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2015

Annual Report : Kharif -

AICRP on Forage Crops & Utilization





अखिल भारतीय समञ्वयित अन्नुसंधान परियोजना चारा फर्स्सले एवं उपयोगिता (भारतीय कृषि अनुसंधान परिषद) भा.कृ.ध.प.–भा.च.चा.अनु.सं झाँसी–284 008 (ड. प्र.)

ALL INDIA COORDINATED RESEARCH PROJECT ON FORAGE CROPS & UTILIZATION (Indian Council of Agricultural Research) ICAR-IGFRI Jhansi-284 003 (U.P.)

May, 2016





हर कदम, हर डगर किसानों का हमसफर भारतीय कृषि अनुसंधान परिषद

Agriesearch with a Buman touch

AICRP on Forage Crops and Utilization

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वार्षिक प्रतिवेदन ANNUAL REPORT



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(2015-16) Part-I: Kharif - 2015



अखिल भारतीय समन्वयित अनुसंधान परियोजना-चारा फसलें एवं उपयोगिता

(भारतीय कृषि अनुसंधान परिषद) भा.कृ.अ.प.-भा.च.चा.अनु.सं झाँसी-284 003 (उ. प्र.)

ALL INDIA COORDINATED RESEARCH PROJECT **ON FORAGE CROPS & UTILIZATION** (Indian Council of Agricultural Research)

ICAR-IGFRI Jhansi-284 003 (U.P.)

May, 2016

Foreword

India is the world's largest dairy producer, but in recent years milk prices have increased dramatically due to inflation in the cost of animal feed cost. Development and growth of livestock sector is limited by the availability of fodder. Various reports suggests that large gap exists between requirement and availability of feed and fodder in the country. The deficiency is more conspicuous in arid and semiarid regions. This deficit of fodder is the result of numerous inter dependent as well as exogenous factors. The small farm holdings, large variations in climatic, edaphic ad resource availability complexes the situation to extreme. In the current pursuit of urbanization, the probability of increasing area under fodder crops is like a delusion. Country is looking for a multi-pronged strategy for adequate availability of fodder in order to provide a buffer to the farmer even in times of climatic extremes. This strategy should interalia envisage supply of quality seeds, improving fodder productivity, extending fodder cultivation to suitable niches including seasonally fallow, fallow and unutilized lands as well as development and adoption of dual purpose varieties in season and offseason etc. Though, the researchers in this field are very few, their efforts as evident by development of more than 150 varieties and forage production and protection technologies are appreciable. The technologies developed have brought significant increase in productivity, production and availability of forage on temporal and spatial basis.

I sincerely appreciate the efforts of Project Coordinator and his team for guiding, formulating, monitoring and compiling the results of trials conducted at cooperating and voluntary centres in voluminous report. The staffs of AICRP on Forage Crops working at different centers including IGFRI are also thanked for their cooperation.

(PK Ghosh)

Director ICAR-IGFRI, Jhansi

PREFACE

It has now been established that the deficit in feed and fodder availability and poor genetic potential of livestock species are major constraint in improving the livestock productivity in the country. The government of India has been making the efforts to tackle the problem by creating the organization and platforms to develop, validate and transfer the technologies. In this chain, AICRP on Forage Crops, guide, formulate as well as monitor the execution of programme on forage resource development through its 22 cooperating as well as voluntary centres additionally.

The Annual Report (2015-16), Part I–*Kharif* 2015 embodies the research trial results in the areas of forage crop improvement, production and protection with the view to develop and test the technologies at multi-locations simultaneously, for quality herbage 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 Centres. The trials and activities were successfully conducted as per the technical programme fixed for Kharif 2015. 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. Weather data recorded at various testing centres has been provided in the report for linking to crop growth and performance *etc.* The status of breeder seed production as per the DAC indents and forage technology Demonstrations' are also compiled and reported.

Results have been presented in the form of chapters. The compiled results of forage crop improvement trials has been presented in Chapter-1, which includes multi-location test performance of newly developed genetic material of annual and perennial forage species. The findings on forage management studies are presented in Chapter-2 which includes: nutrient management for higher productivity, economizing the water requirement, improving the productivity, agronomy oand cultural practices, intercropping, productivity under trees /garden, fodder cropping systems, productivity in problem soils. Chapter 3 encompasses forage protection data which included surveillance, monitoring, evaluation of promising lines, management practices etc. Chapter 4 deals with breeder seed production scenario in the country. Next chapters deal with forage technology demonstrations and tribal sub-plan. The on-going breeding programme at centers and their contributions in the form of training, extension, education, publications are also given in appendices.

The contribution and sincere efforts made by forage researchers and their associates at the Centres deserve appreciation in achieving the objectives of this project. Their valuable contribution for overall outputs of AICRP on Forage Crops and Utilization is gratefully acknowledged.

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

I record my sincere thanks to Dr. Trilochan Mohapatra, Secretary DARE & DG, ICAR; Dr. S. Ayyappan, Ex Secretary DARE and Ex DG, ICAR; Dr. J. S. Sandhu, DDG (CS); Dr. I. S. Solanki, ADG (FFC); Dr. J. S. Chauhan, ADG (seed) for their active leadership, support, guidance and encouragement. Support received in various forms from Dr Dinesh Kumar, Principal Scientist (FFC), ICAR is also gratefully acknowledged. Each and every one in the team at AICRP on Forage Crops and Utilization gratefully acknowledges their support.

A. K Rov

Project Coordinator

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EXECUTIVE SUMMARY

The present report describes compiled and edited results of the various trials conducted at different locations/ centers in the country on crop improvement, crop production and crop production during Kharif 2015 as per approved technical programme. Breeder seed production data is also presented in the report. The outreach programme carried out during the season *viz.*, Forage Technology Demonstrations, Tribal sub-plan activities were also included in the report. In house breeding activities, other activities of coordinated centres were also appended to give complete picture of activities in form of human resource development, technology dissemination, publications, breeding material generated etc. Weather data of various centres during the crop growth period is also appended to correlate the production as most of the experiments were in rainfed condition. In the end, directory of scientists and managers involved in forage research is also appended for ready reference and ease of communication.

A. FORAGE CROP IMPROVEMENT

(a) ANNUAL FORAGES

FORAGE MAIZE

- **IVTM:** An initial varietal trial in forage maize comprising of six entries and two national checks *viz.*, African Tall and J-1006 was conducted at 22 locations in five zones. For green forage yield, entries ADVI 5788 (4%), AFM-5 (2%) and MFM-5 (1.9%) in Hill zone showed marginal superiority over the best check. In other zones as well as at all India level, the check varieties were superior. For dry matter yield, entries ADVI 5788 (3.4%), AFM-5 (0.4%) and MFM -5 (0.2%) in Hill zone, entries ADVI 5788 (1.1%), AFM-5 (0.5%) in North West zone, entry JHM 15-1 (9.6%) in Central zone were superior over the best check. For green forage production potential (q/ha/day), crude protein yield (q/ha) and crude protein content (%), national check African Tall was superior. For IVDMD (%) test entry JHM-15-1 (65.6%) was best performer.
- **AVTM-1:** An advanced varietal trial in forage maize comprising of five entries and two national checks *viz.*, African Tall and J-1006 was conducted at 12 locations in three zones viz., Hill, NW and NE zone. For GFY, entry PAC -746 (15%) in Hill zone and entry MFM-4 (5.5%) in NE were superior over the best check. At all India level, PAC -746 showed marginal superiority. For DMY, entry PAC 746 and entry AFM-4 were superior over the best check J 1006 by a margin of 11.2% and 2.9% respectively. Entry AFM -4 was superior by 10.6% in north west zone and by 2.3% at all India level. For CPY, entries PAC 746 and AFM-4 showed superiority giving 10.2 and 9.7 q/ha as against the best check 8.6 given by J 1006. For crude protein content (%), national check African Tall was best. For leafiness (L/S ratio), entry AFM-4 was best. For other quality parameters, entry AFM-4 was superior for ADF, NDF and DDM, where as entries MFM-6 and MFM-4 were superior for IVDMD.

FORAGE PEARL MILLET

IVTPM: An initial varietal trial in forage Pearl millet comprising of six entries along with two national checks *i.e.* Giant Bajra and Raj Bajra Chari-2 and two zonal checks was conducted at 19 centres located in four zones *viz.*, North-West, North-East, Central and South zone. For GFY, entry TSFB-10-5 (7.4%) in NE zone was superior over the best check Giant Bajra. At national level and in other zones, none of entry performed better than the checks. For DMY, entries TSFB-13-12 (5.6%) and entry TSFB -10-5 (11.1%) were superior over the best checks in NW and NE zones respectively. At all India level, entry TSFB-14-10 was superior by a margin of 6.6% over the best check Giant Bajra. For green forage production potential (q/ha/day), national check Giant Bajra was best performer, whereas for dry matter yield potential (q/ha/day), entry TSFB-14-10 was best followed by Giant Bajra. For leaf stem ratio, entry RBB-6 was best followed by TSFB-14-10. In quality parameters, for CPY, entry TSFB-14-10 ranked first

L

(10.0q/ha) followed by Giant Bajra (9.4 q/ha). For crude protein content, entries RBB-6 and RBB-7 ranked joint first with 9.1% CP. It was followed by TSFB-14-10 (8.8%). For IVDMD (%) and DDM (q/ha), national check Giant Bajra was superior.

