

Papers presented in Symposia/Workshops

Chacko A, Abraham Mareen and Shahiba AM (2018). Forage crop improvement-conventional and novel technologies. RMSI National Symposium on forage and livestock based technological innovations for doubling farmers income' UAS, Dharwad, Karnataka.p.17

Chacko A, Abraham Mareen and Shahiba AM (2018). Genotype x Environment interaction in hedge Lucerne for yield and quality. National Genetics Congress on Genetics for sustainable food, health and nutritional security, IARI, New Delhi. P.65

Fayique AC and Thomas Usha C (2018). Production and economics of fodder rice bean as influenced by spacing and nutrient levels. *International Biodiversity Congress* (IBC 2018).p.528

Fayique AC and Thomas Usha C. (2018). Influence of spacing and nutrient levels on growth attributes, yield and economics of fodder rice bean. *Swadeshi Science Congress- Book of Abstracts. P.3.*

Fayique AC, Thomas Usha C and Ishrath PK (2018). Standardisation of spacing and nutrient levels for fodder ricebean in Kerala. RMSI National Symposium on Forage and livestock based technological innovations for doubling farmers income', UAS, Dharwad, Karnataka.p.65

Praveena VS, Abraham Mareen and Thomas Usha C (2018). Tilling – In forage Crops for crop improvement. RMSI National Symposium on forage and livestock based technological innovations for doubling farmers income' UAS, Dharwad, Karnataka.p.18

Usha CT, Abraham Mareen, Akhila CT, Anita MR and Fayique C (2018). Yield and quality of BN hybrid as influenced by Magnesium and Boron nutrition in Kerala. RMSI National Symposium on Forage and livestock based technological innovations for doubling farmers income' UAS, Dharwad, Karnataka.p.101

Usha CT, Abraham Mareen, Ishrath PK, Allan T and Fayique C (2018). Impact of season, additives and grass types on silage quality of fodder grasses. RMSI National Symposium on Forage and livestock based technological innovations for doubling farmers income'- UAS, Dharwad, Karnataka.p.102

Student(s) guidance

- M.Sc. (Agri.) in Plant Breeding and Genetics – 2
- Ph. D. in Plant Breeding and Genetics – 2
- Ph. D. in agronomy- 1
- M.Sc. (Agri.) in Agronomy-2

Teaching- Courses Handled

Dr. Mareen Abraham

- BSc (Ag) courses- Principles of Genetics, Breeding of crops
- PG courses- Breeding of major crops, Genetics in crop improvement, Genomics and proteomics, Elements of Genetics

Dr. Usha C Thomas

- BSc (Ag) courses-Introductory Agriculture, Principles of Agronomy, Introductory Agro-meteorology and climate change

Trainings conducted

- One day training was conducted on 'Fodder production and preservation techniques' for dairy farmers on 10.12.2018

AICRP (FC&U), BAU, Ranchi

Award

Award received on 26th June, 2018 on the occasion of 38th Foundation day at Birsa Agriculture University, Ranchi for Preparation of District Agriculture Plan (DAP) for the Bokaro district of Jharkhand.

Research papers in journals

Kumar Sunil, Singh DN, Bhushan Shanti and Prasad Yogendra (2018). Characterization of germplasm of upland rice (*Oryza sativa* L.). *Plant Archives* Vol. 18, Special Issue (ICAAAS-2018), pp. 46-50.

Book Chapters/ Souvenir articles

Prasad Yogendra, Singh DN, Kumar Birendra and Kumar Kamleshwar (2018). Challenges of fodder production in Jharkhand. *Fodder Crop-Approaches for value Addition & Enhancing Income*. Chapter 26, pp-225-227.

Extension Bulletin

- Prasad Yogendra and Kumar Birendra (2018). *Jharkhand me Jai ki Unnat Kheti*.
- Prasad Yogendra, Prakash Surya and Kumar Birendra (2018). *Jharkhand me Hara Chara ki Unnat Kheti*.

Training

- Winter school attended at ICAR-Indian Grassland and Fodder Research Institute, **Jhansi** on the Topic "Maintenance breeding and assured quality seed production in dual purpose crops and grasses" from 11th September to 1st October, 2018.

Research project sanctioned during 2019-20: One Project approved for three years.

Title of the project	PI	Budget	Funding Agency	Status
Technology integration for doubling farm income through demonstration and training of innovative technologies in district of Jharkhand	**PI**: Dr. A. K. Singh **Co-PI**: Dr. Yogendra Prasa	50.00 Lakhs	**DBT**	Dumka and Palamau for Field demonstration & training for Doubling Farm Income

Courses taught

Course title	Credit hours	Name of teacher
Fundamental of Plant Breeding	3 (2+1)	Dr. Yogendra Prasad

TSP conducted: 30 fodder demonstrations were conducted at Chanho block in Ranchi district under AICRP on Forage crops during kharif-2018, which included Maize and BxN hybrid. One Kisan Sangoshthi cum farmer's training was organized on 31st October, 2018 at Kanke RVC Farm with 56 Farmer beneficiaries.

AICRP (FC&U), BAIF, Urulikanchan

Research papers in journals

Singh VK, Sinha AK, Takawle PS, and Srivastav MK (2017) Azolla feeding status and it's benefit for livestock in Odisha. ***International Journal of Recent Advances in Multidisciplinary Research* 4(12):** 3281-3282

Singh VK, Sinha AK, Takawle PS, Shindey DN and Srivastav MK (2018) Evaluation of different oat varieties for green fodder and seed production yields. ***International Journal of Recent Advances in Multidisciplinary Research* 5(3):** 3668-3670

Thorat Vipool, Kirdat Kiran, Takawale Pramod and Yadav Amit (2017). First report of 16SrII-D phytoplasmas associated with fodder crops in India. ***Phytopathogenic Mollicutes* 7 (2):** 106-110

Important persons visited to AICRPFC centre

- Dr. K. P. Viswanatha, Vice Chancellor, MPKV, Rahuri, (Maharashtra)
- Mr. R. M. Sundaram, Secretary, Animal Husbandry, Uttarakhand
- Mr. Kantilal Umap, Commissioner, Animal Husbandry, Govt. of Maharashtra, Pune
- Mr. Ingle, Director (Inputs & Quality Control), Commissionerate of Agriculture, (Maharashtra)
- Mr. Anil kumar Pingle, Programme Executive, All India Radio, Pune (Maharashtra)
- Dr. S. R. Gadakh, Director of Research, MPKV, Rahuri, (Maharashtra)

FTDs conducted: Twenty five Field Technology Demonstrations of forage BAI Bajra-1 (10), BAIF Napier Hybrid-10 (10) and forage cowpea var. UPC 9202 (5) were established at farmer's field in three blocks of Pune district to make aware them about new fodder varieties and their package of practices. Monitoring of the demonstrations was done time to time and the data on green fodder yield was generated.

Training conducted for farmers/ NGO/ Govt. officials: Under the component of capacity building of field officers and dairy farmers of RKVY project, the training of 153 Govt. officers and 131 dairy farmers was conducted in "Fodder production and their preservation techniques" during the reporting period.

HRD for AICRP-FC staff : Mr. P. S. Takawale, Forage Breeder & OIC of the project attended 4 days training programme on "Project Management Professionals". Training was arranged by BAIF Development Research Foundation, Pune and conducted by Vinsys IT Services India Pvt. Ltd., Pune.

TV/ Radio talk delivered by AICRP-FC staff/ extension activities: Five

Details of seed/ planting material sold

- Programme of Foundation and Truthful seed production of maize African Tall, BAIF Bajra-1 and cowpea var. UPC 9202 was undertaken as institutional activity and in participation with the farmers. Technical assistance required for seed production programme was provided by scientific staff of the project.
- Under RKVY project, BAIF has supplied 6.58 lakh stem cuttings of BAIF Napier Hybrid-10 (BNH-10) to 51 Taluka Seed Farm of Govt. of Maharashtra.

Externally funded projects

- RKVY funded project (through Commissionerate of Agriculture, Govt. of Maharashtra) on "Development of demonstration cum seed/planting material production areas of forage crops at TSF in different agro-climatic conditions of Maharashtra and capacity building of field officers and dairy farmers"

AICRP (FC&U), SKUAST-K, Srinagar

Research papers in journals

Haq Ansarul S, Korieng Joseph K, Shiekh TA, Bahar FA, Dar Khurshid A, Raja Waseem, Wani Rayees A and Khuroo NS (2018).Yield and quality of winter cereal-legume fodder mixtures and their pure stand under temperate conditions of Kashmir valley, India. ***International Journal of Current Microbiology and Applied Sciences.*** **7 (2):** 3626-3631

Haq Ansarul, Raja Waseem, Hussain Ashaq, Shiekh Tahir A. , Alam Intikhab and Teli Nazir A (2018).Direct and residual effect of organic and chemical sources of nutrients on fodder sorghum-fodder oat cropping sequence. ***Agricultural Reviews*** **(accepted)**

Mehraj U, Abidi I, Ahmad M, Gul zaffar, Dar ZA, Haq Ansarul, Lone AA, Rather MA and Mir MA (2018). Genotype x environment interaction for forage yield and its components in oats (*Avena sativa* L.). ***Electronic Journal of Plant Breeding*****. 8(1):** 157-162

Wani SA, Habib M, Bhat MA, Dar ZA, Lone AA, Ali G and Haq Ansarul (2018). An overview of various quality enhancement strategies in oilseeds and summarization of quality parameters. ***International Journal of Current Microbiology and Applied Sciences*****. 7 (3):** 480-488

Wani SA, Habib M, Dar ZA, Lone AA, Ali G and Haq Ansarul. (2018) A review of various quality enhancement strategies in soybean and rapeseed. ***International Journal of Advance Research in Science and Engineering*****. 7 (4):** 84-89

Papers presented in Symposia/Workshops

Haq Ansarul S, Zaffar G, Shiekh TA, Dar Khurshid A, Bahar FA, Khuroo NS, Raja Waseem and Habib Mehfuza (2018). Cropping system studies in fodder maize with legume intercropping under temperate conditions of Kashmir. *National Conference on Innovative Technological Interventions for Doubling Farmers Income held at SKUAST-Jammu from 8-10th February*, 2018. P 96

Haq Ansarul S**,** Zaffar G, Shiekh TA, Dar Khurshid A, Bahar FA, Bhat M Anwar, Raja Waseem, Khuroo NS and Habib Mehfuza (2018). Effect of varying seed rate of forage legumes on productivity of fodder maize under Kashmir conditions. *National Conference on Innovative Technological Interventions for Doubling Farmers Income held at SKUAST-Jammu from 8-10th February*, 2018. P 108

Visit of Dignitaries to AICRP-FC Srinagar

- Dr. T. Mohapatra, Secretary DARE & DG ICAR
- Prof. P. L. Gautam, Ex-Vice-Chancellor GBPUAT Pantnagar
- Prof. R. R. Hanchinal, Ex-Chairperson PPVFRA

Forage Technology Demonstration: FTD's were conducted to promote location specific varieties/package of practices and other technologies suited to location. During *Kharif* 2018, fifteen (15) numbers of FTD's were conducted on Fodder maize var. African tall of district Kargil and Srinagar through concerned KVKs.

Students Guide:

- M.Sc (Ag) in Agronomy -03 (01-Major advisor & 02-Co-advisor)
- M.Sc (Ag) in Plant Breeding -01 (Major advisor)

AICRP (FC&U), CCSHAU, HISAR

Varieties released at central or state level (During last five years)

Crop	Variety	Status
Sorghum	HJ 541	Released for Haryana State in 2014
Berseem	HB 2	Released for Haryana State in 2014
Oats	OS 377	Released for Central Zone in 2015
	OS 403	Released for North East, South Zone and North West zone of India in 2018
	OS 406	Identified for Central Zone in 2016
	OS 424	Identified for Hill Zone in 2017
	HFO 427	Identified for South Zone in 2018

Courses taught

Course No.	Course title	Name of the teacher
GP 201	Principles of Plant Breeding	Dr. Y. Jindal
GP 202	Breeding of Field Crops	Dr. Y. Jindal
GP 401	Crop Improvement	Dr. Y. Jindal
GP 403	Heterosis Breeding in Crop Plants	Dr. Y. Jindal
Agron. 509	Agronomy of Fodder & Forage Crops	Drs. Uma, Satpal

Students under Guidance:

SN	Name of Student	Degree	Research Title	Guide
1	Arpit Gaur	Ph.D.	Genome Wide Association Mapping for Stem Water Soluble Carbohydrate under Drought Stress Conditions in Bread Wheat	Dr. Y. Jindal
2	Deepak Kaushik	M.Sc.	Genetic Diversity and Path Analysis in Sorghum for Fodder and Grain Yield	Dr. Y. Jindal
3	Sonu	Ph.D.	Yet not decided	Dr. Y. Jindal
3	Atman Poonia	M.Sc.	Evaluation of oat genotypes for yield and quality characters	Dr. D.S. Phogat

Research projects

SN	Title of the project	Principal Investigator	Budget	Funding Agency	Status
1	Development of oat (*Avena sp.*) genotypes with higher yield and nutritive value	**PI**: Dr. Yogesh Jindal **Co-PI**: Dr. Jayanti Tokas	10.00 Lakhs	CCS HAU Ad-hoc Project	Applied

Research papers in journals

Arya S, Kumari P, Thakral NK, Pahuja SK and Tokas J (2017). Forage sorghum germplasm evaluation for green fodder yield and quality characters. ***Progressive Research.*** **12 (4):** 2633-2634.

Dehinwal AK, Pahuja SK, Joshi UN, Kumari P and Arya S (2017). Study of combining ability for quality component in Forage Sorghum [*Sorghum bicolor* (L.) Moench]. ***Bio. Sci. Biotech. Res. Asia.*****14(4):** 1533-1542.

Kumar S, Phogat D and Kumari P (2017). Genetic parameters for various fodder traits among the elite Cowpea (*Vigna unguiculata* L. Walp) genotypes. **G.J.B.B. 6(1):** 166-171.

Kumari P, Pahuja SK, Sheoran RS, Arya S and Joshi UN (2017). Effect of varying levels of salinity on growth, yield and quality of forage sorghum genotypes. ***Forage Res.*** **43 (1):** 64-66.

Kumari T, Jindal Y and Kumari P (2018). Characterization of oat (*Avena sp*) genotypes for morphological traits. ***Forage Research* 43 (4):** 261-265.

Kumari T, Jindal Y and Satpal (2017) Estimates of genetic variability, heritability and genetic advance of Oat (*Avena sp.*) for seed and fodder yield traits. ***Forage Res.* 43 (2):** 110-115.