AVTPM-2: Single entry namely DFMH-30 along with three national checks was evaluated at seven locations in NW and south zone. National check Giant Bajra excelled in performance for GFY, CPY, green and dry fodder production potential (q/ha/day). For DMY, entry DFMH -30 showed marginal superiority over the best check. For crude protein content (%), check Raj Bajra Chari -2 (9.5%) ranked first. For IVDMD% entry DFMH -30 and Raj Bajra chari-2 ranked joint first.

AVTPM-2 (SEED): Single entry *i.e.* DFMH-30 along with three national checks *i.e.* Giant Bajra, RBC-2 and AVKB-19 was evaluated at six locations. National checks were superior in both zones as well as at all India level.

FORAGE COWPEA

IVTC: Six entries along with two national checks and five zonal checks were evaluated at 27 locations across the five zones. For GFY, entry TSFC-12-15 in north east, central and south zones exhibited superiority over best national/ zonal check. At national level entry TSFC-12-15 (7.5%) and entry MFC 09-3 (1.2%) were superior over best check. For DMY, entries UPC 1501 and Vellyani -1 showed superiority in north west zone by a margin of 8.3% and 7.3% respectively. In north east and central zone, entry TSFC-12-15 exhibited superiority by a margin of 5.3% and 6.3% respectively. For green and dry fodder production potential (q/ha/day), entry TSFC-12-15 ranked first followed by national check Bundel Lobia-1. For CPY, entries TSFC-12-15 and MFC-09-13 ranked first and second respectively. For leafiness, entry UPC 1501 ranked first. For crude protein content (%), entries MFC-09-3, MFC -09-13 and MFC -09-4 ranked joint first with average CP % of 15.7. For other quality parameters, entry MFC -09-13 for ADF (%), entry TSFC-12-15 for NDF%, entry MFC 09-3 for IVDMD % and national check Bundle Lobia -1 for DMD q/ha ranked first.

AVTC-2: Single entry namely TNFC-0926 along with two national checks and one zonal check was tested at 05 locations in NE zone. For GFY, zonal check ranked first followed by test entry TNFC-0926. For DMY, entry TNFC-0926 ranked first with 8.7 per cent superiority over the best check. For fodder production potential (q/ha/day), zonal check UPC 622 maintained superiority both for green forage and dry matter production potential. For crude protein yield, test entry TNFC 0926 ranked first with marginal superiority over the best check. For leafiness, test entry TNFC 0926 was superior.

AVTC-2 (SEED): Single entry namely TNFC-0926 along with two national checks and one zonal check was tested at 05 locations in NE zone. National check Bundel Lobia -1 ranked first.

FORAGE RICE BEAN

IVT: Seven entries along with three national checks were evaluated at 9 locations across the country. For GFY and DMY, entry JRBJ-07-1 ranked first with 7.9% and 9.5% superiority over the best check respectively. National check showed superiority both for green and dry matter production potential. For CPY, entry JOR 15-1 and JOR 15-5 ranked first with 8.4 q/ha as against the best check Bidhan -2 (7.6 q/ha). For crude protein per cent, entry JOR 15-1 performed best (13.4%).

Bajra Napier Hybrid (Perennial)

VTBN - 2013 (3rd Year): Evaluation of eleven entries, established during *Kharif*-2013 at 14 locations revealed that for GFY, entry VTBN-2013-8 in NW zone (1381.2 q), VTBN-2013-1 in NE zone (753.7 q), VTBN-2013-4 in Central zone (2379.2 q), VTBN-2013-7 in South zone (1191 q) and VTBN-2013-4 at all India level ranked first. For DMY, entry VTBN-2013-8 (316.6 q) in NW zone, VTBN-2013-1 in NE zone (181.3 q), VTBN-2013-4 (506.7 q) in Central zone, VTBN-2013-1 (214.1 q) in South zone and VTBN-2013-4 at all India level were ranked first.

For CPY, entry VTBN-2013-4 (31.7 q/ha) and for crude protein content, entry VTBN-2013-4 (8.9%) ranked first. Entry VTBN-2013-10 for plant height and VTBN-2013-11 for leafiness was adjudged best performer. For other quality parameters, entry VTBN-2013-4 for ADF (%), NDF (%), and IVDMD (%) was adjudged best performer. (The trial will continue in coded form).

Dichanthium annulatum (Perennial)

VT *Dichanthium*–2013 (3rd Year): Evaluation of eight entries established in *Kharif*-2013 at eight locations, revealed that GFY, entry VTD-3 (407.0 q/ha) ranked first followed by entry VTD -7 (400.3 q/ha). For DMY, entry VTD-7 ranked first with yield of 108.1 q/ha followed by VTD-3 (105 q/ha). For fodder production potential, entry VTD-8 for green forage and dry matter production potential ranked first. Entry VTD-7 and VTD -8 were best for CPY and entry VTD-1 for crude protein content (%). For plant height (cm) and leafiness, entry VTD-3 was best performers. For other quality parameters, entry VTD-4 for ADF (%), NDF (%) and IVDMD (%) ranked first. (The trial will continue in coded form)

Cenchrus ciliaris (Perennial)

VTCC-2013 (3rd Year): Results obtained from seven locations of nine entries established in *Kharif*-2013 revealed that for GFY, test entry VTCC-9 in NW zone, VTCC-4 in South, Central zone as well as at all India level ranked first. For DMY, entry VTCC-9 in northwest, central zone and all India level and entry VTCC -4 for south zone ranked first. For CPY, entry VTCC-9 ranked first, whereas for crude protein percent entry VTCC-1 and VTCC-7 were jointly ranked first with 7.0% crude protein. For plant height, entry VTCC-9 (97.5 cm) and for leafiness, entry VTCC-4 (1.14) ranked first. For NDF (%), ADF (%), and IVDMD (%) entry VTCC-7 ranked first. (The trial will continue in coded form)

Clitoria ternatea (Perennial)

VT *Clitoria*-2013 (3rd Year):, Seven entries established In *Kharif*-2013 at 08 centers in NW and Central zone were evaluated. For GFY and DMY, entry VTCT-1 was superior in both the zones and at national level. For fodder production potential (q/ha/day), entry VTCT-3 for green forage as well as for dry matter production potential ranked first. For crude protein yield (q/ha), entry VTCT-3 ranked first with 6.2 q/ha followed by VTCT-5 (5.7 q/ha). For crude protein content (%), VTCT-3 and VTCT-4 ranked first showing marginal superiority over other entries. For growth parameters, entry VTCT-5 for plant height (cm) and VTCT-1 and VTCT-7 for leafiness were adjudged best performer. For other quality parameters like NDF (%), ADF (%), IVDMD (%) entry VTCT-4 was superior. (The trial will continue in coded form)

Five new perennial trials in Setaria anceps, Pennisetum hybrid (P. gluacum x P. squamulatum), Cenchrus ciliaris, Cenchrus setigerus, Bajra Napier Hybrid were established in 2015. The year being establishment year, the data will be reported from next year

B. FORAGE CROP PRODUCTION

The programme on forage crop production was conducted at 20 locations. In total 12 experiments were conducted, out of which 6 in network (4 coordinated and two AVT based) and 6 in location specific mode with the aim to generate region specific forage production technologies. Research aspect consisted of nutrient management for higher productivity of perennial grasses under low land conditions, use of straw mulch to economize the water requirement and improve the productivity of BN Hybrid, response of Congo-signal grass to planting geometry and N levels, optimum seed rate and sowing methods for multicut sorghum and pearl millet mixture, enhancing the productivity of forage crops in coconut gardens through nutrient management, phosphorus management in sorghum-wheat-summer fodders cropping system, nitrogen management of perennial grasses under tree shade, compatibility of *Stylosanthes hamata* with Sewan and Dhaman Grasses in arid conditions, integrated nutrient management in fodder Rice bean, screening of genotypes of fodder bajra under sodic soil. Besides above, promising entries of pearl millet and cowpea were also evaluated for their responsiveness to nitrogen and phosphorus, respectively.

PS-12-AST-1: Effect of nutrient management on productivity of perennial grasses under low land condition: A field experiment was conducted at Bhubaneswar, Jorhat, Jabalpur and Kalyani to evaluate the performance of lowland grasses in relation to crop establishment, forage productivity and nutrient management. The treatments consisted of three grasses and four nutrient management practices. At Jorhat, significantly higher green fodder and dry matter yield was observed with Karanga dol. At Bhubaneswar, Jabalpur and Kalyani, para grass produced significantly higher GFY, DMY, and net returns. Highest GFY of low land grasses was obtained with application of 50 % NPK (inorganic fertilizers) + FYM 5t/ha.

PS-14-AST-1: Effect of straw mulch on the water requirement, weeds and productivity of BN Hybrid: A field experiment was conducted at Ludhiana, Bikaner and Raipur to evaluate the performance of B N Hybrid (PBN- 233) under three moisture regimes and four straw mulch quantities. Maximum mean green and dry matter yield was recorded with 1.2 IW/CP ratio. Applications of mulch @ 7.5 t/ha proved significantly superior in GFY, DMY, CP content and economics.

PS-14-AST-3: Response of Congo-signal grass (*Brachiaria ruziziensis* cv. DBRS 1) to planting geometry and N levels: A field experiment was carried out at Dharwad to evaluate the performance of Congo-signal grass (*Brachiaria ruziziensis* cv. DBRS 1) under different planting geometry and N levels. Under rainfed conditions 3 cuts were taken whereas under irrigated conditions 5 cuts were taken. Planting geometry at 60 cm x 60 cm recorded higher plant height, tillers/clump, green fodder /clump at each cut as well as higher GFY and DFY. Significant improvement in GFY and DFY was recorded only upto 20 kg N/ha as basal and after each cut. The grass production recorded under irrigated conditions was 523.1 q green and 109.84 q dry matter/ha.