Manjunath H, Phogat DS, Kumari P and Singh Dhiraj (2017). Genetic analysis of seed yield and yield attributes in Indian Mustard (*Brassica juncea* (L.) Czern and Coss.). **EJPB (*Electronic Journal of Plant Breeding)* 8(1):** 182-186.

Panchta R, Satpal and Khatri RS (2017). Variability, Correlation and path analysis studies in Cluster bean genotypes during summer season under Haryana conditions. ***Int. J. Pure App. Biosci*. 5(3):** 485-489. doi: http://dx.doi.org/10.18782/2320-7051.2882.

Phogat DS, Panchta R, Kumari P, Ram Niwas and Arya S (2017). Variability, correlation and path analysis studies in fodder cowpea [*Vigna unguicullata* (L.) Walp]. ***Trends in Biosciences* 10(3):** 1130-1132.

Phogat DS, Phougat D and Kumari P (2017). Genetic diversity analysis in Cowpea *(Vigna unguiculata* (L) walp.) using morphological *traits.* ***Trends in Bio Sciences* 10(3):** 1140-1143.

Poonia A and Phogat DS (2017).Genetic divergence in fodder oat (*Avena sativa* L.) for yield and quality traits. ***Forage Res*. 41(2):**101-105.

Poonia A, Phogat DS and Kumari P (2017). Genetic variability parameters for morphological and quality attributes in fodder oat (*Avena sativa* L.) ***Trends in Biosciences* 37(10):**7687-7691

Poonia A, Phogat DS, Bhuker A and Chhavikant (2018). Evaluation of morphological and quality parameters in forage oat. **Journal of Pharmacognosy and Phytochemistry: 7 (4):**786-790

Poonia A, Phogat DS, Bhuker A and Chhavikant (2018). Study of character association and path coefficient analysis for quantitative and qualitative traits in multi-cut oat. **Journal of Pharmacognosy and Phytochemistrty: 7 (4):**77-83

Poonia A, Phogat DS**,** Pahuja SK, Bhuker A and Khatri RS (2017). Variability, character association and path coefficient analysis in fodder oat for yield and quality traits. ***Forage Res*. 43 (3):** 239-243

Rohilla N, Arya S, Pahuja SK, Kumari P, Pinki, Rani K and Devi N (2018). Morphological characterization and quality parameters of various forage sorghum genotypes (*Sorghum bicolor* L. Moench). ***Int. J. Curr. Microbiol. App. Sci*. (2018) 7(6).** Online published.

Satpal, Sheoran RS, Tokas J and Jindal Y (2018).Quality, yield and economics of oat (*Avena sativa* L.) genotypes for fodder under different nitrogen levels. ***International Journal of Chemical Studies* 6 (1):** 1987-1991.

Satpal, Tokas J, Duhan BS and Neelam. (2018). Fodder quality and nutrient uptake of sorghum as influenced by different fertilizer levels. ***Multilogic in Science.* Vol. VIII Special Issue *(C):*** *127-129*

Satpal, Tokas J, Kumar Anil and Ravi Kumar S. (2018). Potential productivity and radiation use efficiency of multi-cut forage sorghum [*Sorghum bicolor* (L.) Moench] genotypes. ***J. Agrometeorol. 20 (Spl Issue):*** *364-36.*

Sheoran RS, Satpal, Joshi UN, Duhan BS, Kumari P, Arya S. and Phogat DS (2017). Agronomic evaluation of oat genotypes for forage yield, quality and economics under varying levels of nitrogen. ***Forage Res.* 43 (1):** 35-38.

Sheoran RS, Satpal, Tokas J, Duhan BS and Jindal Y (2017). Potential fodder productivity, quality and relative economics of multi-cut oat genotypes under different levels of nitrogen. ***Forage Res.* 43 (3):** 227-230.

Tokas J, Kumari P, Thakral NK, Satpal and Himani (2017). Evaluation of forage sorghum [*Sorghum bicolor* (L.) Moench] genotypes for quality and yield. ***Forage Res.* 43 (3):** 235-238.

Paper abstracted in Seminar/Symposia/Conferences *etc*.:

Gaur A, Parray GA, Shikari AB, Najeeb S, Shabir H Wani and Jindal Y (2017). Molecular diversity for amylose content and aroma traits in a set of traditional landraces of rice in Kashmir. Abstract accepted for presentation at International Seminar on Sustainable Intensification of Agriculture Through Resource Management and Conservation from July 7-9, 2017 At Afro Asian Studies Promotion Association (AASF), Goettingen, Germany

Jindal Y and Tokas Jayanti (2018). Performance of cereal fodder crops as compared to fodder Triticale in semi arid region of North West Haryana in India. Abstract for "2nd International Conference on Triticale and Wheat Biology, Breeding and Production" to be held from June 25-28, 2018 *at* East Anatolian Agricultural Research Institute, Erzurum, Turkey

Jindal Y, Kumari P, Tokas J, Pahuja SK and Bishnoi OP (2017).Evaluation of high nutritive fodder Triticale (X *Triticosecale* Wittmack) vis-a-vis *rabi* fodder crops in semi arid region of North West Haryana in India. In: "International Conference on Triticale Biology, Breeding and Production" held from July 2-5, 2017 at Plant Breeding and Acclimatization Institute & National**,** 05-870 Błonie, Poland held from Research Institute, IHAR-PIB, Radzików.

Jindal Y, Yadav R and Phogat DS (2017). Principal component analysis and determination of the selection criteria in fodder cowpea (*Vigna unguiculata* (L) Walp.) genotypes. In: National Symposium on "New directions in managing forage resources and livestock productivity in 21st century: Challenges and Opportunities" from 3-4 March 2017 held at RVSKVV, Gwalior. Abstract pp 53.

Kumari P (2018). Screening of sorghum maize inter-generic derivatives for biomass yield and related traits in Bio and Nano Technologies for sustainable Agriculture, Food, Health, Energy and Industry (ICBN-2018), Feb, 21-23, 2018, GJUS&T, Hisar.

Panchta Ravish, Phogat DS and Khatri RS (2017) Genetic divergence studies in cowpea [*Vigna unguiculata* (L.) Walp] for seed yield and related traits. International Conference on Global Research Initiatives for Sustainable Agriculture & Allied Sciences (GRISAAS-2017), Dec 02-04, 2017, MPUAT Udaipur (Rajasthan): 37-38.

Satpal, Panchta R, Kumar A, Thakral NK and Neelam (2017). Effect of crop geometries and radiation use efficiency on cluster bean (*Cyamopsis tetragonoloba* L.) genotypes. International Conference on Global Research Initiatives for Sustainable Agriculture & Allied Sciences (GRISAAS-2017), Dec 02-04, 2017, MPUAT Udaipur (Rajasthan): 44-45.

Satpal, Tokas J, Bhardwaj KK, Kumar A, Kumar RS, Kumari P and Arya S (2017). Potential productivity and radiation use efficiency of multi-cut forage sorghum [*Sorghum bicolor* (L.) Moench] genotypes. National Seminar on *Agrometeorology for Sustainable Development with Special Emphasis on Agrometeorological Practices for Climate Resilient Farming and Food Security.*, Oct 12-14, 2017, CCS HAU, Hisar (Haryana): 28-29.

Satpal, Tokas J, Kumari P, Kumar P and Shweta (2017). Response of single-cut forage sorghum genotypes to different fertility levels. National Agronomy Congress-2018 on *Redesigning Agronomy for Nature Conservation and Economic Empowerment*., Feb 20-22,2018, GBPUA&T, Pantnagar (Uttarakhand): 557-558.

Tokas J., Bhadu S and Satpal (2017). Effect of different potassium and sulphur levels on herbage and seed yield of berseem (*Trifolium alexandrinum* L.) quality. International Conference on Global Research Initiatives for Sustainable Agriculture & Allied Sciences (GRISAAS-2017), Dec 02-04, 2017, MPUAT Udaipur (Rajasthan): 97-97.

Bulletin

Satpal, Thakral NK, Arya S, Kumari P and Jakhar A (2018). *Hare Chare ke liye Jawar ka samuchit prabandhan.* TB/2017-18/FC/K/FLD-01.

Popular articles

Satpal, Kumari P and Anil (2018). *Hare chare ke liye jowar fasal-Prabandhan.* Haryana kheti **51**(6): 22-23.

Satpal, Phogat DS and,Devi U (2018). *Hare chare ke liye lobia ki sasya kriyayen.* Haryana kheti **51**(5): 22-22.

Extension Activities

- Different duties were assigned during *'Kisan Mela', 'Farm Darshan'*and T & V training system on monthly basis on the stall and on demonstration plot.

AICRP (FC&U), BCKV, Kalyani

Research papers in journals

Banerjee K, Puste AM, Gunri SK, Jana K and Barman M (2018). Effect of integrated nutrient management on growth, yield, quality and soil health of spring planted sugarcane (*Saccharum officinarum*) in West Bengal. ***Indian Journal of Agronomy* 63(4):** 41 – 47.

Jana K, Das SK, Roy DC, Kundu MK, Kundu A and Sathish G (2018). Seed yield of linseed varieties grown as '*paira*' crop as influenced by dates of sowing. ***Journal of Applied and Natural Science* (ISSN 0974-9411)7 10 (1)**: 17-23.

Jana K, Karmakar R, Banerjee S, Sana M, Goswami S and Puste AM (2018). Aerobic rice cultivation system: Eco-friendly and water saving technology under changed climate. ***Agricultural Research & Technology* (ISSN 2471-6774), 13 (2):** 1-5.

Jana K, Kundu CK, Sarkar S, Banerjee J and De DK (2018). Forages as contingent crops in stress condition and problematic soils of West Bengal. Souvenir, National Group Meet, *Kharif*-2018, AICRP on Forage Crops and Utilization held at TNAU, Coimbatore, Tamil Nadu, April 6-7, 2018.

Jana K, Mondal K, Banerjee S, Goswami S, Mandal R. and Sana M (2018). Grain yield of hybrid rice varieties as influenced by seed rates under aerobic direct seeded situation. ***International Journal of Current Microbiology and Applied Sciences* (ISSN 2319 – 7706) 7(10):** 2839 – 2845.

Koireng RJ, Anal PSR, Jana K and Devi KHP (2018). Prospect of sustainable livestock farming in NEH region of India. ***International Journal of Current Microbiology and Applied Sciences* (ISSN 2319-7706), 7 (1):** 1285-1292.

Kundu Arindam, Kundu Champak Kumar, Das Himangshu, Murmu Kanu and Jana Kalyan (2018)**.** Studies on 2.4-D Dimethylamine 50% SL to Control Weeds in Wheat. ***International Journal of Current Microbiology and Applied Sciences* (ISSN 2319-7706), 7 (9) :** 335-344.

Mandal K, Jana K, Ghosh S, Biswas A, Bhadra KK and Mallick GK (2018). Production oriented survey (POS) on different aspects of rice cultivation and farmers practices under red and lateritic zone of West Bengal, India. ***Archives of Agriculture and Environmental Science* (ISSN 2456 – 6632) 3(4):** 378-381.

Puste AM, Gunri SK, Jana K, Ray Pramanik B, Acharya SK, Dasgupta M, Maity TK (2018). Integrating Management for Land – Water Ecosystem for Augmenting Productivity, Income, and Sustainable Livelihood. *Springer, India Studies in Business and Economics* (ISSN 2198-0012), 385-406.

Popular articles: 2 (in Bengali)

Published one leaflet on Ricebean: Important legume forage crop under drought areas of West Bengal

Student(s) guided: M. Sc. (Ag.) in Agronomy – 4 ; Ph. D. in Agronomy- 5

Courses taught: Agronomy of fodder and forage crops and other courses

No. of FTDs conducted: 51 units (*Kharif*, 2018) : Forage maize (cv. J 1006) - 16 units, Ricebean (cv. Bidhan ricebean 1 & 2) – 21 units and BN hybrid (cv. CO3 and CO4) – 14 units, respectively.

TSP activities: 60 tribal farmers of Taaldangra block (Gram Panchayet: Bibarda, Harmasra, Khalogram) of Bankura district and Bagmundi block (Gram Panchayet: Baghmundi, Ajodhya, Birgram, Sindhri) and Block Manbazar-II (Gram Panchayet: Dighi) of Purulia district of West Bengal (Red & laterite zone i.e. western part) were benefitted by different field activities organized under TSP Programme of AICRP on FC & U, BCKV, Kalyani centre. TSP interventions were implemented at Bankura and Purulia district under red and lateritic zone of West Bengal. Agricultural, livestock and fodder & forage cum food related interventions were demonstrated for socio-economic condition uplift of tribal farmers/families under adopted villages of TSP programme. Maize (cv. J1006), *Moringa* seeds, Sorghum sudan, Rice bean (cv. Bidhan Ricebean-1 and Bidhan rice bean-2), Hybrid maize (cv. Disha), Coix (cv. Bidhan Coix-1), Lathyrus (cv. Prateek & Ratan), Toria (cv. B-54), Oats (cv. Kent), Berseem (cv. Wardan) seeds, planting materials (cuttings) of Bajra-Napier Hybrid (CO 3, CO 4 & CO 5) along with r*hizobium* culture, insecticides and fungicides were distributed among selected tribal farmers. The fodder maize (cv. J1006), Oats (cv. Kent), Berseem (cv. Wardan), *Moringa* seeds, Lathyrus (cv. Prateek & Ratan) and Chickpea (cv. Jaki 9218) has been introduced at Taaldangra block of Bankura and Bagmundi block & Manbazar –II block of Purulia district under red and laterite zone (western part) of West Bengal. Tribal farmers' meet cum demonstrations on improved cultivation practices of fodder & forage crops in Red & Laterite Zone of West Bengal was conducted successfully under this TSP programme for socio-economic condition uplift of tribal farmers/families.

Nucleus and Breeder Seed production programme:

- Ricebean (Bidhan Ricebean-1)
- Ricebean (Bidhan Ricebean-2)
- Ricebean (Bidhan Ricebean-3)

TFL seed production

- Ricebean (Bidhan Ricebean-1)
- Ricebean (Bidhan Ricebean-2)

Farmers' Meeting: 2 (Two)

Management of BN hybrid

- BN hybrid (CO-3) : 7880 cuttings
- BN hybrid (CO-4) : 8820 cuttings
- BN hybrid (CO5) : 1250 cuttings

Multiplication and management of Guinea grass (cv. Local guinea and G CO3**)**

Externally Funded Project: 2 (Private Company)

Ad-hoc Project Funded by ATMA, Govt. of West Bengal: Enhancement of Pulses Production in drought prone areas

Participated in seminar/farmers' meeting etc:

- Farmers and Women Self Help Group (SHGs) Meet on forage production technology with tribal families/farmers at Baghmundi block of Purulia district and Taaldangra block of Bankura district of West Bengal (red and laterite zone).
- Participated as resource person and delivered lecture with PPT on "Water Management in Early Vegetables" in Five Days Residential Training Programme, organized by FACC, BCKV at Lake Hall, BCKV & sponsored by Dept. of Agriculture, Govt. of West Bengal on 27.08.2018
- Participated as Co-PI and delivered PPT in Programme Planning Meeting of Adaptive Research under Govt. of WB.- ICARDA Project on 08.08.2018 at Pulses & Oilseed Research Station, Berhampore.
- Participated in Regional Coordination Committee Meeting, 2018-19 in respect of Regional Fodder Station, at Kalyani on 15th June, 2018.
- Participated as resource person and delivered lecture with PPT in DAESI classes during 2018-19 at FACC, BCKV, Kalyani.