K-15-AST-13 C: Performance of multicut sorghum and pearl millet mixture at various seed rates under different methods of sowing: A field experiment was executed during *kharif* 2015 at Ludhiana and Palampur to find out suitable methods of sowing mixture of sorghum and pearl millet with optimum seed rate. The treatments consisted of five seed rate/ratio of Sorghum: pearl millet and two sowing methods. Three cuts were obtained at Palampur and two cuts at Ludhiana. Seed rate/ratio of Sorghum: Pearl millet @ 50:50 or 25:75 seed rate/ratio of Sorghum: Pearl millet recorded higher green and dry matter yields. Line sowing proved superior.

PS-12-AST-3: Enhancing the production potential of various forage crops in coconut gardens through nutrient management: The experiment was conducted during 2012-2015 at Mandya center to assess the performance of different crops and nutrient levels on productivity, quality and economics of forage crops in coconut garden. The treatment consisted of three crops and three levels of NPK. Pooled data of three years experimentation revealed that BN hybrid recorded significantly highest GFY, DMY, net monetary returns and benefit cost ratio. The application of 150% RDF to recorded highest GFY, DMY, net monetary returns and benefit cost ratio.

CS-13-AST-4: Residual effect of P applied to wheat on the succeeding summer fodders in sorghum-wheat-summer fodders cropping system: The experiment was initiated during *Kharif* 2013 at PAU, Ludhiana with a view to identify suitable summer fodder crop in sorghum-wheat-summer fodder cropping system and to study the residual effect of P applied to wheat on succeeding summer fodder crops. The treatments consisted of three summer fodders and five levels of P applied to summer fodder. Summer fodders crop of maize gave significantly higher green and dry matter yield. Maize responded upto 50% of recommended dose of fertilizer whereas bajra up to 25% of recommended dose of fertilizer. After harvesting of summer fodders, sorghum fodder was sown. The green fodder yield, gross returns, net returns and benefit cost ratio was significantly higher in wheat-cowpeasorghum cropping system.

K-14-AST-13: Effect of levels of nitrogen on productivity of perennial grasses with and without tree shade: The experiment was conducted during *kharif* 2012-2015 at Jorhat to study the productivity of perennial grasses (Setaria and Congo-signal grass) as influenced by tree shade and nitrogen levels. Pooled analysis indicated that the GFY and DMY under open condition were higher over tree shade. Congo-signal and Setaria grass remained at par in green forage productivity. Congo signal grass recorded higher dry matter yield. The highest GFY and DMY were recorded with the application of 125% RDNF. Open condition recorded 51% higher net return than shade condition.

K-15-AST-8C: Compatibility of Stylosanthes hamata with Sewan (Lasiurus sindicus) and Dhaman Grass (Cenchrus setigerus) in arid conditions: This was first year of experiment at Bikaner. The treatments included eight combinations of Sewan, Dhaman grasses and Stylosanthes. Results indicated that sole Sewan grass recorded the highest plant height, number of tillers/clump; shoot weight, root weight and dry matter yield. But maximum green fodder yield was obtained with intercropping of Sewan, Dhaman & Stylosanthes (1:1:1) row arrangement.

K-15 AST-2: Screening of genotypes of fodder bajra under sodic soil: The field experiment was conducted at Faizabad centre to screen the fodder pearl millet entries for their performance under sodic condition. The treatments comprised of total eight genotypes including two checks. NDFB-939 proved superior in all parameters *viz.*, plant height, leaf stem ratio, green, dry and crude protein yields as well as crude protein content. The entry also recorded maximum per day productivity.

K-15-AST-3 L Studies on integrated nutrient management in fodder Rice bean: The experiment was initiated in kharif-2015 at Imphal with a view to study the effect of combined application of organic manure and inorganic fertilizers on forage yield and economics of fodder rice bean. The data revealed that application of 50% RDF for phosphorus + 2 t poultry manure/ha recorded highest green fodder yield, dry matter yield, crude protein content and crude protein yield.

AVTPM-2: Effect of nitrogen levels on promising entries of pearl millet (AVTPM-2): Advanced varietal trial on pearl millet was conducted with 4 entries (3 national checks and one entry DFMH-30) and 4 levels of nitrogen (0, 30, 60 and 90 Kg N/ha) at Ludhiana, Hisar, Bikaner in North West Zone and Coimbatore, Hyderabad, Mandya in South Zone to find out the response of promising entries of pearl millet to supplementation of graded doses of nitrogen. In the NWZ, entry DFMH-30 recorded highest GFY. In south zone national check Giant bajra proved superior in both GFY and DMY. On overall mean basis across the zones, Giant Bajra yielded maximum GFY and DMY followed by DFMH-30.

AVTC-2: Effect of phosphorus levels on promising entries of cowpea (AVTC-2): A field trial was conducted at Faizabad, Kalyani Jorhat, Bhubaneswar and Ranchi in North East zone to study the effect of phosphorus levels on the performance of AVTC-2 entries of cowpea in NE zone, with four entries (including three national checks) and three levels of phosphorus. The results indicated that the entry TNFC-0926 out yielded the checks. It recorded higher GFY, DMY and CPY.

C. FORAGE CROP PROTECTION

Forage crop protection trials were conducted during Kharif 2015 on three major aspects *viz.*, occurrence of insect-pest, diseases and nematodes; evaluation of improved breeding lines/ entries; devising suitable methodologies for pest management. One experiment was also conducted to validate the treatment recommended in large plot size. A total of six trials were conducted at different locations *viz.*, Ludhiana, Dharwad, Palampur, Rahuri, Hyderabad.

PPT 1: Monitoring of diseases and insect pests in *Kharif* **forage crops ecosystem:** Four cultivated Kharif forage crops *viz.* Sorghum, Bajra, Maize and cowpea were screened under field conditions to observe the occurrence and incidences of major diseases, insect-pests at five locations viz., Hyderabad, Dharwad, Palampur, Rahuri and Ludhiana.

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Palampur: During *kharif* 2015, wilt/root rot (55%), Leaf spot (40%) and blights (12%) of cowpea, blight of maize (20%), zonate leaf spot of sorghum (50% and *Helminthosporium* blight of Bajra (15%) & sorghum (20%) were observed as the major diseases. In cowpea, wilt incidences reached peak in third week of July, leaf spot, anthracnose and blight continued up to mid August. In maize, diseases like blight, stem borer, leaf and sheath banded blight showed maximum intensity in last week of August. In Sorghum, leaf blight and zonate leaf spot appeared in last week of July and reached at peak in last week of August and declined thereafter.

Rahuri: Very meager incidence/infestation of insect-pests and diseases were noticed throughout the kharif 2015 forage crop period. The incidence of stem borer was negligible on maize (< 5%). In cowpea, low level of infestation of aphids per plant (range-1.67 to 4.00/plant) was noticed. Similarly, jassids population was also observed at low level (range-2.0 to 3.00/leaf). The population of coccinellids was ranged 0.0 to 0.33 /plant on cowpea during the infestation of aphids. The symptom of yellow mosaic virus was found low throughout the crop period. In pearl millet insect-pests and diseases were not observed throughout the crop period.

Hyderabad: Incidence of aphids on forage cowpea variety APFC -10-1 started from 29th std week and highest frequency was observed during 31st std week (98 aphids per 10 plants). It decreased gradually afterwards, decreasing to 14 aphids per 10 plants in 33rd week. Afterwards incidence was negligible. At Hyderabad, negligible incidence of stem borer was observed on Maize var. African Tall.

Dharwad: Seasonal incidence of insect pest indicated that aphid *Aphis craccivora* population started in 30th week and was highest (465/plant) during 33rd Indian Standard week *i.e.* during 3rd week of August. It started declining and during 36th week no incidence was observed. Hairy caterpillar *Spilosoma obliqua* ranged from 0.4 to 8.2 during 3rd week of July to first week of August, reaching peak at 30th week and declining afterwards. Cowpea yellow mosaic was highest to the tune of 25% during second week of August and declined gradually. No incidence was recorded during and after 35th week.

Ludhiana:

Leaf blast of Pearl millet: leaf spots (blast) of pearl millet on variety FBC 16 started appearing in second fortnight of August 2015. Disease progressed till third week of October with favourable temperature range of 26.7 -30.1°c and RH of 66-79 percent. Due to absence of showers and lowering of the temperatures, the disease development became static with maximum disease severity of 29.1 percent. Downy mildew of Pearl millet: The incidence of Downy mildew was less on the recommended cultivars and varied from traces to 2.0 percent. On the susceptible check, 7042, the incidence was 68.0 per cent.

Cercospora leaf spot of Sorghum: Cercospora leaf spot of sorghum appeared on SL44 variety in the first fortnight of August, 2015 in the crop sown during first week of June, 2015. Disease progressed slowly till first week of September and then progressed at alarming rate up to first week of October, 2015 with 54.9 percent disease severity. During this period, 65.6 to 87 mm rainfall and moderate temperatures of 29.9°C with mean RH of 64-79 percent witnessed in last week of August and September favoured the disease development. The disease further progressed at a steady pace till last week of October with percent severity of 58.6. **Anthracnose of Sorghum:** Anthracnose of sorghum on SL44 variety was observed in the last week of August, 2015. Disease progressed slowly till first week of September and further progressed at rapid rate upto first week of October, 2015. Maximum disease severity of anthracnose (45.2 %) was recorded during second week of October, 2015. During this period, 65.6 mm of rainfall with moderate temperatures and mean RH of 26.8 to 30.1°C and 66-76 percent respectively favoured the disease development. With the maturity of crop (non-availability of green areas) and decrease in temperatures and RH, the disease development slowed down. **Zonate leaf spot on Sorghum:** The occurrence of zonate leaf spot on SL 44 variety of sorghum was very less i.e. 8.6 per cent and more over it appeared late in the season.

Leaf blight of Maize: Disease appeared in the third week of August, 2015 on J 1006 variety and progressed slowly upto first week of September with 87 mm rainfall during second fortnight of August and no rainfall upto last week of September. Thereafter disease showed rapid increase upto first week of October with percent severity of 42.6 (mean RH ranging from 70-79% and mean temperature between 26.8 to 30.1°C. Thereafter, as the crop reached physiological maturity and the disease development slowed down and progressed at a steady pace with maximum severity of 42.6 percent.

PPT-2: Evaluation of kharif breeding materials for their reaction to insect-pests and diseases

Maize

IVT Maize: At Rahuri, all the entries of IVT maize were found less susceptible to stem borer as these entries showed less than 3 mean leaf injury score. At Ludhiana, entries ADVI 5788, JHM 15-1 and check J 1006 were found to be moderately susceptible, whereas other entries were moderately resistant. At Palampur, entry AFM-4 was found to be susceptible to leaf blight; entries MFM-5, ADVI 5788, JHM -2, African Tall were found to be moderately susceptible, other entries were moderately resistant. **AVT-1-** At Ludhiana, all the entries were found to be moderately susceptible for maydis leaf blight. At Palampur, African Tall, MFM-4, AFM-4 showed moderately resistant reaction whereas other entries were moderately susceptible.

Pearl millet

IVT: At Rahuri, Maximum rust incidence was observed on TSFB-13-12, which was susceptible, all other entries were found resistant. **AVT-2** At Ludhiana, all the entries were resistant to Pyricularia leaf spot with minimum incidence observed in the test entry DFMH -30. There was no incidence of downy mildew and ergot. **AVT-2 (Seed)** At Ludhiana, In seed trial also, the minimum incidence was observed in entry DFMH-30.

Cowpea

IVTC Palampur: At Palampur all the entries showed susceptible to highly susceptible reaction for leaf disease, root rot/ wilt/ collar rot.

IVTC Hyderabad: At Hyderabad, (DOS: 2-7-15), all the cowpea entries recorded 28.1 to 35.3 number of aphids per sq.cm leaf. The infestation in all the entries are above the ETL(15/twig) hence categorised as susceptible. Aphids were controlled by spraying of Dimethoate @ 2ml/l. Yellow mosaic virus infestation ranged between 0.33 to 2.33. The entries UPC-5286(NC), UPC-1501, Vellyani-1 are resistant while others are moderately resistant.

IVTC Ludhiana: At Ludhiana, all the entries show near similar response to root rot/damping off and mosaic incidence.

IVTC Rahuri: Aphids: All the entries showed significant differences in survival population of aphids/plant. However, UPC 9202 (zonal check) showed 2.89 aphids/plant, which was significantly lower than the other entries except MFC -09-4 (3.11), Vellyani -1 (3.78), TSFC-12-15 (4.22) and MFC-09-13 (4.55). These entries were found at par with each other. The highest population of aphid was recorded in UPC 5286 (27.33 aphids/plant). **Jassids:** Among the 9 entries, entry Bundel Lobia -1 (NC) recorded significantly lesser (1.89 jassids/leaf) number of nymphs of jassids/leaf. However, it was at par with MFC -09-4 (2.00), Vellyani-1 (2.45), UPC -9202 (ZC CZ) (2.56), MFC-09-3 (3.00) and MFC-09-13 (3.11). The highest population of jassid was recorded in UPC-1501 (4.56 jassids/leaf). **Yellow Mosaic Virus:** All the entries were found resistant to yellow mosaic virus except UPC-1501 it was susceptible to YMV. Resistant entries showed less than 2 score whereas, UPC-1501 was found susceptible to YMV as it recorded 4.0 score rating of YMV. It can be inferred that for aphids, UPC-5286 (NC) was highly susceptible to aphids (35.33 aphids/plant), whereas UPC-1501 was susceptible to aphids jassids and yellow mosaic virus.

Napier bajra hybrid – **VTBN** – **Ludhiana-** No incidence of root rot and Pyricularia leaf spot was observed in any entry at Ludhiana. The entries are in coded form and will be decoded after completion of trial.

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Evaluation of cowpea breeding materials for insect-pest at Dharwad: Out of 8 parents, one (UPC-622) exhibited susceptible reaction to hairy caterpillar at 90 days after sowing, while remaining showed moderately resistant reaction. Among crosses, four expressed susceptible reaction to hairy caterpillar, while remaining showed moderately resistant reaction (Table, 2). All the parents exhibited resistant reaction to cowpea yellow mosaic virus at 90 days after sowing. Among twenty eight crosses, five expressed resistant reaction, while other twenty three exhibited moderately resistant reaction to cowpea yellow mosaic virus at 90 days after sowing.

PPT 15: Integrated management of root rot and foliar diseases of forage cowpea: The experiment was conducted at Palampur and Ludhiana to evaluate the losses due to root rot and foliar diseases of cowpea by three treatment sets and their combinations. Date of sowing, seed treatment by bio-control agents and foliar spray of fungicides were applied in different combinations to work out the effective integrated management of various diseases in forage cowpea.

Ludhiana: Cowpea mosaic incidence (%): At Ludhiana, with respect to incidence of mosaic, disease was quiet less in plots where seed was treated with tebuconazole 2DS @ 1g/kg seed + NSKP(50 g/kg seed) followed by foliar spray of propiconazole @ 1ml/l at 15 days interval followed by seed treatment with metalaxyl 8% + Mancozeb 64% @ 2.5g/kg seed + NSKP(50 g/kg seed) followed by foliar spray of propiconazole @ 1ml/l at 15 days interval and Seed treatment with *Trichoderma viride* + *Paecilomyces lilacinus* @ 5 g/kg seed each followed by foliar sprays of propiconazole @ 1ml/l at 15 days interval respectively as compared to check. First date of sowing (02/07/2015) showed higher disease incidence as compared to other two dates of sowing (15/07/2015 & 30/07/2015).

At Ludhiana, the green fodder yield was maximum in plots where seed was treated with tebuconazole 2DS @ 1g/kg seed + NSKP(50 g/kg seed) followed by foliar spray of propiconazole @ 1ml/l at 15 days interval followed by seed treatment with metalaxyl 8% + Mancozeb 64% @ 2.5g/kg seed + NSKP(50 g/kg seed) followed by foliar spray of propiconazole @ 1ml/l at 15 days interval and Seed treatment with *Trichoderma viride* + *Paecilomyces lilacinus* @ 5 g/kg seed each followed by foliar sprays of propiconazole @ 1ml/l at 15 days interval respectively as compared to untreated plot. Besides high incidence of mosaic, the green fodder yield was maximum on first date of sowing (02/07/2015) followed by crop sown on 15/07/2015 & 30/07/2015 respectively. There was no incidence of root rot in cowpea.

Palampur: In untreated crop, root rot incidence increase with the delay in sowing of the crop. Minimum incidence (10.1%) was observed in early sown crop & maximum (40.0%) in late sown crop. However, the disease severity of Anthracnose was maximum (32.2%) on 19th June sown crop & minimum (15.1%) in crop sown on 4th July. In case of leaf blight the severity was maximum (27.2%) in the normal sowing date (19 June) & minimum (14.2%) in late sown crop. The nematode population also increases with the delay in sowing.

For the management of diseases & nematode seed treatment with fungicides (tebuconozole 2DS or metalaxyl + mancozeb) and NSKP followed by foliar spray with propiconazole were found effective. Both the treatments i.e. seed treatment with tebuconozole + NSKP followed by sprays of propiconazole (T_3) and seed treatment with metalaxyl + mancozeb + NSKP followed by sprays of propiconazole (T_4) were found very effective & gave maximum control of root rot, anthracnose, leaf blights and nematode in all the three dates of sowing with maximizing the GFY Data in table PPT 15a revealed that the appearance of the root rot and leaf blight was delayed with the delay in sowing. The incidence of root rot was maximum (37.3%) where as disease severity of anthracnose (15.1%) and leaf blight (14.9%) was minimum in the late sown crop. The GFY yield was maximum in normal sown crop being followed by early and late sown crop.

PPT 17: Biological management of defoliators on cowpea: The trial was conducted at Dharwad and Rahuri center to evaluate the efficacy of biopesticides in management of defoliators on cowpea.

Dharwad: All the biological control agents except *Pseudomonas fluorescence* @5 g(cfu 10⁶)/lt proved superior over untreated check in managing defoliator. Among the biological agents tested against defoliator *Spilosoma obliqua*, three treatments *viz., Beauveria basiana* @ 5 g (cfu 10⁶) /lt (T₁), NSE 5% (T₃) and *Nomurae relyi* @ 5 g (cfu 10⁶)/lt (T₂) were at par with each other and they were superior over *Pseudomonas fluorescence* @5 g (cfu 10⁶)/lt (T₄). Similar trend was reflected in obtaining green forage yield dry matter yield.

At MPKV, Rahuri, during the kharif-15, Sowing of Variety Sweta was done on 17/07/2015 as per technical programme. However, infestation of defoliators was not observed on cowpea throughout the crop period hence the spray treatments were not been given to the crop. Therefore, the data of the trial is not included.