- Participated in the meeting for physical observation of cultivated maize (J-1006) foundation fodder crops in respect of Regional Fodder Station, at Kalyani, Nadia, West Bengal.
- Participated as resource person and delivered lecture with PPT on Management of Betel Vine cultivation at SAMETI-WB at Ramakrishna Mission, Narendrapur on 03.08.2018.
- Participated as resource person in 8th krishi mela at Ramakrishna Mission, Kamarpukur, Hooghly on 8th January, 2019 and delivered a speech with power point presentation (PPT) on "Diversification of intensive cropping system".

Awareness development on 'seed production' of forage crops: Seed production of Forage maize (cv. J 1006) and Oats (cv. Kent) by farmers for their own uses as seed for the next year.

Transfer of technology:

- Distribution of Ricebean seeds to farmers for popularizing as legume cover crop for conservation of soil and water, nutrient enrichment and fodder production in drought prone areas of Bankura, Purulia, Paschim Medinipur districts.
- Conducting on-farm trials/demonstration on forage production along with rice introducing the *Coix aquatica* and the model is acceptable to the farmers as they are getting forage in the low lying areas, coastal areas and red & laterite zone of West Bengal.
- Distribution of Ricebean seeds to farmers for popularizing as an under canopy legume crop in nutrient enrichment and fodder production in the Mango, Banana, Litchi and Guava Orchards.
- Given trainings to the farmers and Women SHGs group of different districts of West Bengal.
- Provide seeds of maize (cv. J1006), ricebean (Bidhan ricebean-1 & Bidhan ricebean-2), cutting of Guinea & BN hybrid (cv. CO 3, CO 4 & CO 5) and Coix (cv. Bidhan coix-1) to PSB, Viswa Varati, Sriniketan centre & UBKV, Pundibari, Cooch Behar and supplied breeder seed of Bidhan ricebean 2 to AICRP on FC & U, BAU, Ranchi centre.
- Distributions of leaflets on forage crops among the farmers.
- Distribution of planting material (cuttings) of BN hybrid (Variety: CO 3, CO 4 & CO 5) to the resource poor farmers in different districts of West Bengal, like Bankura, Purulia, Paschim Medinipur, Nadia, North-24 PGS, Cooch Behar, Burdwan and Hooghly districts etc.

Other activities

- Act as external examiner for the subject 'Organic Farming' (AGR-405) of UBKV, Coochbehar.
- Monitoring the AICRP on FC & U-AAU, Jorhat Centre, Assam on 18.09.2018
- Act as reviewer of research papers in Journal of Agriculture and Technology, UBKV and another in Journal of Crop and Weed, BCKV, Mohanpur, Nadia, West Bengal-741252.

AICRP (FC&U), CSKHPKV Palampur

Research papers in journals

Devi Pooja, Sood VK and Devi Rajni (2018). Evaluation of morphological and genetic determinants of fodder yield as a selection criterion in F_2 , F_3 and F_4 generations of oat (*Avena sativa* L.). **Forage Research 44(1) :** 1-7.

Guleria G and Kumar N (2018). Production efficiency, forage yield, nutrient uptake and quality of sorghum sudan grass hybrid (*Sorghum bicolor x Sorghum Sudanese)* + cowpea (*Vigna unguiculata)* intercropping system as influenced by sowing methods and varying seed rates of cowpea. ***Indian J Agronomy* 63(2):** 150-156.

Kapoor Ritika, Gupta MK, Kumar Naveen and Kanwar SS (2017). Analysis of nhaA gene from salt tolerant and growth promoting *Enterobacter ludwigii*. ***Rhizosphere* 4 :** 62-69

Katoch R, Singh SK, Tripathi A and Kumar N (2017). Effect of seasonal variation in biochemical composition of leaves of fodder trees prevalent in the mid hill region of Himachal Pradesh. ***Range Mgmt. & Agroforestry* 38(2):** 234-240.

Mehta A, Basandrai AK, Banyal DK and Daisy Basandrai D (2018). Effect of weather parameters on powdery mildew development of wheat at different location in Himachal Pradesh. ***Indian Phytopathology* 71:** 349-353.

Sharma Sanjay, Ankita, Rana SS and Kumar Naveen (2017). Evaluation of multi-nutrient extractants for determination of available P, K and micronutrient cations in soil. ***Journal of Plant Nutrition* 41 (6):** 782-792.

Shweta, Katoch R, and Kumari M (2018). Proximate and anti-nutritional composition of underutilized and common *Vigna* species of Himachal Pradesh. ***Bull Env Pharmacol Life Sci* 6:** 24-31.

Sood VK, Sharma Ankita, Prakash Jay and Chaudhary HK (2018). Genetic variability, character association and path analysis for forage yield and quality traits of tall fescue germplasm under north western Himalayas. ***Range Management and Agroforestry* 39 (1):** 22-28.

Papers presented in Symposia/Workshops

Arora A, **Sood V K**, Chaudhary H K and Devi Rajni (2017). Performance of elite oat (*Avena sativa* L.) genotypes for forage yield and related traits under mid hill conditions of North-Western Himalayas. Compendium of abstracts: The Third International Conference on Bioresources and Stress Management, Jaipur, India 8-11 November , 2017 pp 187

Sood VK, Sharma Aditi, Kumari Anjali, Kumar Sawan, Chaudhary HK (2018). Transferability of genomic SSR of *Setaria italica* across *Setaria anceps*, for genetic diversity analysis. 1st National Genetics Congress on "Genetics for sustainable food, health and Nutritional Security", Indian Society of Genetics and Plant Breeding, Delhi Dec. 14-16, 2018 pp. 104

Book Chapters

Katoch Rajan, Kumar Naveen, Sood VK and Banyal DK (2017). Effect of environmental factors on the quality of forage legumes. All India Coordinated Research Project on Forage Crops, Souvenir of National Group Meet, UAS Bengaluru, pp 50-54

Katoch Rajan, Tripathi Ankur, Kumar Naveen, Sood VK and Banyal DK (2018). Revisiting prospects in red clover: A potential temperate fodder legume. All India Coordinated Research Project on Forage Crops, Souvenir of National Group Meet, TNAU Coimbatore, pp 55-61.

Research projects prepared/submitted during the year:

SN	Title of the research project	Funding Agency	Budget	PI /Co-PI
1	Establishment of Penta Level micro environment green house facility for strengthening the ongoing speed breeding programme of bread wheat improvement following chromosome elimination	RKVY	Rs 45.00 Lakhs	Co-PI
2	Strengthening of quality seed and seedlings production of improved perennial grasses and forage legumes	RKVY	Rs 55.00 Lakhs	Co-PI

Participation of scientists in Seminar/ Workshop/ Group meetings

- Attended one day Group Integrative Dialogue on the Biological Diversity act 2002 and its access and benefit Sharing Provision on 27th September 2018 at CSK HPKV Palampur.
- Attended National Symposium on "Alternative Approaches in Plant Health Management for Enhancing Farmers' Income" at UHF Solan on November 2-3, 2018. Delivered a lead lecture and acted as Co-Chairman on session-I on Molecular approaches in disease diagnosis.
- Attended Agricultural officer workshop on Rabi Crops 2018 at CSK HPKV Palampur on 25-10-2018
- Attended National group meeting – *Rabi* 2018 of All India Co-ordinated Research Project on Forage Crops at CCS HAU Hisar on 6-7th September, 2018
- Attended State Level Project Screening Committee meeting of RKVY with Principal Secretary (Agri.), Govt. of Himachal Pradesh at Shimla on May 27, 2018 and presented RKVY project proposal for approval
- Attended State Level Sanctioning Committee meeting of RKVY under the Chairmanship of Chief Secretary, Govt. of Himachal Pradesh at Shimla on July 17, 2018. Discussed RKVY project proposal for final sanction

Courses taught

Course No	**Course Title**	**Cr. Hr.**
Pl Path 518	Epidemiology and Forecasting of Plant Diseases	2+1=3
Agron510	Agrostology and Agro-forestry	2+1
LPM 121	Fodder Production and Grassland Management	1+1
Pl Path 605	Principles and Procedures of Certification	1+0= 1
Pl Path 591	M.Sc. Seminar	1+0= 1
Pl Path 591	Ph.D Seminar	1+0= 1
GP 508	Cell Biology and Molecular Genetics	2+1= 3
GP 591	Master's Seminar	1+0= 1
GP 604	Molecular and Chromosomal Manipulations for Crop Improvement	2+0= 2
GP 608	Advances in Breeding of Major Field Crops (Fodder portion)	3+0= 3
Biochem.503	Human Biochemistry	3+0=3
Biochem.601	Biochemistry of biotic & abiotic stresses	3+0=3
Biochem.602	Advanced Molecular Biochemistry	3+0=3

• Students guidance	:	18 (as major advisor) ; 34 (Member advisory committee)
• Forage technology consultations	:	9
• Lectures deliveres to farmers and developent officers	:	7
• *TV talk*	:	1
• *Radio talk*	:	2

• Linkage with NGOs	:	–Society for Environmental & Rural Awakening (ERA), Khudian, Distt Kangra
• Consultancy	:	–**Department of Animal Husbandry, Govt. of HP**, - Preparation of a Project proposal for "Improved Productive Pasture and Jersey Cattle Breeding Farm, Palampur. Proposal approved and technical support provided for the execution of programme. –Fodder development activities at ***Gosadan***Aima, Palampur
• Linkage with other programmes and institutes:	:	–IVRI Regional Research Station Palampur –AICRP (IFS); AICRP (Agroforestry)
• Association in *Adhoc* Projects	:	–Scientists associated in 4 Ad hoc projects –One RKVY proposal sanctioned –One new project proposal submitted
• Resource generation (Mega Seed Project- Forage during 2017-18)	:	–Rs. = 7,48,500/-
• Members monitoring team		–Dr. Naveen Kumar and Dr. V. K. Sood

AICRP (FC&U), CAU, Imphal

Extension Activities

- Agri-Fare : 2
- Farmers' Field Day : 1
- Resource person : 3
- Interaction programme : 3

Lectures delivered on

- "Strategies for round the year fodder availability for feeding of dairy animals in NEH region with special reference to Manipur" organized by Dairy Voluntary organization of Manipur.
- "Issues and strategies for development of dairy farmers of Manipur" organized by Manipur Milk Producers' Co-operative Union Ltd.
- Invited as an expert during CAU, Agri Fair, 2018-19 at COA, CAU, Imphal

FTDs conducted – Kharif 2018

Crop (variety)	No. of FTDs conducted	Yield farmers practice	Improved yield
Rice bean var. Bidhan-1	10	345q/ha	400q/ha
Maize Var. J1006	10	451q/ha	535q/ha

TSP activity: During the Kharif 2018, 90 nos. of families from 3 different villages of Chandel District, Manipur were benefited through TSP Programme. Fodder rice bean seed, Fodder maize seed, sorghum, Napier hybrid cuttings, plant protection chemicals were distributed to the beneficiaries.

M.Sc /Ph.D students guided: 1 Ph. D. (Agri.) and 1 M. Sc. (Agri.) as Co-guide

Courses taught

Course B. Sc. (Agri.)/ M. Sc. (Agri.)/ Ph. D. (Agri.)	Number of topics
fodder crops and Organic farming,	35

Publications

Research paper	Bulletins	Popular articles
2	2	-

Germplasm maintained

SN	Crop	No. of accessions	Source area
1.	Rice bean	30	Imphal East, Imphal West, Thoubal, Bishnupur, Senapati, Churachandpur and Myanmar
2.	Maize	25	Tamenglong, Ukhrul, Senapati Imphal east, Churachandpur
3.	**Perennial fodder crops**		
	Napier hybrid	4	IGFRI, Jhansi, AAU, Jorhat, TNAU, Coimbatore, BAIF, Pune
	Seteria	1	IGFRI, Jhansi and AAU, Jorhat
	Signal	1	AAU, Jorhat

Inputs supplied

- Fodder maize and rice bean seed, chemical fertilizers etc were supply to FTDs beneficiaries.
- Any type of fodder seed (seasonal, perennial, perennial cutting etc) are made available at the AICRP on Forage Crops & Utilization, CAU, Imphal Centre.
- *Scientist and staff of AICRP on Forage crops of CAU Imphal centre are also actively involved in many activities in the Directorate of Research office of CAU, Imphal

AICRP (FC&U), OUAT, Bhubaneswar

Externally funded project:
Project started during 2018-19: "Spineless Cactus and Grass pea feeding to ruminants for sustenance of production", funded by ICARDA; carried by Dept. of Animal Nutrition and AICRP on Forage Crops & Utilization, OUAT, Bhubaneswar
PI: Prof. Niranjan Panda, Dept. of Animal Nutrition
Co PI: Dr. Arabinda Dhal, OIC

PG Thesis Work:

- Studies on BLSB disease of forage maize with reference to its integrated management; Student: Nanda Nandan Nanda, 5th Year MSc (Ag) Plant Pathology Chairman: Dr. Arabinda Dhal, Pathologist

Dr. Arabinda Dhal, Pathologist

- PPT-313 (2+1), 3rd Year 5th Semester at UG Level
- PPT-324 (2+1), 3rd Year 6th Semester at UG Level
- PPT-605 (1+0), 1st Year students PhD (Plant Pathology)
- Demonstration & Teaching on Forage Crops to students of BVSC & AH and BSc (Ag)
- Dr. Arabinda Dhal, Pathologist: Attending Quarterly Doordarshan & Radio Programme on Forage Crop Production and Animal Nutrition
- Involvement in Farmer's First Programme conducted by Integrated Farming System Research Scheme.
- Dr. Arabinda Dhal, Pathologist: Participation in State Level Agro Exhibition and facilitate farmer scientist interface programme from 15th to 19th January 2019.

Research papers in journals

Umamaheswari T, Beura SK, Dhal A, Mary DS (2018). In-vitro evaluation of fungicide against Myrothecium disease of cotton. ***Int. J. Curr. Microbiol. App. Sci.* 7 (11)**

Vinella DRS, Beura SK, Dhal A, Swain SK (2018). Integrated Management of Soil Borne Diseases of Groundnut in Coastal Ecosystem of Odisha. **Journal of Mycopathol Research (2018) 56 (3);** 189-193

Papers presented in Symposia/Workshops

Behera P, Dash B, Panda NK and Dhal A (2018). Studies on Management of Foliar Diseases of Forage Oat. Research paper presented in National Symposium on "New Dimensions in Plant Protection-A Step towards Food and Nutritional Security and Environmental Safety, held at OUAT, Bhubaneswar 27-28 Oct 2018

AICRP (FC&U), Assam Agricultural University, Jorhat

Research papers in journals

Bepary RH, Wadikar DD, Neog S Bora and Patki PE (2017). Studies on physic-chemical and cooking characteristics of rice bean varieties grown in NE Region of India. ***J. Food Sci. and Technol.* 54:** 973-986

Extension leaflet – 2 - (in Assamese)

- Round the year fodder production for successful dairy farming in Assam
- Feeding nutritious tree fodder

Important persons visit:

- Dr Rajiv Agrawal, PI (Agronomy), AICRPFCU, IGFRI, Jhansi

Student(s) guided: M.Sc. (Agri.) in 3 in PBG and in Agronomy-3; Ph.D in Agronomy- 2

No. of FTDs conducted: 40

TSP activities: Adopted 2 villages in TSP district Baksa , Assam in North Bank Plain Zone.

Training conducted for farmers/ NGO/ Govt. officials: 4

TV/ Radio talk delivered by AICRP-FC staff/ extension activities: 1

Forage crops seed/planting materials supplied (2017-18)

SN	Forage crops	Total quantity (kg)		
		Total Slips(No)	Foundation seed	TFL seed
1.	Hybrid Napier CO-4,CO-5	0.70 lakh		
2.	Setaria Kazungula,PSS-1	1.1 lakh	-	
3.	Rice bean Var. Shyamalima		25 kg	
4.	Oat Var. Kent nnd JHO 822			4.00 q
	Grand Total	**1.80 lakh**	**25.00 Kg**	**4.00 q**

New Variety Developed during last 3 years

Varieties	Year of identification / Notification	Breeding methods/ source	Breeding institution	Area of adoption	Specific features
Madhuri	2016 / 2018	Pure line selection	AAU, Jorhat	Assam	High green and dry matter yields, high quality characters and tolerant to insect pest and diseases in rice fallow both as relay and sole crop. Tolerant to drought and cold

Research papers in journals

Damame SV, Gate DV and Surana PP (2018). Evaluation of F_1 B x N hybrids between Giant Bajra and Napier grass for sugars, minerals and oxalic acid. ***AGRES-Intl. e. J.* 7 (3):**336-342.

Gate DV, Damame SV and Gore SB (2018). Assessment of forage nutritional quality of BxN hybrids between Giant Bajra and Napier grass. ***Forage Res.* 43(4):**279-282.

Joshi S, Ramya RS, Novik O, Pawar SA, Hole UB and Tambe AB (2019). Redescription of *Palvinaria indica* Avasthi and Shafee, 1985 (Hemiptera: Coccomorpha: Coccidae) with new host and distribution records. ***Zootaxa* 4545 (I):** 133-138.

Tamboli ND, Patil CS and Tambe AB (2018). Efficacy of combination of bio pesticides against *Spodoptera litura* (Fabricius) infesting lucerne *Medicago sativa* (L). ***Intl. J. Agril. Sci.* 10(21):** 7488-7490.

Popular articles: 02

Visits:

- Monitoring team Dr. B. G. Shekara, UAS, ZARS, VC Farm, Mandya, Karnataka and Dr. T. Shashikala, PJTSAU, Hyderabad on 20-21 Sept., 2018 and monitored *Kharif-2018* trials.
- The Director of Research, MPKV, Rahuri visited the Project on 03-12-2018 and monitored all annual and perennial experiments, seed production plots.

Student Guide

M.Sc. (Agri.)

- Prof. A. H. Sonone (Plant Breeding) : 01
- Dr. A. B. Tambe (Entomology) : 01
- Dr. S. V. Damame (Biochemistry) : 01

- **Radio talk :**03
- **Lectures to farmers in training programme**: Dr. A.B. Tambe : 05
- **Kisan Adhar Sammelan (Kharif field day)** was organized at Central Campus, MPKV, Rahuri on 15-18 Oct. 2018. A field demonstration of six forage varieties was taken on an area of 2.0 are each. All staff of the project participated and gave information of forage varieties to the farmers.
- **Externally funded project: 01**

Seed Production (*Kharif*-18)

Name of Scheme	Crop/variety	Stage	Area (ha)	Approx. Yield (Q)
Forage Project, MPKV, Rahuri	Maize - African tall	N	0.20	200 kg
	Maize - African tall	B	2.00	12.00 qtl
	Cowpea- Shweta	N	0.10	3.0 kg
		B	0.10	15.00 kg
		T	0.20	0.74 qtl
	Cowpea- EC-4216	B	0.90	1.80 qtl
	Bajra- Giant bajra	N	0.10	1.00 kg
		B	0.10	20.00 kg
		T	0.40	2.00 qtl
	H x N- P Gunwant	T	0.70	--

Visits of farmers and Govt. Staff

- No. of Farmers visited to farm during *Kharif*-18 : 350
- No. of Govt. officers/staff visited to farm during *Kharif*-18 : 25

AICRP (FC&U), Anand Agricultural University, Anand

Papers presented in Symposia/Workshops

Rathod, D. D., Patel, K. P., Ramani, V. P., Patel, K. C. and Rathod, P. H. (2018). Crop yields and soil properties as affected by integrated use organic and inorganic inputs in wheat-fodder maize cropping. Paper presented in *83rd Annual Convention of Indian Society of Soil Science & National Seminar on Developments in Soils-2018* held during November 27-30 at Anand Agricultural University, Anand, Gujarat.

Group meeting/ Training/Seminar /Conference attended/participated:

- P. H. Rathod attended NGM *Rabi*-2018 held at CCHAU, Hisar September 7-8, 2018.
- H. K. Patel and P. H. Rathod attended 83rd Annual Convention of Indian Society of Soil Science and National Seminar on Developments in Soil Science-2018 at Anand Agricultural University, Anand on November 27-30, 2018.
- H. K. Patel participated in ICAR sponsored 21 days training programme on Recent Advances and Innovation in Modern Organic Agriculture, during September 05-25, 2018 at MPUAT, Udaipur, Rajasthan.
- P. H. Rathod participated in a week short course (From August 6-10, 2018) on *Promotion of Organic Farming for Sustainable Agriculture* at Extension Education Institute, Anand Agricultural University, Anand, Gujarat, India.

Book

Patel PM, Patel HK, Shah SN, Patel AP and Patel MV (Eds) (2018). *Sajiv kheti* "Prakruti naa Sathvare" (2018). Published by Department of Agronomy, B.A. College of Agriculture, AAU, Anand. ISBN No. 978-93-5300-881-5

Book Chapters

Patel HK (2018). *Gujarat maa Sajiv kheti naa ayamoo*. In: *Sajiv kheti* book (Patel, P. M., Patel, H. K., Shah, S. N. Patel, A. P. and Patel, M. V., Eds) published by Directorate of Extension Education, AAU, Anand. ISBN No. 978-93-5300-881-5

Patel HK (2018). Environmental safety by organic farming. In: *Sajiv kheti* book published by Directorate of Extension Education, AAU, Anand. ISBN No. 978-93-5300-881-5

Patel HK (2018). Organic farming integrated area management. In: *Sajiv kheti* book published by Directorate of Extension Education, AAU, Anand. ISBN No. 978-93-5300-881-5

Patel HK (2018). Soil-crop nutrient management in organic farming. In: *Sajiv kheti* book published by Directorate of Extension Education, AAU, Anand. ISBN No. 978-93-5300-881-5

Patel HK (2018). Role of various cakes in organic farming. In: *Sajiv kheti* book published by Directorate of Extension Education, AAU, Anand. ISBN No. 978-93-5300-881-5

Patel HK (2018). Vermicompost. In: *Sajiv kheti* book published by Directorate of Extension Education, AAU, Anand. ISBN No. 978-93-5300-881-5

Patel HK (2018). Role of mulching in organic farming. In: *Sajiv kheti* book published by Directorate of Extension Education, AAU, Anand. ISBN No. 978-93-5300-881-5

Patel HK (2018). Non-chemical weed management in organic farming. In: *Sajiv kheti* book published by Directorate of Extension Education, AAU, Anand. ISBN No. 978-93-5300-881-5

Popular article: Three

Patel HK, Patel PM., Desai DH and Padheriya DR (2018). *Grasscharana pakoni adhyatan kheti padhdhati. Pashupalan: Bamni aavakno strot.* p. 69.

Gohil DP, Patel HK and Padheriya DR (2018). *Rajkana pakni vagyanik kheti padhdhati. Krushigovidhya*. November issue. p. 46.

Gohil DP, Patel HK, Rathod PH and Padheriya DR (2018). *Grasscharana pakoni adhunic kheti. Pashu Aahar ane tenu vyavsthapan*. p. 106.

PG/UG Courses Taught

- PGS-503 (1+0): Intellectual Property and its Management in Agriculture.
- GP-511 (2+1): Breeding for cereals, forage and sugarcane.
- AGRON 602 (2+0): Crop Ecology.
- PGS-506 (1+0): Disaster Management.
- ABM-519: Fertilizer Technology and management.
- e-Course: Usefulness of disaster management in Agriculture, Distance Education at IDEA, AAU, Anand

FTD conducted: Fourteen - Hybrid Napier (Co-3 & BNH-10):

Externally funded project: One

- RKVY Funded project entitled "Quality Seed Production in Fodder Crops" under Fodder Development Programme.

Extension activities

- Participated in "Kishan Kalyan Mahotsav-2018" programme and delivered lectures on for dissemination of Forage technology.
- Delivered lectures in short term training programme of women organized by the Department of RBRU, AAU, Anand.
- Lectures in *Kharif* Pre-seasonal training under T & V programme.
- Delivered lectures in short term refreshers training course organized by the EEI, AAU, Anand.
- Deliver lecture in training programme for Recent managemental practices for crops and animals for farmer of Pali Rajasthan, Extension Education Institute, AAU, Anand on November 2018 under ATMA project.
- Delivered lecture in training programme for Recent management practices for crops and animals for farmer of Barmer, Rajasthan, Extension Education Institute, AAU, Anand on Dec.-2018 under ATMA project

AICRP (FC&U), IGKV, RAIPUR

Award and Honour

Dr SK Jha awarded by **" *Krishi Seromani Award*"** by the Kshisak Samridhi group for the outstanding work on fodder in Chhattisgarh

Research papers in journals

Jha SK and Tiwari Nitish (2018) Evaluation of intensive fodder cropping system for round the year green fodder production in Chhattisgarh. ***Forage Res*. 44(2):**115-118

Jha SK, Pandey N and Kumar Sunil (2018). Effect of weed management practices and seed rates on energy input, output, input output ratio, energy use efficiency and energy productivity on direct seeded rice production system ***International Journal of Chemical Studies* 6(4):** 2054-2058

Mohan Minu, Rathore AL and Jha SK (2018). Response of Drip Fertigation, Intra Row Seeding of Legume and Planting Geometry on Net Return of Summer Maize ***Int. J. Pure App. Biosci.* 6 (2):** 964-967.

Sahu Mayuri (2019) Path analysis in cowpea (*Vigna unguiculata* (L.) Walp.) ***International Journal of Chemical Studies.* 7(1):** *912-914*

Book Chapter

Jha SK and Sahu Mayuri (2018). Fodder and livestock scenario, constraints and opportunity for prosperity of Chhattisgarh livestock sector. National Group Meet, Kharif 2018 Coimbatore pp62-65

Jha SK and Sahu Mayuri (2018). Hydroponics Fodder Production: An Alternative Technology for Round the year Green Fodder. In: Fodder Crops: Approaches for Value Addition & Enhancing Income pp**.**163-170

Sahu Mayuri, Jha SK, Nanda Hem Chand and Chandrakar Deepak K (2018). Forage Lathyrus: Scope and Constraint. In: *Fodder Crops: Approaches for Value Addition & Enhancing Income.* pp.93-103.

Extension Articles

Jha SK (2018) *Chhattisgarh me Chara Utpadan Avashyakta awam Sambawna*" Krishak Samriddhi pp66-67

Jha SK and Porte Chanchal *(2018) Hare Chare se Silage avam hay Kaise baneye"* Chhattisgarh Kheti pp32-33

Jha SK Tiwari Nitish and Porte Chancal (2018) *Hare Chare Ke Liye Jowar Lagae-Krishak Jagat*

Externally Funded Projects

SN	Projects	Title	PI	Funding source	Budget (Rs. in lakh)
1	AGRON -8	Standardization of oat seed production	SK Jha	VV fund	0.50
2.	AGRON-42	Hydroponics fodder production, evaluation, standardization and demonstration under Chhattisgarh condition.	SK Jha	VV fund	3.0
3.	Public Private	Evaluation of Tembotrione 34.4 % SC along with surfactant against mix weed flora in Maize	SK Jha	Sponsor	2.0

4.	Adhoc project	Gamma ray mutagenesis for delayed	Mayuri	BRNS,	21.0

		flowering (65-75 days) and increased leaf stem ratio of Lathyrus. (Parteek & Mahateora)	Sahu	BARC, Mumbai (M.H.)	
5.	RKVY (Skill Development)	Training on Hydroponic production	SK Jha	State Government	3.90

Teaching

S. No.	Level	COURSES	SUBJECT	CREDIT
SK Jha	PG	AGRON -501	Modern Concept in crop production	3+0
	UG	AGRO5121	Agricultural Water Management	1+1
Mayuri Sahu	PG	GP-503	Principles of Plant Breeding	3 (2+1)
	PhD	GP-605	Advances in Plant Breeding systems	2+0
	NCC Officer cum Care Taker for; 8th CG Girl's BN, CoA, Raipur			

Research Guidance

Subject	No of student registered
Agronomy (SK Jha)	**PG:** Major advisor- 2, Co-advisor -6 **Ph. D.:** Major advisor- 2
Plant Breeding (Mayuri Sahu)	**PG:** Major advisor- 2 , Co-advisor -2

Fodder Seed production

Initiated foundation and certified seed production programme in 2016-17.

Incorporated fodder seed production programme in university.