PPT 18 : Validation of management of foliar diseases of forage sorghum: The experiment was conducted at Palampur, Ludhiana to validate the management technology for the diseases of sorghum particularly Zonate spot. The highly effective treatment i.e. seed treatment with carbendazim @ 2 g/kg seed + Two foliar sprays of propiconazole @ 0.1per cent was evaluated at large plot.

Palampur: It was observed that the treatment provided 83.9 per cent control of zonate leaf spot (13.2 % disease severity) over check (81.8 % disease severity) with 22.5 per cent increase in green fodder yield (299q/ha) as compared to control (244q/ha).

Ludhiana: Seed treatment with carbendazim @ 2g/kg seed + two foliar sprays of propiconazole @ 0.1% helped in the management of the disease with total leaf spot severity of 55.13 per cent as compared to check with percent severity of 97.88 percent. This treatment also showed increased green fodder and dry matter yield as compared to the check.

PPT 19. Efficacy of different bio pesticides against aphids on forage cowpea: At Hyderabad, Six bioagents and two neem formulations were tested against aphids on cowpea. Experiment comprised of 9 treatments replicated thrice in RBD. Vijaya (APFC 10-1) variety released from PJTSAU was grown in plots of 3x4m size on 4.7.2015. Spraying was done on 5.8.2015. Neem seed extract 5% proved to be the best among all the treatments tested with 79.38% reduction over control in cowpea aphid population during kharif 2015. It was followed by *B. bassiana* @ 10⁸ cfu/g (7.5g/l). Number of aphids per sq.cm leaf at 5 days after neem seed extract spray was 4.6. Number of coccinellids was not affected due to biopesticide spray. Significantly higher green fodder yield (108.3q/ha) was obtained in Neem sprayed plot as against control plot (70.83 q/ha). This is the first season of experiment and the trial will be repeated kharif 2016.

D. BREEDER SEED PRODUCTION

Forage Crops Breeder Seed Production in Kharif-2015 [indent year kharif 2016]: In Kharif-2015, the total indent for breeder seed production was 77.84q as received from DAC, GOI for 7 varieties of three forage crops, which was allocated to seven SAUs/ICAR/NGO institutes. Among the quantity allocated for different forage crops, the maximum was for Maize (75.79 q) followed by Cowpea (1.95 q), and minimum was for Pearl millet (0.10 q).

The overall breeder seed production was higher in comparison to allocated quantity. In Maize, the production was 82.85 q (7.06 q surplus) and in Pearl millet, 4.40q (4.30 q surplus), in cowpea, 3.25 q (1.30 q surplus). The overall breeder seed production was 90.50 q against the allocation of 77.84 q, which was 12.66 q surplus or 16.26 per cent higher than the quantity allocated.

In addition, CSK HPKV, Palampur and PAU, Ludhiana have additional non lifted seed of Forage maize variety African tall (3.95 q) and J 1006 (14.4 q) respectively. In pearl millet PAU Ludhiana has produced 1.5 q Breeder seed of FBC 14 as per indent.

FODDER TECHNOLOGY DEMONSTRATIONS

A total of 935 FTDs were allocated to different centers to be conducted during Kharif 2015. It included 290 FTDs in Bajra Napier hybrid, 225 in fodder maize, 145 in fodder Bajra, 35 in rice bean, 40 in Setaria, 70 in fodder cowpea, 55 in intercropping. No extra financial support was provided due to paucity of funds. However, most of the centers conducted FTDs out of their own resources.

TRIBAL SUB-PLAN ACTIVITIES

Tribal sub-plan activities were conducted by 09 centres in eight states. Various activities included training of farmers, awareness and sensitization about forage crops; demonstration of improved cultivars and package of practice; distribution of literature, providing inputs like improved seed, fertilizers, minor farm tools, livestock component etc.

OTHER RELEVANT ACTIVITIES

Scientists in the centre also carried out activities related to human resource development like teaching courses in graduate and post graduate levels, guiding M Sc and Ph D students; training of stakeholders in the field of fodder and livestock; production and distribution of breeder, foundation and certified/ TFL seeds; disseminating technologies in form of radio, TV talks, popular articles, extension publications; presenting findings in research journals, seminar/symposia etc.

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

		Coordina	ted Centers	Testing Locations						
Zone	S. N.	Location	Establishment Year	State	S. N.	Location	State/Union Territory			
I. Hill	1.	Palampur,	1970	Himachal	1.	Almora, VPKAS*	Uttarakhand			
States = 3		CSKHPKV		Pradesh						
Locations = 3	2.	Srinagar, SKUAS&T-K	2010	Jammu & Kashmir						
II. North West	3.	Ludhiana, PAU	1989	Punjab	2.	Meerut, SVBPUA&T	Uttar Pradesh			
States = 5	4.	Hisar, CCS HAU	1970	Haryana	3.	Avikanagar, IGFRI-RRS*	Rajasthan			
Locations = 13	5.	Pantnagar, GBPUAT	1995	Uttarakhand	4.	Jodhpur, CAZRI-RRS*	Rajasthan			
	6.	Bikaner, SKRAU	1995	Rajasthan	5.	Jalore, AU-ARS, Jodhpur	Rajasthan			
					6.	Udaipur, MPUAT	Rajasthan			
					7.	Pali-Marwar, CAZRI-RRS*	Rajasthan			
					8.	Jaisalmer, CAZRI-RRS*	Rajasthan			
					9.	Fatehpur Shekhawati/ARS Sikar	Rajasthan			
					10.	Bawal, CCSHAU	Haryana			
III. North East States = 8	7.	Faizabad, NDUAT	1982	Uttar Pradesh	11.	Umiam (Barapani), ICAR Res. Complex for NEH Region*	Meghalaya			
Locations = 9	8.	Ranchi, BAU	1970	Jharkhand	12.	Visva Bharti, Shantiniketan Sriniketan	West Bengal			
	9.	Kalyani, BCKV	1972	West Bengal						
	10.	Bhubaneswar,OUAT	1987	Orissa						
	11.	Jorhat, AAU	1970	Assam						
	12.	Imphal, CAU	2010	Manipur						
	13.	Pusa, RAU	2015 (Approved)	Bihar						

		Coordi	nated Centers			Testing Locations		
Zone	S. N.	Location	Establishment Year	State	S. N.	Location	State/Union Territory	
IV. Central	14.	Anand, AAU	1970	Gujarat	13.	Kanpur, CSAU&T	Uttar Pradesh	
States = 6	15.	Jabalpur, JNKVV	1970	Madhya Pradesh	14.	Jhansi, IGFRI*	Uttar Pradesh	
Locations = 10	16.	Rahuri, MPKV	1971	Maharashtra	15.	Dhari,JAU	Gujarat	
	17.	Urulikanchan, BAIF	ulikanchan, BAIF 1982		16.	Akola, PDKVV	Maharashtra	
	18.	Raipur, IGKV	2010	Chhattisgarh	17.	Dapoli & Palghar, DBSKKV	Maharashtra	
V. South	19.	Mandya, UAS (B)	1986	Karnataka	18.	Dharwad, IGFRI-RRS*	Karnataka	
States = 6 Locations = 7	20.	Coimbatore, TNAU	1976	Tamil Nadu	19.	Pudducherry, PJLNCA & RI, Karaikal	Pudducherry	
	21.	Vellayani, KAU	1971	Kerala	20.	Hyderabad , ANGRAU	Andhra Pradesh	
	22.	Hyderabad, PJTSAU	1970	Telangana	21.	Raichur, UAS, Raichur	Karnataka	

Summary: Zone = 5, States = 24, Coordinating Centres = 22, Testing Locations = 21

*ICAR Institute

AICRP on Forage Crops & Utilization Coding of varieties for Kharif-2015

S. N.	Contributor	Designation	Code									
1. IVTM	: Initial Varietal Trial in Forage	Maize (New)										
1	Mandya	MFM-5	IVTM-4									
2	Mandya	MFM-8	IVTM-1									
3	Anand	AFM-5	IVTM-3									
4	IGFRI	JHM-15-1	IVTM-7									
5	IGFRI	JHM-2	IVTM-8									
6	Advanta	ADVI 5788	IVTM-6									
7	NC	African Tall	IVTM-5									
8	NC	J-1006	IVTM-2									
S. N.	Contributor	Designation	Code									
2. AVT	M-1: First Advanced Varietal T	rial in Forage Maize										
1	Mandya	MFM-6	AVTM-1-3									
2	Mandya	MFM-4	AVTM-1-6									
3	Udaipur	MPC-1	AVTM-1-7									
4	Anand	AFM-4	AVTM-1-4									
5	Advanta	PAC-746	AVTM-1-2									
6	NC	African Tall	AVTM-1-1									
7	NC	J-1006	AVTM-1-5									
S. N.	Contributor	Designation	Code									
3. IVTPM: Initial Varietal Trial in Forage Pearl millet (New)												
1	Anand	AFB-36	IVTPM-7									
2	Bikaner	RBB-6	IVTPM-1									
3	Bikaner	RBB-7	IVTPM-4									
4	Hyderabad	TSFB-10-5	IVTPM-8									
5	Hyderabad	TSFB 14-10	IVTPM-2									
6	Hyderabad	TSFB 13-12	IVTPM-9									
7	NC	Raj Bajra Chari-2 (NC)	IVTPM-5									
8	NC	Giant Bajra (NC)	IVTPM-3									
9	ZC	BAIF Bajra 1 (CZ)	IVTPM-10									
10	ZC	AFB-3 (NWZ)	IVTPM-6									
11	ZC	APFB-9-1 (NEZ)	IVTPM-11									
S. N.	Contributor	Designation	Code									
4. AVT	PM-2: Second Advanced Variet	tal Trial in Forage Pearl r	nillet									
1	deVgen	DFMH-30	AVTPM-2-3									
2	NC	Raj Bajra Chari-2	AVTPM-2-1									
3	NC	Giant Bajra	AVTPM-2-4									
4	NC	AVKB-19	AVTPM-2-2									
S. N.	Contributor	Designation	Code									
5. AVT	PM-2 (Seed): Second Advanced	Varietal Trial in Forage	e Pearl millet (Seed)									
1	deVgen	DFMH-30	AVTPM-S-2-3									
2	NC	Raj Bajra Chari-2	AVTPM-S-2-1									
3	NC	Giant Bajra	AVTPM-S-2-4									
4	NC	AVKB-19	AVTPM-S-2-2									

S. N.	Contributor		Designation	Code		
6. IVTC: 1	Initial Varietal Tri	al in Forage	Cowpea (New)			
1	Mandya		MFC-09-3	IVTC-3		
2	Mandya		MFC-09-13	IVTC-6		
3	Mandya		MFC-09-4	IVTC-10		
4	Pantnagar		UPC-1501	IVTC-7		
5	Hyderabad		TSFC-12-15	IVTC-1		
6	Vellyani		Vellayani-1	IVTC-11		
7	NC		Bundel Lobia-1 (NC)	IVTC-8		
8	NC		UPC-5286 (NC)	IVTC-2		
9	ZC		Bundel Lobia-2 (NWZ),	IVTC-4		
10	ZC		UPC-622 (HZ)	IVTC-12		
11	ZC		UPC-628 (NEZ)	IVTC-13		
12	ZC		UPC-9202 (CZ)	IVTC-9		
13	ZC		MFC-8-14 (SZ)	IVTC-5		
S. N.	Contributor		Designation	Code		
7. AVTC-2	2: Second Advance	d Varietal T	Frial in Cowpea			
1	Coimbatore		TNFC-0926	AVTC-2-3		
2	NC		Bundel Lobia-1	AVTC-2-1		
3	NC		UPC-5286	AVTC-2-4		
4	ZC		UPC-622 (NEZ)	AVTC-2-2		
S. N.	Contributor		Designation	Code		
8. AVTC-2	2 (Seed): Second A	dvanced Va	rietal Trial in Cowpea for Se	eed		
1	Coimbatore		TNFC-0926	AVTC-S-2-3		
2	NC		Bundel Lobia-1	AVTC-S-2-1		
3	NC		UPC-5286	AVTC-S-2-4		
4	ZC		UPC-622 (NEZ)	AVTC-S-2-2		
S. N.	Contributor	Designatio	n	Code		
9. IVT Ric	e bean: Initial Va	rietal Trial i	n Rice bean			
1	Jorhat	JOR-15-1		IVT RB-4		
2	Jorhat	JOR-15-2		IVT RB-2		
3	Jorhat	JOR-15-3		IVT RB-7		
4	Jorhat	JOR-15-4		IVT RB-10		
5	Jorhat	JOR-15-5		IVT RB-9		
6	Jorhat	JOR-15-6		IVT RB-3		
7	Jabalpur	JRBJ-07-1		IVT RB-5		
8	NC	K-1 (Bidha	in-1)	IVT RB-8		
9	NC	Bidhan-2		IVT RB-6		
10	NC	RBL-6		IVT RB-1		

DECODES OF ENTRIES OF AVT AGRONOMICAL TRIAL KHARIF-2015

S.N.	Contributor	Designation	Code
K-14-AST-1:	Effect of nitrogen levels on pro	omising entries of pearl millet	(AVTPM-2)
1	deVgen	DFMH-30	AVTPM-A-2-3
2	NC	Raj Bajra Chari-2	AVTPM-A-2-1
3	NC	Giant Bajra	AVTPM-A-2-4
4	NC	AVKB-19	AVTPM-A-2-2
K-14-AST-2:	Effect of phosphorus levels on	promising entries of cowpea ((AVTC-2)
S.N.	Contributor	Designation	Code
1	Coimbatore	TNFC-0926	AVTC-A-2-3
2	NC	Bundel Lobia-1	AVTC-A-2-1
3	NC	UPC-5286	AVTC-A-2-4
4	ZC	UPC-622 (NEZ)	AVTC-A-2-2

CHAPTER-1 FORAGE CROP IMPROVEMENT

1. IVTM: INITIAL VARIETAL TRIAL IN FORAGE MAIZE

(Reference Tables: 1.1 to 1.9)

An initial varietal trial in forage maize comprising of six entries and two national checks *viz.*, African Tall and J-1006 was conducted at 22 locations in five zones of the country.

For green forage yield (q/ha), entries ADVI 5788 (4%), AFM-5 (2%) and MFM -5 (1.9%) in Hill Zone showed superiority over the best check. In other zones as well as at all India level, the check varieties were superior. For dry matter yield (q/ha), entries ADVI 5788 (3.4%), AFM-5 (0.4%) and MFM -5 (0.2%) in Hill Zone, entries ADVI 5788 (1.1%), AFM-5 (0.5%) in North West Zone, entry JHM 15-1 (9.6%) in Central Zone were superior over the best check. None of the entries were superior at national level.

For green forage and dry matter production potential (q/ha/day), national check African Tall and entry JHM 15-1 were superior respectively.

For crude protein yield (q/ha) and crude protein content (%), national check, African Tall was the best. For the character plant height, national check African Tall (216.7 cm) was adjudged best performer. For other quality parameters, national check African Tall for ADF (34.8%) and AFM-5 for NDF (62.4%) ranked first whereas for IVDMD (%) test entry JHM-15-1 (65.6%) was best performer.

2. AVTM-1: FIRST ADVANCED VARIETAL TRIAL IN FORAGE MAIZE (Reference Tables: 2.1 to 2.9)

An advanced varietal trial in forage maize comprising five entries and two national checks *viz.*, African Tall and J-1006 was conducted at 12 locations distributed in three zones viz., Hill, North West and north east zone.

For green forage yield (q/ha), entry PAC -746 (15%) in hill zone and entry MFM-4 (5.5%) in north east were superior over the best check. At all India level, PAC -746 showed marginal superiority. For dry matter yield (q/ha), entry PAC 746 and entry AFM-4 were superior over the best check J 1006 by a margin of 11.2% and 2.9% respectively. Entry AFM -4 was superior by 10.6% in north west zone and by 2.3% at all India level.

In green forage production potential (q/ha/day), none of the entries could surpass best check J 1006. For dry matter production potential (q/ha/day), entry AFM-4 showed marginal superiority over the best national check J-1006.

For crude protein yield (q/ha), entry PAC 746 and AFM-4 showed superiority giving 10.2 and 9.7 q/ha as against the best check 8.6 given by J 1006. For crude protein content (%), national check African Tall was best. For the character leafiness (L/S ratio), entry AFM-4 was best followed by national check J 1006. For plant height, African Tall was adjudged best performer. For other quality parameters, entry AFM -4 was superior for ADF, NDF and DDM, where as entries MFM-6 and MFM-4 were best for IVDMD.

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]	Hill Zone			North West Zone							
Entries	Palam-	Sri-	Aver-	Ra-	Superi-	Ludh-	His-	Udai-	Jal-	Pant-	Aver-	Ra-	
	pur	nagar	age	nk	ority%	iana	ar	pur	ore	nagar	age	nk	
MFM-8	675.8	322.0	498.9	5		198.6	311.1	277.8	266.7	233.3	257.5	8	
AFM-5	707.9	338.0	523.0	2	2.0	455.6	349.0	423.6	246.7	266.6	348.3	2	
MFM-5	729.0	316.4	522.7	3	1.9	207.9	259.6	382.0	266.7	256.6	274.5	7	
ADVI 5788	746.8	319.6	533.2	1	4.0	306.3	338.2	354.2	260.0	238.8	299.5	5	
JHM-15-1	604.2	373.9	489.0	6		284.3	300.0	377.3	273.3	215.8	290.1	6	
JHM-2	567.8	330.6	449.2	8		302.5	307.7	474.6	260.0	247.9	318.5	4	
J-1006 (NC)	561.7	348.3	455.0	7		418.5	396.3	437.5	280.0	257.0	357.9	1	
African Tall (NC)	662.9	362.3	512.6	4		349.1	359.3	412.1	300.0	211.2	326.3	3	
Mean	657.0	338.9	497.9			315.4	327.6	392.4	269.2	240.9	309.1		
CD at 5%	34.0	15.4				45.5	81.4	71.3	80.2	6.1			
CV%	4.8	5.3				15.9	14.6	10.4	17.0	13.7			