Crop	Category	Quantity (q)
Maize AfricanTall	Foundation	28
Oat Kent	Foundation	10
Perennial sorghum COFS-29	TL	0.5

Linkage with other programmes and institutes

- AICRP (Dryland Agriculture),
- CARS, Jagdalpur, Bastar (Chhattisgarh)
- AICRP (IFS)
- KVK's of Chhattisgarh

TV/ Radio talk delivered /extension activities:

- Lecture delivered to farmers and agricultural developmental officers
- TV Talk on Sub title: *"**Chhattisgarh me Hare Chare ki Sambhawana**"* in Programme Krishi Darshan" Live Telecast date : 5.30 p.m. on date 31-10-2018

Extension packages

- Generated package of practices of fodder crops production under Chhattisgarh Condition and published for Extension workers
- Published package of practices of fodder crops in **university annual diary** in 2018
- Published package of practices of fodder crops production in **Krishi Yug Panchang** in 2018
- Demonstrated the fodder production technology in **Agriculture Museum** at IGKV, Raipur
- Developed computer based programme of fodder production technology demonstration in museum
- Training for SMS , PC of KVK's on fodder production
- Training for REO, ADO, DDA of C.G. Government Agriculture department on fodder production.

Awards

- **Indian Society of Agronomy (ISA) Fellow-2016** to Dr Mahendra Singh Pal during National Symposium held on 24-26 Oct. 2018 at MPAUT, Udaipur.

Research papers in journals

Chauhan A, Rajput N, Kumar A and Verma JS (2018). Interactive effects of gibberellic acid and salt stress on germination, seedling growth and chlorophyll content in oat cultivars. ***Journal of Environmental Biology.*** **39 :** 639-646.

Kumar Amrendra, **Pal MS** and Bhatnagar A and Qureshi A (2018). Effect of tillage and nutritional management on growth, yield, harvest index and nutrient use efficiency of corn (Zea mays L.) in Indo-Gangetic plains of India. **International Journal of Current Microbiology & Applied Sciences 7(special issue):** 4185-4191

Pal MS and Joshi YP (2018). Tillage options and its effect on productivity, Profitability and quality of forage under feed/fodder-food based cropping systems. Forage Research 43 (4): 291-294.

Roy C and Verma JS (2017). Identification of morphological traits using Smith index for grain yield improvement in oat (*Avena sativa* L.). ***Agric. Res. Jr.(PAU)*** **54(1) :** 11-15.

Ruwali Y and Verma JS **(**2018). Analysis of G x E interaction and stability parameters for yield and its components in Oat (*Avena sativa* L.) under natural conditions. ***Range Mgmt.* & *Agroforestry.*** communciated

Verma JS (2018). Breeding forage crops for improved abiotic stress tolerance – A review. ***Forage Research*** **44(3) :** accepted

Books/Book Chapter: 02

Pal MS (2018). Water Management for Sustainable Agriculture. In: Green technologies for sustainable agriculture (eds by R S Sengar). (Under publication).

Shekhawat SS, Garg DK and Verma JS (2018). Oats Germplasm Evaluation Report Lambert Acad. Publisher.

Research papers in workshop/Conferences=03

Pal MS (2018). Paradigm shift in crop residue management in Asia. Book of Abstracts. 5th AGRICO-2018, held on 16 & 17 Aug. 2018 at Colombo, Sri Lanka (TIIKM). 36p.

Pal MS (2018). Integrated farming system for rainfed agriculture. Key note lecture was delivered in a National Conference on Sustainable Management of Rainfed Agriculture, organized at ITM University, Gwalior on 16-17 Nov. 2018**.**

Pal MS (2017). Role of fodder in improving income and livelihood of farming communities in Uttarakhand. Souvenir: Strategies for enhancing farmers' income in Uttarakhand. 31st Convocation, 16 Nov 2017, GBPUAT, Pantnagar. pp.135-139.

Pal MS (2017). Augmenting fodder production from non cropped area. CAFT Training held in Sept 2018 at Department of Agronomy.

Popular articles

Pal MS (2018). Spring sunflower cultivation for boosting net profit. *Kisan Bharti 49* (6): 9-13.

Pal MS (2018). Barley: A dual purpose cereal. *Indian Farmers' Digest* 51 (03): 16-24.

Pal MS (2018). Hydroponic green fodder production. Kisan Bharti 51 (5): 4-7

Singh NK, Kumar Amarjeet and Prasad Birendra **(**2017). Makke Ki Kheti : Bhutte Ke Saath Chara bhi deti Kisan Bharati 49(2) : 4-7.

Verma JS (2018). Enhancing livestock productivity through breeding forage crops for increased nutritional value. *In*: *Strategy for enhancing Farmers' income in Uttarakhand*. *Souvenir* XXXI Convocation, GBPUA&T, Pantnagar pp.140-141.

TSP-Forage Crops: 263 fodder demonstrations (108 spring 2017+ 155 Kharif 2017)

- Total scheduled tribes dominated 6 villages i.e. Madpuri, Salmata Kanpura, Matiha (U S Nafgar) & Basani and Dogra (Nainital) were selected in Uttarakhand state.
- In spring/summers, total 77 fodder demonstrations including 66 and 11 of sorghum and maize, respectively and 57 of sorghum crop in *Kharif* seaon 2018 were conducted.
- Total 134 forage demonstrations including 123 of sorghum and 11 of maize crop were conducted from April to September 2018.

FTD conducted : **39** (19-Spring 2018 + 20-Kharif 2018)
Farmers' Meetings : **08** (04-Spring 2018 + 04-Kharif 2018)
Group discussions : **09** (06- Spring + 03-Kharif 2017)

Radio Talks : 06

SN	Scientist Name	No. of Radio Talks
1	Dr Mahendra Singh pal	02
2	Dr J S Verma	02
3	Dr B Prasad	02

Participation in Conference/Workshop

SN	Scientist Name	Nos. of participation	
		National	International
1	Dr Mahendra Singh Pal	04	01 (AGRICO-2018, 16-17 August 2018 at Colombo, Sri Lanka)
2	Dr J S Verma	02	-
3	Dr B Prasad	02	-

Teaching courses

SN	Scientist Name	Nos. of Courses
1	Dr Mahendra Singh Pal	02
2	Dr J S Verma	02
3	Dr B Prasad	02

Guidance of Students (PG & Ph D)

SN	Scientist Name	Nos. of students guided
1	Dr Mahendra Singh Pal	02
2	Dr J S Verma	02
3	Dr B Prasad	02

Submission of theses research work = 03

Seed production: 7 q breeder seed of UPC 8705 cowpea variety was produced out of 8 q allotted.

Radio Talk delivered by Dr JS Verma : 05

AICRP (FC&U), PJTSAU, Hyderabad

Honors and awards

- Awarded certificate of appreciation as best performing AICRP on FCU centre for the rabi 2017-18 during National Group Meet Rabi 2018 at CS HAU Hisar Haryana.

Book Chapters/ Souvenir articles

Shashikala T, Shanti M, Ekambram, Murali B, Susheela R and Sri Ramreddy P **(2018).** Scope of fodder crops ushering in second white revolution in state of Telangana. Souvenir National Group meet, Kharif 2018 held at TNAU, Coimbatore from 6th-7th April 2018.

Papers presented in Symposia/Workshops

Shanti M, Shashikala T, Susheela R, Anuradha M, Murali M and Shailaja K (2018). Hydroponics fodder production – An appraisal of yield and quality parameters. Souvenir and abstracts published by RMSI, Jhansi, National Symposium, Dec 13th -14th 2018, pp. 91.

Popular articles

Maheshwaramma S, **Shashikala T**, Sameer Kumar CV, Nagesh Kumar MV and Venkata Ramana M (2018). Pasugrasa Jonna Saagu – Laabalu bagu. Vyavasayam. 2(4): 23-25

Shashikala T, Shanti M, Susheela R, Murali B and Balazzii Naik RVT (2018). Vesaviki Anuvaina Pasugrasapu Sajja- Moti bajra. Published in Vyavasayam, April 2018 pg25-26.

Tribal Sub Plan: Identified 15 Tribal farmer families as beneficiaries in Gangapur (village), Utnur (mandal) of Adilabad (Dist) in Telangana State. Farmers will be provided with improved seeds/slips and package of practices for enhancing fodder production. The improved varieties include APBN-1 cuttings in Hybrid Napier and Hedge Lucerne seed. Literature related to forage production technology were distributed and created awareness about importance of growing fodder crops and its utilization.

FTDs conducted during *kharif* 2018 : 50

Radio Talks and TV programmes : 5

Participation in important meetings/seminars/trainings etc

- Dr. T. Shashikala attended Regional Coordination Meeting on 18-05-2018 at RFS Pahadi Sheriff
- Dr. T. Shashikala: attended Pearl millet field day on 3rd-4th October 2018 at ICRISAT
- Sri B. Murali attended 10 days short course (3-10-2018 to 12-10-2018) at IIOR Hyderabad.

Research Guidance : 1 M.Sc. Student, GPB by Dr. T. Shashikala

Guest Lectures: 5

Important persons visit

- Dr. M. Venkata Ramana ADR RARS Palem visited our center on 11-05-2018
- Dr. Nitish Bharadwaj, Scientist (Plant Pathology), IGFRI, Jhansi
- Dr. C. Babu and Dr. Shiva Kumar S. TNAU Coimbatore on 17-18 September 2018
- Dr. Anuradha, University Head, Dept of Genetics & pl. breeding on 27-09-2018
- Dr. AK Roy, Project Coordinator, AICRP-FCU, IGFRI, Jhansi on 26-27 October 2018
- Dr. B. Joseph, University Head Agronomy and AD, Ag College, Palem, Nagar Kurnool dist
- Dr. Rajiv Agrawal, PI Agronomy, AICRP-FCU, IGFRI, Jhansi on 29-11-2018

Technical guidance to farmers

- To farmers: A number of farmers visited this station and technical guidance was given by the Scientists on various aspects of forage crops.
- Through telephone: 235 phone calls were attended during the period under report about various aspects of forage production.

Extension activities

- T&V Meetings: Every month this meeting was attended by Head, Forage breeder and suitable suggestions had been given for forage related problems.
- Visits to FTD farmer fields.
- Attended 240 telephone calls from farmers on fodder technology.

WEATHER REPORT FOR KHARIF -2018

The weather report of AICRP Forage Crops coordinating, cooperating and voluntary centers across different zones of the country during Kharif 2018 has been presented in this section. The weather parameters from 26th Standard Meteorological Week (June 25, 2018) to 44th Standard Meteorological Week (November 04, 2018) were taken into consideration, which covers the *Kharif* 2018 season for all the testing locations for trial conduction. The meteorological data recorded at different centers is presented in tables **[M1 to M13]** and graphically represented in succeeding pages**.** During the reporting period, weather variations are clearly visible in maximum and minimum temperature, rainfall, rainy days, relative humidity and sunshine hours in different agro-climatic zones, which demonstrated varied impact on establishment, growth, yield and quality of different forage crops, varieties and cropping systems. The weather parameters have also shown close correlation with the incidence and surveillance of insect-pest and diseases of forage crops.

Temperature

In Hill zone, meteorological data from Srinagar, Palampur and Almora has been compiled and presented. In general, Srinagar center recorded wide variations in temperature. On seasonal mean basis, Srinagar remained the coolest, recording mean minimum temperature (T_{min}) of 13.6^{0}C followed by Palampur (17.2^{0}C). Almora recorded highest mean maximum temperature (T_{max}) (28.6^{0}C). Srinagar also witnessed the coolest week with low temperature of 7.0^{0}C during 42nd and 43rd SMW. At Srinagar, T_{max} was recorded (31.8^{0}C) during 34th SMW.

In North-East zone, data has been compiled from Faizabad, Ranchi, Kalyani, Jorhat, Bhubaneswar and Imphal. Imphal recorded lowest T_{min} (14.7^{0}C) during 43rd SMW. On the basis of mean T_{min} of the season, Ranchi was coolest recording 19.1^{0}C whereas, Faizabad recorded highest mean T_{max} (32.8^{0}C). Maximum day temperature was recorded at Faizabad (36.6^{0}C) during 36th SMW. Least variation for minimum and maximum temperature over the season was observed at Kalyani followed by Bhubaneswar.

In North-West zone, data has been presented from Hisar, Bikaner, Pantnagar and Ludhiana center. Maximum mean temperature was recorded at Bikaner (40.9^{0}C) during 28th SMW. The highest mean T_{max} (36.6^{0}C) was also recorded at Bikaner. The mean T_{min} was nearly equal and ranged between 22.4 to 24.6^{0}C.

In Central zone, data has been reported from Jhansi, Anand, Rahuri, Urulikanchan, Jabalpur, and Raipur. Significant variations in T_{Max} and T_{Min} has been observed at different centre. In the central zone, Rahuri recorded the lowest T_{Min} (14.4^{0}C) during 44th SMW followed by Jhansi (14.5^{0}C) in the same week. The highest T_{Max} during 42nd SMW was recorded at Urulikanchan (37.4^{0}C) during 39 SMW. Rahuri recorded lower mean T_{Min} (21.0^{0}C) over the season as compared to rest of the locations. Anand recorded higher mean T_{Max} (33.3^{0}C) during the season. The least difference in minimum and maximum temperature over the season was at Urulikanchan.

In South zone, meteorological data has been reported from Hyderabad, Mandya, Coimbatore, Vellayani and Dharwad. The lowest T_{Min} was recorded at Hyderabad (14.4^0C) during 44th SMW followed by Dharwad (15.9^0C) in 44th SMW. The T_{Max} was recorded at Coimbatore centre (33.8^0C) during 37th SMW. On the seasonal mean basis, Mandya and Vellayani experienced higher mean T_{Max} as compared to other locations in the zone. The lowest mean T_{min} (19.3^0C) was observed at Mandya followed by Dharwad centre (19.5^0C). The minimum difference in mean ($T_{max.}$ and $T_{min.)}$ temperature was observed at Vellayani.

Rainfall

India, being vast country with diverse agro-climate condition witnessed wide variation in total rainfall of season *kharif* 2017, ranging from 203 mm at Rahuri to 2041.8 mm at Palampur. The number of rainy days recorded between 10 at Rahuri to 80 at Kalyani. In Hill zone, Palampur received highest rainfall (2041.8 mm) followed by Almora (464.2 mm in 46 rainy days). In North East zone, Bhubaneswar received highest rainfall (1776.7mm) in 73 rainy days followed by Jorhat (1018 mm) and lowest being at Imphal (593.3 mm). The maximum numbers of rainy days were recorded at Kalyani (80 rainy days) and lowest being at Ranchi (39 rainy days). In North-West zone, Pantnagar received highest rainfall (1515.1 mm) in 49 rainy days followed by Ludhiana (1270.2 mm) in 36 rainy days and lowest being at Bikaner (279.2 mm in 13 rainy days). In Central zone, maximum rainfall (1076.1 mm) in 42 rainy days was received at Jabalpur followed by Jhansi (990.4 mm) in 37 rainy days and lowest being with Rahuri (203 mm in 10 rainy days). In South zone, Vellayani received maximum rainfall (1048.9 mm) in 49 rainy days followed by Coimbatore (432.9 mm in 35 rainy days) and lowest total rainfall was at Mandya (331 mm in 40 rainy days).