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

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

]	North E	ast Zone				Central Zone							
Entries	Bhuban-	Ran-	Jor-	Imp-	*Faiza-	Aver-	Ra-	Super-	Ana-	Rai-	Jabal-	Rah-	Urulikan-	Jha-	Aver-	Ra-
	eswar	chi	hat	hal	bad	age	nk	iority%	nd	pur	pur	uri	chan	nsi	age	nk
MFM-8	281.2	333.3	314.3	484.3	97.2	353.3	1	0.3	159.0	416.1	543.6	479.7	817.8	318.3	455.8	7
AFM-5	257.3	333.3	185.5	410.0	86.6	296.5	6		386.0	397.4	364.5	610.2	731.2	427.0	486.1	4
MFM-5	265.6	379.7	201.4	361.0	125.0	301.9	5		258.0	427.8	360.3	419.5	571.9	380.3	403.0	8
ADVI 5788	260.4	370.3	238.7	312.3	94.0	295.4	7		260.0	374.2	389.5	523.2	710.8	543.9	466.9	6
JHM-15-1	275.0	379.7	284.5	319.4	81.7	314.6	4		321.0	437.1	464.5	589.9	955.1	384.8	525.4	2
JHM-2	242.7	333.3	260.6	316.6	71.1	288.3	8		348.0	405.6	389.5	514.9	688.7	488.6	472.6	5
J-1006 (NC)	294.7	416.7	217.3	472.3	132.3	350.3	3		441.0	383.0	437.4	687.6	728.0	480.5	526.2	1
African Tall (NC)	298.9	435.3	247.2	428.0	62.3	352.4	2		367.0	418.7	610.3	675.1	564.6	303.5	489.8	3
Mean	272.0	372.7	243.7	388.0	93.8	319.1			317.5	407.5	445.0	562.5	721.0	415.9	478.2	
CD at 5%	20.8	59.4	10.2	40.6	24.3				42.4	31.6	112.3	72.5	60.3	48.2		
CV%	6.3	9.0	13.2	6.0	14.8				7.6	4.4	14.4	7.4	4.7	6.6		

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Note: * Not included in zonal and all India average because of very low yield

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			South Zon	e			All India	Average
Entries	Hyderabad	Coimbatore	Mandya	Karaikal	Average	Rank	Average	Rank
MFM-8	458.7	513.9	487.2	366.5	456.6	5	393.3	7
AFM-5	398.5	574.1	426.4	370.4	442.3	7	412.3	3
MFM-5	361.4	588.0	445.5	414.2	452.3	6	373.9	8
ADVI 5788	463.3	569.4	612.9	300.9	486.6	4	404.5	5
JHM-15-1	393.8	490.7	490.9	393.5	442.2	8	409.9	4
JHM-2	500.4	606.5	581.0	304.8	498.2	3	403.4	6
J-1006 (NC)	514.3	588.0	546.3	406.5	513.8	2	443.5	2
African Tall (NC)	569.9	708.3	641.6	494.7	603.6	1	448.6	1
Mean	457.5	579.9	529.0	381.4	487.0		411.2	
CD at 5%	83.9	47.9	87.0	80.8				
CV%	10.5	4.7	9.4	12.1				

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

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

]	Hill Zone			North West Zone							
Entries	Palam-	Sri-	Aver-	Ra-	Superi-	Ludh-	Hi-	Pant-	Aver-	Ra-	Superi-		
	pur	nagar	age	nk	ority%	iana	sar	nagar	age	nk	ority%		
MFM-8	121.8	75.1	98.5	6		81.4	82.4	42.8	68.8	5			
AFM-5	128.6	74.9	101.7	3	0.2	73.7	99.8	62.8	78.7	2	0.5		
MFM-5	131.8	72.1	102.0	2	0.4	77.8	78.4	47.9	68.0	7			
ADVI 5788	135.1	74.9	105.0	1	3.4	81.7	110.2	45.6	79.2	1	1.1		
JHM-15-1	111.7	87.2	99.5	5		80.3	79.0	35.5	64.9	8			
JHM-2	104.6	75.4	90.0	8		74.5	94.1	46.5	71.7	4			
J-1006 (NC)	102.4	81.3	91.8	7		67.2	120.3	47.4	78.3	3			
African Tall (NC)	118.5	84.5	101.5	4		74.5	99.4	31.3	68.4	6			
Mean	119.3	78.2	98.7			76.4	95.4	45.0	72.3				
CD at 5%	11.8	3.1				8.9	29.0	13.8					
CV%	5.6	2.5				16.3	17.9	17.6					

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				North 1	East Zone	•			Central Zone								
Entries	Bhuban-	Ran-	Jor-	Faiza-	Imp-	Aver-	Ra-	Supe-	Ana-	Rai-	Jabal-	Rah-	Urulikan-	Jha-	Aver-	Ra-	Superi-
	eswar	chi	hat	bad	hal	age	nk	riority%	nd	pur	pur	uri	chan	nsi	age	nk	ority%
MFM-8	58.7	125.3	57.7	23.5	118.4	76.7	2		31.9	121.1	125.4	100.5	135.9	101.6	102.7	5	
AFM-5	53.1	91.4	35.3	21.7	105.5	61.4	7		66.4	117.6	82.4	122.6	133.0	121.1	107.2	3	
MFM-5	56.0	106.4	36.6	31.9	91.5	64.5	6		60.7	131.3	81.8	85.2	76.0	99.0	89.0	7	
ADVI 5788	54.6	130.6	48.5	23.4	78.5	67.1	5		62.9	87.7	87.2	104.8	120.0	133.2	99.3	6	
JHM-15-1	57.0	169.7	57.2	20.1	72.8	75.4	3		62.4	133.2	107.0	127.5	177.2	118.1	120.9	1	9.6
JHM-2	50.6	113.6	47.7	17.7	72.6	60.4	8		82.4	102.5	87.4	114.7	120.0	130.4	106.2	4	
J-1006 (NC)	62.8	132.5	40.8	33.9	116.1	77.2	1		73.6	103.4	99.9	145.3	120.6	118.7	110.3	2	
African Tall (NC)	61.5	141.4	45.0	15.2	112.5	75.1	4		70.5	109.2	144.3	149.6	87.4	101.0	110.3	2	
Mean	56.8	126.4	46.1	23.4	96.0	69.7			63.9	113.3	101.9	118.8	121.3	115.4	105.7		
CD at 5%	5.8	38.9	3.3	7.2	18.2				8.5	10.4	21.9	15.1	9.9	18.2			
CV%	5.8	17.5	9.9	17.8	10.8				7.6	5.3	12.4	7.3	4.6	9.0			

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

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

Entries			South Z	one			All	India Average
Entrics	Hyderabad	Coimbatore	Mandya	Karaikal	Average	Rank	Average	Rank
MFM-8	69.7	80.6	112.5	78.9	85.4	5	87.2	5
AFM-5	56.0	94.9	115.0	75.3	85.3	6	86.6	6
MFM-5	52.3	100.1	94.9	85.1	83.1	8	79.8	8
ADVI 5788	76.3	92.6	166.0	56.2	97.8	3	88.5	4
JHM-15-1	66.3	75.5	107.6	85.0	83.6	7	91.5	3
JHM-2	78.7	100.8	145.5	56.8	95.5	4	85.8	7
J-1006 (NC)	83.1	92.6	159.2	90.7	106.4	2	94.6	2
African Tall (NC)	86.9	126.3	139.1	99.3	112.9	1	94.9	1
Mean	71.2	95.4	130.0	78.4	93.7		88.6	
CD at 5%	11.7	15.2	16.6	20.3				
CV%	9.4	9.1	7.3	14.8				

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

	Palam_	Sri-	Ludb-	His-	Pant-	Rai-	Ran-	Faiza-	Rhuhan-	Ang_	Ior-	Iahal-	Rah-	Urulikan-	Karai.	Coimh-	Man-	Hydera-	Ave-	Ra-
Entries	pur	nagar	iana	ar	nagar	pur	chi	bad	eswar	nd	hat	pur	uri	chan	kkal	atore	dya	bad	rage	nk
MFM-8	9.9	4.13	4.50	4.79	3.82	7.17	5.85	1.33	4.26	2.60	4.99	6.24	7.99	13.19	4.87	9.18	8.60	7.50	6.16	6
AFM-5	10.5	4.33	4.10	5.37	6.01	7.36	6.94	1.40	4.02	7.57	2.94	4.14	11.30	11.99	4.77	10.83	8.20	6.30	6.56	3
MFM-5	10.8	4.06	4.30	3.99	4.21	7.64	9.26	1.76	4.22	3.91	3.15	4.00	7.23	8.80	5.39	10.69	7.63	5.60	5.92	8
ADVI 5788	10.8	4.10	4.50	5.20	3.98	5.94	8.23	1.25	4.20	4.48	3.79	4.37	8.72	9.61	3.88	10.35	11.00	7.20	6.20	5
JHM-15-1	8.7	4.80	4.40	4.62	3.53	7.8	8.63	1.06	4.51	5.26	4.52	5.27	9.83	15.66	5.59	8.46	8.73	6.10	6.53	4
JHM-2	8.1	4.24	4.10	4.73	4.06	6.99	7.75	0.90	4.04	5.28	4.09	4.32	8.73	9.57	4.18	10.28	10.10	7.90	6.08	7
J-1006 (NC)	8.0	4.47	3.70	6.55	4.28	6.96	8.86	1.76	4.54	8.16	3.40	4.91	11.85	11.20	5.70	10.89	9.67	7.70	6.81	2
African Tall (NC)	9.6	4.65	4.10	5.53	3.52	7.75	11.45	0.84	4.75	5.40	3.92	7.18	9.78	8.30	6.97	12.65	11.63	8.40	7.02	1
Mean	9.55	4.35	4.21	5.10	4.18	7.20	8.37	1.29	4.32	5.33	3.85	5.05	9.43	11.04	5.17	10.42	9.45	7.09	6.41	