Relative Humidity (RH)

Being the rainy season, in general higher mean RH values were recorded at all the centres. Jorhat recorded highest mean morning RH of 94% whereas highest evening RH was observed at Mandya centre (78.4%). In Hill zone, the mean morning RH was highest at Palampur (83.9%). Srinagar recorded minimum morning RH (51.5%) on mean seasonal basis. The maximum difference in morning and evening RH was observed at Srinagar centre. In North-East zone, relatively higher RH was recorded at all centres. Higher mean RH of 94.4 and 93.7% were noted at Jorhat and Kalyani during morning, respectively. Minimum RH during morning hours was recorded at Faizabad (88.5%), whereas, lower evening RH (66.1%) was recorded at Imphal. In North-West zone, RH ranged from 72.8 to 88.8 % in morning hours and between 41.5 to 71.1% in afternoon. The lowest mean RH during morning as well as evening hours was recorded at Bikaner 72.8% and 41.5 respectively). Highest mean RH during morning as well as evening hours was recorded at Pantnagar (88.8% and 71.1%), respectively. In Central zone, maximum mean RH in morning hours (90.8%) was recorded at Anand and lowest RH at Urulikanchan (73.4%). As regards to mean RH during evening hours, maximum mean RH in (71.7%) was recorded at Jabalpur. The high variation between minimum and maximum RH was noted at Anand. In South zone, maximum mean RH in morning hours (92.8%) was recorded at Mandya and lowest RH at Coimbatore (86.1%), whereas, in evening hours maximum mean RH was recorded at Vellayani (78.5%) and lowest RH at Hyderabad (59.7%).

Sunshine hours

Among all the zones, maximum mean sunshine hours were observed at Bikaner (7.7 h/day) and minimum at Raipur (4.0 h/day). In Hill zone, higher average sunshine hours were recorded at Srinagar (6.7 h/day) followed by Almora (5.1 h/day). In North-West zone, more sunshine hours were recorded at Bikaner (8.7 h/day) followed by Ludhiana (6.5 h/day). Shortest days were observed at Pantnagar (5.3 h/day). In North-East zone, on seasonal mean basis, maximum average sunshine hours were recorded at Ranchi (5.7 h/day) whereas, shortest days were observed at Bhubaneswar (4.2 h/day). Other centres recorded little difference in sunshine duration. In Central zone, on mean basis, the maximum sunshine hours was recorded at Anand (5.0 h/day) followed by Jabalpur (4.3 h/day) and lowest being with Raipur (4.0 h/day). In South zone, on mean basis, Vellayani and Coimbatore recorded maximum sunshine hours (5.8 h/day), whereas lowest was at Mandya (4.9 h/day).

SMW		SMW		SMW	
26	June 25-July 01,2018	**33**	Aug. 13-Aug. 19, 2018	**40**	Oct. 01-Oct. 07, 2018
27	July 02-July 08, 2018	**34**	Aug. 20-Aug. 26, 2018	**41**	Oct. 08-Oct. 14, 2018
28	July 09-July 15, 2018	**35**	Aug. 27-Sep. 02, 2018	**42**	Oct.15-Oct. 21, 2018
29	July 16-July 22, 2018	**36**	Sep. 03-Sep. 09, 2018	**43**	Oct. 22-Oct.28, 2018
30	July 23-July 29, 2018	**37**	Sep. 10-Sep. 16, 2018	**44**	Oct. 29-Nov. 04, 2018
31	July 30-Aug. 05, 2018	**38**	Sep. 17-Sep. 23, 2018		
32	Aug. 06-Aug 12, 2018	**39**	Sep. 24-Sep. 30 2018		

Table M1: Meteorological data in Hill zone during crop growth period of Kharif-2018

Std. Week No.	PALAMPUR						ALMORA						
	Temperature (C)		Humidity (%)		Rainfall (mm)	Sunshine hrs	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Sunshine hrs
	Max.	Min.	RH1	RH2			Max.	Min.	RH1	RH2			
26	28.5	19.8	80	75	120.7	4.3	31.5	20.6	70	54	3	19	5.9
27	25.8	18.5	89	86	161.5	3.1	30.6	21.1	88	59	2	18	4.5
28	28.2	20.5	92	87	232.0	3.1	30.1	22.4	85	60	3	15	3.8
29	28.2	20.2	93	92	93.0	4.6	31.6	21.7	80	63	3	8	5.0
30	26.4	20.0	100	86	261.0	2.0	27.6	21.5	88	75	6	90	2.3
31	27.5	19.7	89	82	39.6	4.5	26.8	21.1	88	77	6	47	0.9
32	24.3	19.8	98	93	154.4	0.5	27.1	20.9	88	76	5	55	3.3
33	26.8	19.8	96	86	236.4	2.8	29.4	21.6	85	68	2	8	5.4
34	26.1	20.1	93	88	255.8	1.9	25.8	21.4	86	83	5	108	1.2
35	26.9	19.9	90	85	112.0	5.2	27.2	21.0	92	81	6	31	1.5
36	26.4	19.5	76	86	78.4	2.4	29.9	19.8	68	65	1	8	3.6
37	26.5	17.7	88	88	105.0	2.8	30.2	19.4	79	60	1	4	6.8
38	27.1	15.9	81	76	50.0	8.8	28.5	17.1	88	65	2	30	5.8
39	23.6	15.2	87	79	138.0	5.0	28.8	17.8	84	60	1	25	7.1
40	26.8	14.1	70	55	2.0	8.8	28.9	13.4	73	44	-	-	8.7
41	26.0	12.8	73	48	2.0	7.3	26.3	17.6	84	42	-	-	7.6
42	25.2	12.4	84	72	0.0	9.5	27.6	13.7	76	41	-	-	8.7
43	23.6	10.1	48	40	0.0	9.5	26.4	13.6	77	42	-	-	9.0
44	23.7	11.0	68	55	0.0	8.0							
Mean/ Total	**26.2**	**17.2**	**83.9**	**76.8**	**2041.8**	**5.0**	**28.6**	**19.2**	**82.2**	**62.1**	**46**	**464.2**	**5.1**

Table M2: Meteorological data in Hill zone during crop growth period of Kharif-2018

Std. Week No.	SRINAGAR					
	Temperature (C)		Humidity (%)		Rainfall (mm)	Sunshine hrs
	Max.	Min.	RH1	RH2		
26	23.8	14.1	83	70	43.6	2.4
27	26.6	15.0	81	64	39.2	6.5
28	31.1	18.5	82	56	17.8	5.5
29	30.4	18.7	85	57	10.4	6.7
30	27.3	17.9	92	67	64.8	3.3
31	31.6	15.2	77	49	0.0	10.0
32	29.6	18.6	82	66	43.0	6.0
33	29.7	17.1	85	54	77.6	7.4
34	31.8	17.1	85	45	0.0	7.6
35	31.0	13.4	78	44	0.0	8.6
36	29.2	15.1	78	57	7.4	5.8
37	27.6	13.3	80	55	14.4	7.2
38	28.2	9.6	84	43	1.0	8.3
39	26.0	9.1	83	46	0.0	6.6
40	28.6	9.3	85	37	0.0	6.8
41	28.1	8.2	81	38	0.0	7.2
42	25.3	7.0	80	39	0.0	7.1
43	24.6	7.0	80	40	0.0	7.4
Mean/ Total	**28.4**	**13.6**	**82.3**	**51.5**	**319.2**	**6.7**

Table M3: Meteorological data in North West zone during crop growth period of Kharif-2018

Std. Week No.	HISAR						BIKANER						
	Temperature (C)		Humidity (%)		Rainfall (mm)	Sunshine hrs	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Sunshine hrs
	Max.	Min.	RH1	RH2			Max.	Min.	RH1	RH2			
26	35.1	26.5	81	71	56.7	4.1	35.7	26.1	77.3	56.6	3	34.6	4.7
27	35.3	26.7	82	60	39.1	6.3	40.0	29.5	71.6	40.0	0	0.0	8.8
28	37.6	27.9	82	61	14.2	6.0	40.9	29.9	91.9	42.9	2	14.4	9.5
29	33.9	26.3	94	81	11.7	4.6	35.2	26.5	86.7	67.0	4	162.6	6.5
30	33.4	26.3	95	79	93.5	2.9	35.0	26.8	88.4	58.9	1	12.8	4.0
31	36.1	26.5	80	54	0.0	6.1	36.5	26.9	89.1	43.6	0	0.0	8.0
32	36.6	26.6	78	58	0.0	4.7	36.1	26.8	88.1	53.6	1	10.2	6.9
33	32.7	26.2	92	73	22.1	3.5	36.3	26.9	80.1	51.7	1	6.6	6.5
34	35.6	27.2	90	62	0.6	6.8	35.2	25.8	81.3	54.4	1	38.0	8.4
35	36.1	26.9	89	66	0.8	5.2	36.7	26.5	73.1	47.3	0	0.0	8.5
36	35.1	26.2	90	64	3.0	4.9	35.5	25.9	72.0	48.4	0	0.0	4.0
37	34.4	23.5	90	64	29.2	7.6	36.1	24.4	73.1	43.0	0	0.0	8.9
38	33.7	23.3	93	76	44.6	6.6	36.9	23.1	65.1	39.4	0	0.0	8.8
39	30.8	21.6	98	69	32.0	5.1	38.0	22.2	66.4	31.1	0	0.0	7.6
40	34.4	20.0	90	40	0.0	7.9	39.5	22.1	50.9	19.7	0	0.0	9.4
41	32.5	15.2	86	43	0.0	6.8	36.4	19.0	61.6	21.6	0	0.0	9.0
42	33.4	16.5	72	30	0.0	7.1	35.5	17.3	56.0	22.0	0	0.0	8.0
43	31.4	14.4	84	36	0.0	7.1	35.7	16.7	53.1	23.0	0	0.0	9.7
44	31.0	15.4	92	44	0.0	2.1	34.0	16.0	58.3	23.7	0	0.0	9.0
Mean/ Total	**34.2**	**23.3**	**87.3**	**59.5**	**347.5**	**5.5**	**36.6**	**24.1**	**72.8**	**41.5**	**13**	**279.2**	**7.7**

Table M4: Meteorological data in North West zone during crop growth period of Kharif-2018

Std. Week No.	PANTNAGAR							LUDHIANA						
	Temperature (C)		Humidity (%)		No. of Rainy Days	Rainfall (mm)	Sunshine hrs	Temperature (C)		Humidity (%)		No. of Rainy	Rainfall (mm)	Sunshine hrs
	Max.	Min.	RH1	RH2				Max.	Min.	RH1	RH2			
26	35.9	26.6	81	68	1	18.2	6.4	37.6	27.2	64	41	6	141.8	6.8
27	32.6	25.4	90	70	3	180.8	6.0	33.9	26.0	85	62	2	52.8	6.9
28	32.5	26.0	88	78	3	173.2	3.1	35.5	28.1	79	58	0	64.0	6.3
29	33.3	26.9	82	73	2	79.6	6.7	33.4	25.9	84	77	4	167.8	4.0
30	31.2	25.7	91	80	5	169.0	2.2	33.9	26.6	85	65	2	91.4	4.1
31	29.7	24.1	94	84	7	218.1	1.0	34.3	26.6	83	64	10	376.6	5.5
32	30.9	24.9	90	80	3	126.4	3.6	32.7	26.5	86	72	0	53.8	4.8
33	31.9	26.1	89	72	3	73.4	4.0	33.9	26.8	84	69	1	13.0	4.3
34	30.9	25.5	95	83	5	160.8	3.2	34.2	27.3	83	68	0	0.0	5.7
35	30.7	25.5	92	81	5	86.8	2.0	34.1	27.3	84	67	5	74.0	5.4
36	32.3	25.3	90	76	3	76.6	6.0	33.4	26.1	88	64	2	20.0	5.3
37	31.9	24.3	93	78	2	15.6	5.6	33.4	25.2	86	60	0	0.0	8.3
38	32.1	22.6	90	73	3	49.2	6.8	31.1	22.3	86	61	2	146.8	7.6
39	30.4	22.0	91	70	2	80.6	4.6	29.9	21.3	93	65	2	68.2	8.2
40	32.3	18.5	84	60	0	0.0	9.1	32.5	20.5	93	47	0	0.0	9.6
41	30.9	17.1	83	61	1	2.6	7.3	30.8	18.6	85	40	0	0.0	8.0
42	30.7	14.3	87	59	0	0.0	7.8	31.7	16.0	88	33	0	0.0	8.9
43	29.6	12.0	90	51	0	0.0	8.3							
44	29.9	13.7	87	54	1	4.2	7.1							
Mean/ Total	**31.6**	**22.4**	**88.8**	**71.1**	**49**	**1515.1**	**5.3**	**33.3**	**24.6**	**84.5**	**59.6**	**36**	**1270.2**	**6.5**

Table M5: Meteorological data in Central zone during crop growth period of Kharif-2018

Std. Week No.	URULIKANCHAN					RAIPUR						
	Temperature (C)		Humidity (%)	No. of Rainy days	Rainfall (mm)	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Sun shine (hours)
	Max.	Min.	RH1			Max.	Min.	RH1	RH2			
26	27.2	23.1	75.9	1	5.0	33.5	26.0	84	60	3	16.9	4.4
27	26.5	23.5	78.5	4	41.4	33.8	25.4	87	60	0	1.6	3.6
28	26.1	23.8	80.5	3	30.2	31.1	25.0	94	86	4	199.2	0.9
29	25.8	23.4	81.9	3	72.8	30.4	25.4	93	82	4	75.8	0.4
30	26.5	23.7	77.6	0	1.0	28.6	25.4	88	76	3	51.4	0.1
31	27.3	23.6	76.6	0	1.0	31.9	25.4	88	67	1	31.0	2.3
32	26.7	23.7	77.3	0	3.2	30.0	24.8	92	88	3	103.4	1.2
33	25.8	23.3	82.9	1	13.4	30.3	25.3	94	79	4	101.2	2.9
34	25.6	23.0	83.8	4	26.4	29.0	24.6	93	79	3	60.4	0.6
35	26.9	22.7	81.8	2	36.4	28.3	24.1	96	86	4	275.0	0.2
36	28.4	22.0	82.3	2	14.0	29.2	23.9	93	57	3	30.2	1.1
37	33.9	25.1	78.2	0	0.0	32.6	25.1	90	55	0	0.0	6.4
38	35.4	28.4	81.2	2	12.2	31.0	24.1	92	68	2	32.8	3.6
39	37.4	29.1	77.1	0	0.0	32.9	25.0	93	59	1	11.0	7.8
40	34.3	22.0	62.6	0	0.0	34.0	23.8	91	44	0	0.0	8.0
41	34.8	22.6	57.6	0	0.0	32.4	22.8	87	51	0	0.0	7.1
42	33.4	22.3	61.6	0	0.0	33.4	21.3	89	40	0	0.0	8.5
43	34.1	21.5	48.1	0	0.0	32.9	18.9	86	48	0	0.0	8.3
44	32.1	20.8	49.2	0	0.0	31.0	19.6	86	49	0	0.0	9.3
Mean/ Total	**29.9**	**23.6**	**73.4**	**22**	**257.0**	**31.4**	**24.0**	**90.3**	**64.9**	**35**	**989.9**	**4.0**

Table M6: Meteorological data in Central zone during crop growth period of Kharif-2018

Std. Week No.	ANAND						RAHURI					
	Temperature (C)		Humidity (%)		Rainfall (mm)	Sunshine hrs	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)
	Max.	Min.	RH1	RH2			Max.	Min.	RH1	RH2		
26	34.5	25.8	90	60	61.4	3.2	32.1	23.0	73	53	1	63.8
27	33.6	24.8	93	72	122.4	4.1	31.7	23.3	76	59	1	26.2
28	32.0	24.6	93	77	103.2	1.1	28.2	22.8	80	70	2	13.8
29	29.4	23.6	98	89	218.8	0.1	29.4	23.0	77	65	1	4.4
30	30.0	25.0	93	83	5.6	0.4	28.6	22.7	75	62	-	-
31	32.9	25.0	90	65	0.6	3.7	31.3	23.3	72	53	-	-
32	32.8	24.8	89	72	13.0	3.0	30.0	23.0	75	62	-	-
33	31.2	24.3	94	77	135.6	1.4	27.8	22.5	81	73	1	58.4
34	30.3	23.4	98	83	151.0	2.5	27.9	21.5	80	70	2	24.2
35	30.4	23.7	95	76	32.8	2.2	29.6	21.1	75	61	1	6.4
36	30.7	22.7	91	70	2.0	5.0	30.1	19.6	70	53	-	-
37	32.1	23.0	88	59	0.0	6.4	32.4	19.5	69	59	-	-
38	34.2	23.3	88	58	39.2	6.9	31.9	22.1	71	45	1	3.8
39	34.2	21.3	92	50	18.0	8.4	33.8	22.3	71	44	-	-
40	37.3	22.3	86	43	0.0	9.0	34.0	21.5	67	43	-	-
41	37.2	20.4	89	35	0.0	9.0	34.0	18.4	55	30	-	-
42	37.2	19.8	91	33	0.0	9.0	33.5	18.6	50	30	-	-
43	36.8	16.7	89	26	0.0	9.8	34.4	16.8	46	30	-	-
44	35.5	17.4	78	29	0.0	9.9	31.7	14.4	58	39	-	2.0
Mean/ Total	**33.3**	**22.7**	**90.8**	**60.9**	**903.6**	**5.0**	**31.2**	**21.0**	**69.5**	**52.7**	**10**	**203.0**

Table M7: Meteorological data in Central zone during crop growth period of Kharif-2018

Std. Week No.	JABALPUR							JHANSI					
	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Sunshine hrs	Temperature (C)		Humidity (%)		Rainfall (mm)	No. of Rainy days
	Max.	Min.	RH1	RH2				Max.	Min.	RH1	RH2		
26	33.6	25.3	85	76	3	29.9	2.2	36.7	26.7	77	60	51.6	3
27	32.5	24.6	86	67	3	44.1	3.9	36.6	26.8	75	51	3.4	1
28	32.4	24.8	92	78	6	64.6	1.8	36.6	26.8	83	58	61.6	2
29	31.4	24.8	95	80	2	137.0	1.8	34.0	26.9	87	72	67.6	3
30	28.7	23.6	95	88	4	106.9	0.0	28.9	25.0	94	85	119.2	6
31	29.6	24.3	89	73	0	2.8	0.5	31.1	24.7	90	73	79.0	3
32	29.4	24.3	93	84	4	187.9	0.6	33.1	25.6	90	68	16.0	2
33	30.3	24.6	94	78	6	86.3	2.6	33.1	26.0	91	71	7.4	2
34	28.5	23.3	95	93	5	138.8	0.9	30.0	24.3	95	85	131.6	5
35	26.8	23.4	95	91	5	193.8	0.3	30.9	24.3	96	82	261.2	4
36	26.8	22.6	96	84	4	72.2	0.3	28.6	22.9	94	85	175.6	5
37	31.2	22.7	90	69	0	0.0	8.1	31.8	22.8	90	61	0.0	
38	31.1	22.7	91	72	1	11.8	6.0	33.2	22.8	88	59	16.2	1
39	32.8	22.1	90	62	0	0.0	8.0	33.4	22.2	85	51	0.0	
40	34.2	19.8	89	54	0	0.0	9.2	35.8	20.0	80	36	0.0	
41	32.0	18.0	86	61	0	0.0	8.1	34.6	18.3	79	36	0.0	
42	32.7	17.8	86	53	0	0.0	8.7	34.8	15.9	76	36	0.0	
43	31.9	14.7	85	53	0	0.0	9.2	33.6	14.9	75	38	0.0	
44	30.5	15.1	88	46	0	0.0	8.6	32.1	14.5	78	43	0.0	
Mean/ Total	**30.9**	**22.0**	**90.6**	**71.7**	**43**	**1076.1**	**4.3**	**33.1**	**22.7**	**85.4**	**60.5**	**990.4**	**37**

Table M8: Meteorological data in North East zone during crop growth period of Kharif-2018

Std. Week No.	JORHAT							RANCHI						
	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Sunshine hrs	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Sunshine hrs
	Max.	Min.	RH1	RH2				Max.	Min	RH1	RH2			
26	33.3	24.8	94	74	5	25.5	3.5	30.8	19.1	89	66	3	88.0	2.9
27	32.3	25.6	93	80	5	110.6	2.4	29.2	18.7	86	64	1	16.3	5.5
28	34.3	25.8	92	71	5	46.3	5.2	31.6	21.9	86	68	0	2.0	7.3
29	35.0	26.9	93	71	3	3.5	5.9	30.0	21.8	87	68	5	74.3	4.3
30	33.6	25.8	94	75	5	50.3	3.5	27.1	19.5	86	69	5	63.3	0.3
31	31.7	25.5	96	78	3	99.1	2.5	27.3	20.1	86	69	2	28.8	0.4
32	34.8	26.0	92	72	4	70.9	5.3	27.3	19.3	86	69	2	17.6	3.6
33	34.1	26.4	95	73	6	65.2	5.9	28.0	20.0	86	69	3	32.9	5.0
34	33.5	25.4	94	79	2	127.5	3.4	29.6	22.7	85	68	4	166.0	7.1
35	32.8	25.2	97	73	4	127.9	4.0	29.1	19.6	85	68	3	102.6	5.5
36	34.1	25.8	89	71	6	71.0	4.9	27.0	18.8	85	68	5	130.7	2.3
37	31.4	24.4	93	81	2	137.8	2.8	29.6	19.9	86	68	3	31.7	8.1
38	33.0	25.3	92	74	3	9.5	6.0	29.1	19.3	86	69	3	24.9	8.2
39	30.3	23.9	99	83	4	55.5	1.1	29.4	19.2	85	68	0	0.0	8.4
40	30.6	23.0	97	69	3	4.0	5.8	27.9	18.3	85	69	0	0.0	8.7
41	28.7	21.3	97	78	1	12.8	3.6	26.4	16.5	84	69	0	2.0	5.6
42	29.0	19.8	94	71	2	0.6	4.6	25.9	15.2	87	68	0	0.0	9.1
43	30.7	18.9	97	61	2	0.0	7.1	26.5	15.4	87	68	0	0.0	8.9
44	28.9	18.1	95	65	1	0.0	6.1	27.9	17.9	87	68	0	0.0	7.5
Mean/ Total	**32.2**	**24.1**	**94.4**	**73.6**	**66**	**1018.0**	**4.4**	**28.4**	**19.1**	**85.9**	**68.1**	**39**	**781.1**	**5.7**

Table M9: Meteorological data in North East zone during crop growth period of Kharif-2018

Std. Week No.	IMPHAL						FAIZABAD						
	Temperature (C)		Humidity (%)		Rainfall (mm)	Sunshine hrs	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Sun shine hrs
	Max.	Min.	RH1	RH2			Max.	Min.	RH1	RH2			
26	30.3	22.3	89	68	43.3	4.0	36.6	26.7	80.7	56.8	3	12.4	4.9
27	28.5	22.2	85	70	10.9	2.0	36.2	27.4	78	52.2	2	5.5	5.1
28	30.7	22.8	89	66	29.9	3.0	34	26.3	90.2	68.7	3	89.8	3.8
29	30.9	22.7	85	64	8.0	4.0	33.2	26.6	85	69.2	3	86.2	3.9
30	29.9	22.2	91	72	128.2	2.0	30.8	26	93.5	83.4	4	142.9	0.6
31	29.0	22.1	93	70	78.8	2.0	28.3	25	97.5	87.7	7	147.8	0.3
32	29.0	21.9	92	74	32.9	3.0	32.6	26.5	87.1	72.1	2	9.6	5.1
33	29.9	22.5	91	72	34.0	3.0	33	26.2	86.8	70.8	3	55.4	4.9
34	31.1	22.2	91	64	15.9	4.0	32.7	25.5	93.4	78.7	4	123	3.9
35	29.1	22.3	94	74	64.4	2.0	31.8	26	93.8	81.8	5	66	3.7
36	30.1	21.9	93	70	13.0	3.0	31.4	25.7	92.2	77.1	3	48.4	3.5
37	29.6	21.2	90	69	0.7	4.0	32.4	25	90.5	70.1	1	27.2	7.8
38	31.4	21.2	88	64	14.2	7.0	32.4	24	90	65.5	1	1.6	7
39	30.2	19.9	89	65	0.0	7.0	33.4	23.9	88.8	62.1	0	0	8.4
40	31.1	18.8	91	53	0.0	8.0	34.3	21.6	87.5	55.4	0	0	9.2
41	28.2	18.0	89	63	24.2	5.0	32.6	21	88.5	56.5	0	0	8.3
42	25.9	15.9	91	68	82.6	5.0	33.5	17.5	83	48.1	0	0	8.4
43	28.6	14.7	86	40	0.0	9.0	32.1	15.3	86	55.5	0	0	8.4
44	25.1	15.9	90	71	12.3	5.0	31.8	15.5	89.5	49.8	0	0	8.7
Mean/ Total	**29.4**	**20.6**	**89.9**	**66.1**	**593.3**	**4.3**	**32.8**	**23.8**	**88.5**	**66.4**	**41**	**815.8**	**5.6**

Table M10: Meteorological data in North East zone during crop growth period of Kharif-2018

Std. Week No.	KALYANI							BHUBANESWAR						
	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Sun shine hrs	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Sunshine hrs
	Max.	Min.	RH1	RH2				Max.	Min.	RH1	RH2			
26	31.3	26.2	90.9	80.3	6	34.8	3.8	30.9	25.0	93	81	6	134.5	1.9
27	33.4	26.6	94.2	75.1	5	72.3	4.2	33.2	26.2	94	72	4	37.0	1.5
28	33.7	27.0	95.3	79.4	7	80.5	5.9	33.1	26.1	93	78	6	73.3	3.7
29	32.6	27.0	95.0	81.0	7	48.7	5.6	31.0	25.9	96	88	6	402.5	1.9
30	30.6	25.9	97.3	85.1	6	208.7	0.8	32.3	26.5	94	76	6	34.4	2.3
31	31.5	26.2	96.9	81.7	6	46.1	2.2	32.5	25.5	91	75	3	55.6	2.8
32	32.9	26.8	93.3	74.9	5	45.2	6.0	32.4	25.7	94	75	7	216.7	4.2
33	32.3	27.2	92.3	75.9	5	17.2	5.6	32.7	26.1	93	78	5	149.2	4.3
34	33.1	26.9	93.6	72.7	4	78.7	4.8	32.5	26.1	93	79	5	31.3	3.3
35	31.5	26.6	92.7	81.1	7	50.0	4.0	31.3	25.5	94	83	4	59.5	1.5
36	32.4	26.2	94.1	70.1	6	53.8	5.7	30.8	24.7	94	78	6	137.9	2.6
37	33.6	26.4	93.0	68.9	2	6.0	4.4	34.1	25.9	91	66	2	12.9	6.6
38	33.4	26.1	93.4	70.4	5	49.4	6.0	31.7	25.1	94	78	4	155.9	3.3
39	35.0	26.3	93.6	67.6	1	35.4	7.2	33.8	25.4	95	73	3	39.2	6.5
40	35.4	25.3	92.4	53.4	0	0.0	9.1	35.1	25.4	94	55	0	0.0	7.5
41	30.1	23.5	94.0	73.6	4	11.0	3.7	30.7	23.3	96	72	4	230.4	3.4
42	33.9	21.8	93.9	56.6	0	0.0	8.8	33.4	22.5	94	56	0	0.0	7.5
43	32.5	19.9	91.6	51.3	0	0.0	7.7	33.0	20.6	92	53	1	3.6	8.7
44	30.6	21.7	92.7	59.6	4	10.4	6.3	30.0	21.8	94	63	1	2.8	6.7
Mean/ Total	**32.6**	**25.4**	**93.7**	**71.5**	**80**	**848.2**	**5.3**	**32.3**	**24.9**	**93.6**	**72.6**	**73**	**1776.7**	**4.2**

Table M11: Meteorological data in South zone during crop growth period of Kharif-2018

Std. Week No.	HYDERABAD							VELLAYANI						
	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Sunshine hrs	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Sunshine hrs
	Max.	Min.	RH1	RH2				Max.	Min.	RH1	RH2			
26	33.2	22.1	86	65	0	0.0	5.2	31.4	24.4	89.7	80.7	4	25.2	6.6
27	32.2	21.6	91	76	1	16.2	3.3	31.5	24.6	86.5	75.4	1	10.2	7.8
28	27.4	20.9	94	83	5	64.0	0.6	29.6	23.0	93.8	85.4	6	69.3	2.9
29	29.5	21.4	91	74	0	7.4	2.9	30.4	23.5	91.1	79.1	4	56.3	5.5
30	31.8	21.5	83	58	0	0.0	5.2	31.4	23.5	89.2	73.2	2	13.1	6.8
31	32.7	21.4	79	48	1	6.4	6.7	29.4	23.9	90.4	80.9	3	136.2	4.6
32	30.2	21.0	86	78	3	96.0	2.6	30.2	23.3	91.0	85.1	4	107.3	2.4
33	27.6	21.1	90	82	2	13.8	1.4	29.0	22.6	94.5	89.9	6	205.2	2.5
34	28.2	20.2	92	73	3	29.2	3.9	31.0	24.0	89.4	76.6	1	2.8	8.3
35	29.7	20.4	93	70	1	16.6	5.5	32.0	24.4	89.1	71.9	-	-	8.0
36	30.7	19.9	83	52	0	0.0	7.6	32.1	24.0	87.1	72.0	-	-	9.7
37	32.9	19.6	95	52	1	22.0	6.7	33.0	24.0	85.1	70.9	-	-	9.6
38	30.3	20.3	89	64	1	4.2	3.3	32.0	24.2	88.4	72.0	1	9.3	7.1
39	32.1	19.9	94	58	1	14.8	5.7	32.5	24.6	90.1	81.4	3	57.7	5.7
40	32.6	18.6	91	47	0	0.0	8.1	31.5	24.7	92.0	85.4	3	48.3	3.0
41	33.4	16.2	79	34	0	0.0	7.1	30.7	24.3	93.1	80.1	3	134.6	2.8
42	32.1	18.4	90	47	2	43.2	6.3	32.0	24.5	91.4	77.3	5	90.6	5.2
43	32.2	14.9	87	32	0	0.0	7.2	31.4	24.2	93.7	76.4	1	11.3	4.8
44	30.1	14.4	87	43	0	0.0	8.0	31.8	24.3	93.4	77.1	2	71.5	6.7
Mean/ Total	**31.0**	**19.7**	**88.4**	**59.7**	**21**	**334**	**5.1**	**31.2**	**24.0**	**90.5**	**78.5**	**49**	**1048.9**	**5.8**

Table M12: Meteorological data in South Zone during crop growth period of Kharif-2018

Std. Week No.	COIMBATORE							MANDYA						
	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Sunshine hrs	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Sun shine hrs
	Max.	Min.	RH1	RH12				Max.	Min.	RH1	RH2			
26	30.7	23.7	85	59	1	5.2	4.8	30.6	19.1	87	81	4	12.7	2.8
27	32.1	22.9	88	56	1	5.6	5.6	31.3	20.1	88	75	0	1.0	3.9
28	28.3	23.2	81	74	4	44.4	3.5	30.7	20.4	91	75	5	25.4	1.5
29	28.9	23.5	82	68	3	20.8	2.4	31.1	20.1	91	69	0	0.0	2.4
30	30.8	23.5	83	61	1	2.6	5.9	31.6	19.9	93	73	0	0.0	3.0
31	32.1	23.2	87	57	0	0.0	4.9	31.4	19.6	94	85	0	0.0	3.1
32	29.5	23.0	83	68	2	22.0	2.4	31.6	19.4	95	76	1	6.6	3.5
33	28.6	23.1	80	73	4	35.6	3.1	31.2	19.2	94	78	1	5.0	2.2
34	30.7	22.9	85	59	0	0.8	7.4	31.6	19.4	95	83	0	0.0	5.8
35	30.9	22.3	89	62	0	2.0	3.9	30.6	19.1	94	76	1	4.4	2.8
36	32.6	21.6	86	51	0	0.0	10.0	31.9	16.9	95	82	0	0.0	8.4
37	33.8	22.9	87	52	0	0.0	8.4	31.2	19.3	94	80	3	45.8	6.3
38	33.3	22.4	85	49	0	0.0	7.5	31.4	19.1	96	79	1	39.6	7.0
39	32.2	22.2	89	61	7	115.7	7.7	31.2	18.9	88	75	4	80.8	6.6
40	29.9	22.7	89	70	4	66.0	4.7	31.4	19.1	93	78	2	32.6	5.2
41	30.9	22.4	89	59	1	12.9	6.0	31.1	19.1	95	82	4	20.4	6.2
42	30.2	22.5	90	68	4	72.7	6.4	31.4	19.1	95	81	7	27.6	6.7
43	30.1	21.3	88	50	0	0.0	9.4	31.9	19.4	94	83	7	29.1	8.9
44	29.7	21.1	90	64	3	26.6	6.4	31.4	19.4	91	78	0	0.0	6.5
Mean/ Total	**30.8**	**22.7**	**86.1**	**61.1**	**35**	**432.9**	**5.8**	**31.3**	**19.3**	**92.8**	**78.4**	**40**	**331.0**	**4.9**

Table M13: Meteorological data in South Zone during crop growth period of Kharif-2018

Std. Week No.	DHARWAD					
	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)
	Max.	Min.	RH1	RH2		
26	27.7	20.9	87	76	1	3.0
27	27.2	20.5	87	82	2	11.2
28	25.5	20.5	93	86	7	45.6
29	25.0	20.8	91	88	7	54.4
30	25.2	20.7	90	87	3	17.2
31	26.7	20.6	89	83	0	6.0
32	26.0	20.3	89	86	3	18.6
33	24.8	20.4	92	88	3	32.8
34	25.9	20.0	89	80	1	9.0
35	26.7	19.9	89	82	1	12.6
36	27.8	18.7	86	75	0	2.2
37	30.6	17.8	82	53	0	0.0
38	29.8	19.4	81	68	1	24.2
39	30.9	19.4	83	70	2	36.8
40	32.5	19.8	77	60	3	13.8
41	32.4	19.6	83	49	0	0.4
42	30.1	19.3	83	72	3	62.6
43	32.1	16.8	60	56	0	0.0
44	30.4	15.9	61	44	0	0.0
Mean/ Total	**28.3**	**19.5**	**83.9**	**72.9**	**37**	**350.4**

Monitoring Details of Kharif-2018 of AICRP (FC&U) Trials

S. N.	Centre	Monitoring Team	Date of Monitoring
1	AAU, Jorhat	Drs. Kalyan Jana and Sutanu sarkar	18th Sept., 2018
2	CAU, Imphal	Drs. A. K. Mehta and S. R. Kantwa	11-12th Sept., 2018
3	OUAT, Bhubaneswar	Drs. S. K. Jha and Mayuri Sahu	30th Aug. 2018
4	BCKV, Kalyani	Drs. Naveen Kumar and V. K. Sood	28th Sept., 2018
5	BAU, Ranchi	Drs. Naveen Kumar and V. K. Sood	26th Sept., 2018
6	NDUAT, Kumarganj	Drs. S. S. Shekhawat and R. C. Bairwa	26th Sept., 2018
7	JNKVV, Jabalpur	Drs. U S Tiwana and Yogesh Jindal	26-27th Sept., 2018
8	AAU, Anand	Drs. P. S. Takawale and Mr. R. V. Kale	31st Aug., 2018
9	BAIF, Urulikanchan	Dr. B. G. Shekhara	19th Sept., 2018
10	MPKV, Rahuri	Dr. B. G. Shekhara	20th Sept., 2018
11	SKRAU, Bikaner	Drs. Rahul Kapoor & Mukesh Choudhary	29th Aug., 2018
12	PAU, Ludhiana	Drs. Yogesh Jindal and M. S. Pal	15th Sept., 2018
13	CCS HAU, Hisar	Drs. S. S. Shekhawat and R. C. Bairwa	9th Sept., 2018
14	GBPUA&T, Pantnagar	Drs. Rahul Kapoor & Mukesh Choudhary	27-28th Aug., 2018
15	TNAU, Coimbatore	Drs. A. H. Sonone and A. B. Tambe	14th Sept., 2018
16	PJTSAU, Hyderabad	Drs. C Babu and S. D. Shiva Kumar	17th Sept., 2018
17	UAS (B) -ZARS, Mandya	Drs. P. S. Takawale and R. V. Kale	16th Sept. 2018
18	CSK HPKV, Palampur	Drs. Yogesh Jindal and U. S. Tiwana	13th Sept., 2018
19	KAU, Vellayani	Drs. A. H. Sonone and A. B. Tambe	12-13th Sept., 2018
20	IGKV, Raipur	Drs. P. Mahadevu and M. S. Pal	17-18th Sept., 2018
21	RPCAU, Pusa	Drs. S. K. Jha and Mayuri Sahu	13-14th Sept., 2018

APPENDIX I: FORAGE CROP IMPROVEMENT TRIALS AT A GLANCE: (KHARIF-2018)

Kharif-2018		Tr.-1	Tr.-2	Tr.-3	Tr.-4	Tr.-5	Tr.-6	Tr.-7	Tr.-8	Tr.-9	Tr-10	Tr.-11	Tr.-12	Tr.-13	Tr.-14	Tr.-15	Total
Zone	Location	IVTM	CAVTM-1 & 2	IVTPM	AVTPM-2	AVTPM-2 (Seed)	IVTC	AVTC-1	IVT + AVT-2 Rice bean	IVT + AVT-2 Rice bean (Seed)	VT C. ciliaris-2015 (4th Year) Perennial	VT C. Setig.-2015 (4th Year) (Perennial)	VTBN-2015 4th Year) (Perennial)	VT Seteria. grass-2015 (4th Year) (Perennial)	VT Penn. hybrids-2015 (4th Year) (Perennial)	VT Desmanthus 2016 (3rd Year)	
1 (HZ)	Palampur	DR					DR	DR					DR	DR	TF		5/6
2	Srinagar	DR					DR	DR									3/3
3	Almora	DR						DR					DR	DR			4/4
4	Bajoura													DR			1/1
5	Mukteshwar													TF			0/1
6	Rajouri	DR					DR	DR									3/3
7 (NWZ)	Bikaner			DR	DR	DR	DR				DR	DR	TF			DR	7/8
8	Jalore	TF		DR	DR	DR	DR					TF					4/6
9	Pali											TF					0/1
10	Hisar	DR		DR	DR	DR	DR				DR		DR		DR		8/8
11	Ludhiana	DR		DR	DR	DR	DR				DR		DR		TF	DR	8/9
12	Avikanagar										DR	DR					2/2
13	Jodhpur										DR	DR					2/2
14	Pantnagar	DR					DR									DR	3/3
15	Udipur	DR					DR									TF	2/3
16 (NEZ)	Jorhat		DR				DR		DR	DR			DR	DR			6/6
17	Kalyani						DR		DR	DR					TF	DR	4/5
18	Bhubaneswar	DR	DR	DR			DR		TF				DR			TF	5/7
19	Ranchi	DR	DR	DR			DR		DR	DR			DR				7/7
20	Pusa	DR		DR			DR		DR	TF							4/5
21	Faizabad	DR	DR	DR			DR										4/4
22	CAU Imphal	DR	DR				DR		DR	DR							5/5
23 (CZ)	Jhansi	DR		DR			DR				DR	DR	TF		DR	DR	7/8
24	Rahuri	DR		DR			DR				DR	DR	DR		DR	DR	8/8
25	Urulikanchan	DR		DR			DR				DR		DR		DR	DR	7/7
26	Dhari											DR					1/1
27	Anand	DR		DR			DR				DR	DR	DR		DR	DR	8/8
28	Jabalpur	DR		DR					DR	DR	DR		DR		DR		7/7
29	Raipur	DR		DR			DR						DR				4/4
30	Palghar								TF				TF				0/2
31	Meerut			DR			DR										2/2
32 (SZ)	Hyderabad	DR	DR	DR	DR	DR	DR	DR			DR	DR	DR			DR	11/11
33	Mandya	DR	DR	DR	DR	DR	DR	DR			DR	DR	DR			DR	11/11
34	Coimbatore	DR	DR	DR	DR	DR	DR	DR			DR	DR	DR			DR	11/11
35	Dharwad						DR	DR					DR				3/3
36	Vellayani						DR	DR	DR				DR			DR	5/5
37	Raichur			TF	TF		DR	DR									2/4
38	Karaikkal	DR	DR														2/2
Total Location		23/24	9/9	18/19	7/8	7/7	28/28	10/10	7/9	5/6	13/13	11/12	17/20	4/5	7/10	11/13	179/194

Abbreviations: **DR =** Data reported**, TF =** Trial failed**, Success index (%) = 179/194 -** 92.26 (%)

APPENDIX II: FORAGE CROP PRODUCTION TRIALS AT A GLANCE: (KHARIF-2018)

Location/ Trial	CS-15-AST-4	K-15-AST-10C	K-16-AST-2	K-17-AST-1	K-17-AST-3	K-18-AST-2	K-15-AST-5L	K-15-AST-6L	K-15-AST-8-7L	K-16-AST-8	K-17-AST-4L	Expl. Trial	R-18-AST-6	K-18-AST-3	K-18-AST-4	Total
HILL ZONE																
Palampur																
Srinagar																
NORTH WEST ZONE																
Hisar						DR										1/1
Ludhiana												DR			DR	2/2
Bikaner															DR	1/1
Pantnagar	DR															1/1
NORTH EAST ZONE																
Faizabad					DR				DR	DR				DR		4/4
Ranchi	DR				DR											2/2
Kalyani	DR		DR			DR										3/3
Bhubaneswar			DR													1/1
Jorhat											DR					1/1
Imphal						DR								DR		2/2
CENTRAL ZONE																
Jabalpur	DR		DR		DR											3/3
Rahuri					DR	TF		DR								2/3
Urulikanchan			DR		DR	DR										3/3
Anand			DR													1/1
Raipur					DR	DR										2/2
SOUTH ZONE																
Hyderabad							DR							DR	DR	3/3
Mandya		DR		DR		DR									DR	4/4
Coimbatore				DR										DR		2/2
Vellayani		DR		DR												2/2
Dharwad						DR							DR			2/2
Total (DR & TC)/ Allotted	4/4	2/2	5/5	3/3	6/6	7/8	1/1	1/1	1/1	1/1	1/1	1/1	1/1	4/4	4/4	42/43

Abbreviations: DR = Data reported, TF = Trial failed, **Success index (%)** = 42/43 - **97.7 (%)**

APPENDIX-III: FORAGE CROP PROTECTION TRIALS AT A GLANCE (KHARIF-2018)

Locations /Trial	PPT-1	PPT-2	PPT-21	PPT-22	PPT-23	PPT-25	Total	Success index (%)
Bhubaneswar	DR	DR	DR				3/3	100 (%)
Jhansi	DR	DR					2/2	100 (%)
Palampur	DR	DR	DR	DR			4/4	100 (%)
Rahuri	DR	DR					2/2	100 (%)
Ludhiana	DR	DR		DR	DR	DR	5/5	100 (%)
Dharwad	DR	DNR					1/2	50 (%)
Total	**6/6**	**5/6**	**2/2**	**2/2**	**1/1**	**1/1**	**17/18**	**94.44 (%)**

DR=Data reported**, DNR-**Data not reported, **Data Reporting (%) =** 17/18**, 94.44 (%)**

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