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

Entrice	Sri-	Ludh-	His-	Pant-	Ran-	Faiza-	Ana-	Jor-	Bhuban-	Jabal-	Rah-	Urulikan-	Rai-	Coimb-	Karai-	Hydera-	Aver-	Ra-
Entries	nargar	iana	ar	nagar	chi	bad	nd	hat	eswar	pur	uri	chan	pur	atore	kkal	bad	age	nk
MFM-8	0.96	0.80	1.27	0.70	2.19	0.32	0.52	0.92	0.89	1.44	1.67	2.19	1.61	1.44	1.05	1.10	1.19	7
AFM-5	0.96	0.70	1.53	1.03	1.90	0.28	1.30	0.56	0.83	0.93	2.27	2.18	1.55	1.79	0.97	0.90	1.23	4
MFM-5	0.92	0.70	1.21	0.78	2.59	0.45	0.92	0.57	0.89	0.90	1.47	1.17	1.77	1.82	1.11	0.80	1.13	8
ADVI 5788	0.96	0.80	1.70	0.76	2.90	0.31	1.08	0.77	0.88	0.98	1.75	1.62	1.39	1.68	0.72	1.20	1.22	5
JHM-15-1	1.11	0.80	1.21	0.58	3.87	0.26	1.02	0.91	0.94	1.21	2.12	2.90	1.90	1.30	1.21	1.00	1.40	1
JHM-2	0.96	0.70	1.45	0.76	2.64	0.22	1.25	0.75	0.84	0.97	1.94	1.67	1.46	1.71	0.78	1.20	1.21	6
J-1006 (NC)	1.04	0.60	1.85	0.79	2.82	0.45	1.36	0.64	0.97	1.12	2.50	1.86	1.44	1.71	1.27	1.20	1.35	3
African Tall (NC)	1.08	0.70	1.53	0.53	3.72	0.21	1.04	0.71	0.98	1.69	2.17	1.28	1.56	2.25	1.40	1.30	1.38	2
Mean	1.00	0.73	1.47	0.74	2.83	0.31	1.06	0.73	0.90	1.16	1.99	1.86	1.59	1.71	1.06	1.09	1.26	

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

Entrice	Palam-	Ludh-	His-	Faiza-	Jor-	Imp-	Bhuban-	Ana-	Rai-	Jabal-	Rah-	Urulikan-	Karai-	Coimb-	Hydera-	Man-	Jha-	Aver-	Ra-
Litties	pur	iana	ar	bad	hat	hal	eswar	nd	pur	pur	uri	chan	kkal	atore	bad	dya	nsi	age	nk
MFM-8	9.2	12.2	7.6	1.8	5.4	8.8	4.4	1.6	8.6	10.0	8.6	12.4	4.2	7.8	4.5	7.4	12.8	7.5	4
AFM-5	11.3	12.2	10.5	1.6	2.9	7.1	4.0	3.6	9.5	6.2	9.1	11.4	3.0	7.5	2.0	7.0	16.6	7.4	5
MFM-5	11.9	8.8	7.4	2.3	3.7	6.8	4.3	2.9	10.5	6.0	6.5	7.2	3.3	8.8	3.0	5.8	11.4	6.5	7
ADVI 5788	11.0	12.6	10.4	1.8	4.4	5.8	4.4	3.2	5.7	6.8	10.6	10.5	2.2	8.2	5.4	7.3	18.8	7.6	3
JHM-15-1	10.4	9.1	7.4	1.6	5.4	6.1	4.5	3.4	10.8	8.5	9.5	16.5	3.4	6.6	2.6	5.2	13.3	7.3	6
JHM-2	9.4	9.9	8.9	1.4	4.5	5.4	3.8	4.3	7.2	6.6	10.0	10.8	3.0	9.7	3.8	8.9	18.6	7.4	5
J-1006 (NC)	8.6	9.9	12.6	2.7	4.1	8.5	5.1	3.9	6.3	7.9	14.2	10.0	3.2	7.3	5.8	9.1	14.5	7.9	2
African Tall (NC)	10.4	13.6	9.8	1.1	4.3	7.4	4.7	3.6	8.4	11.6	11.1	7.5	4.3	11.0	7.5	10.2	12.0	8.1	1
Mean	10.3	11.0	9.3	1.8	4.3	7.0	4.4	3.3	8.4	8.0	9.9	10.8	3.3	8.4	4.3	7.6	14.8	7.5	

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

Entrios	Palam-	Ludh-	His-	Faiza-	Jor-	Imp-	Bhuban-	Ana-	Rai-	Jabal-	Rah-	Urulikan-	Jha-	Karai-	Coimb-	Man-	Hydera-	Aver-	Ra-
Entries	pur	iana	ar	bad	hat	hal	eswar	nd	pur	pur	uri	chan	nsi	kkal	atore	dya	bad	age	nk
MFM-8	7.6	15.0	9.2	7.6	9.4	7.4	7.6	5.1	7.1	8.1	8.6	9.1	12.6	5.2	9.6	6.6	6.6	8.4	2
AFM-5	8.8	16.6	10.5	7.5	8.4	6.8	7.6	5.4	8.0	7.8	7.4	8.6	13.7	3.9	7.9	6.1	3.5	8.1	4
MFM-5	9.0	11.3	9.4	7.1	10.2	7.5	7.7	5.8	8.0	7.6	7.6	9.5	11.5	3.9	8.8	6.1	5.7	8.0	5
ADVI 5788	8.2	15.4	9.4	7.6	9.3	7.4	8.1	5.1	6.5	7.8	10.1	8.7	14.1	3.9	8.7	4.4	7.0	8.3	3
JHM-15-1	9.3	11.3	9.4	8.0	9.6	8.3	7.9	5.5	8.1	8.1	7.4	9.3	11.3	3.9	8.8	4.8	3.9	7.9	6
JHM-2	9.0	13.3	9.4	8.0	9.5	7.5	7.6	5.2	7.0	7.9	8.8	9.0	14.3	5.3	9.6	6.1	4.8	8.4	2
J-1006 (NC)	8.5	14.8	10.5	7.9	10.2	7.3	8.1	5.3	6.1	8.1	9.8	8.3	12.2	3.5	7.9	5.7	7.0	8.3	3
African Tall (NC)	8.7	18.2	9.9	7.4	9.7	6.6	7.6	5.1	7.7	8.1	7.4	8.5	11.9	4.4	8.7	7.4	8.7	8.6	1
Mean	8.6	14.5	9.7	7.6	9.5	7.4	7.8	5.3	7.3	7.9	8.4	8.9	12.7	4.3	8.8	5.9	5.9	8.3	

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

Entries	Palampur	Srinagar	Ludhiana	Hisar	Udaipur	Pantnagar	Faizabad	Ranchi	Jorhat	Imphal	Bhubaneswar	Anand
MFM-8	176.0	158.4	200.0	147.3	143.6	135.0	115.4	157.0	183.7	255.1	190.7	192.0
AFM-5	218.6	165.6	230.0	177.2	168.6	186.0	120.5	182.0	195.9	221.2	175.3	203.0
MFM-5	221.6	142.3	257.7	172.7	162.2	163.3	115.2	175.0	201.8	188.9	184.3	203.0
ADVI 5788	210.3	147.9	238.3	165.9	162.2	135.0	105.6	178.0	164.2	173.1	180.6	185.0
JHM-15-1	198.3	172.0	242.3	169.7	165.6	150.0	108.7	173.0	209.3	196.8	187.6	201.0
JHM-2	193.3	159.9	255.0	178.2	161.0	126.7	104.2	176.0	178.1	190.7	170.3	199.0
J-1006 (NC)	200.0	157.5	193.3	183.9	179.8	190.0	117.2	172.0	224.5	220.3	193.5	207.0
African Tall (NC)	208.3	162.3	248.3	174.7	181.3	170.0	110.5	175.0	189.8	213.3	198.3	205.0
Mean	203.3	158.2	233.1	171.2	165.5	157.0	112.2	173.5	193.4	207.4	185.1	199.4

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

Entries	Raipur	Jabalpur	Rahuri	Urulikanchan	Jhansi	Hyderabad	Coimbatore	Mandya	Karaikkal	Average	Rank
MFM-8	267.8	211.3	227.5	146.8	249.9	216.6	259.8	212.1	186.1	192.0	7
AFM-5	237.4	198.0	215.2	207.8	214.5	187.6	263.0	210.6	186.5	198.3	6
MFM-5	278.6	193.5	241.2	219.4	233.1	236.4	245.4	252.6	187.3	203.6	4
ADVI 5788	222.8	198.7	170.9	166.9	197.2	188.7	215.0	162.2	176.7	178.3	8
JHM-15-1	298.2	213.3	223.5	247.0	244.9	260.2	254.6	257.2	169.3	206.8	2
JHM-2	279.8	192.7	216.4	212.8	229.2	223.8	258.8	239.1	245.3	199.5	5
J-1006 (NC)	264.7	205.8	244.3	196.8	239.4	198.6	274.9	241.1	212.3	205.6	3
African Tall (NC)	281.8	221.7	276.7	250.6	235.9	268.5	281.6	262.6	235.0	216.7	1
Mean	266.4	204.4	227.0	206.0	230.5	222.6	256.6	229.7	199.8	200.1	

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

Entries	Palam-	Sri-	Ludh-	His-	Pant-	Faiza-	Ran-	Jor-	Imp-	Bhuban-	Rai-	Jabal-	Rah-	Urulikan-	Jha-	Karai-	Coimb-	Man-	Hydera-	Aver-	Ra-
Littles	pur	nagar	iana	ar	nagar	bad	chi	hat	hal	eswar	pur	pur	uri	chan	nsi	kkal	atore	dya	bad	age	nk
MFM-8	0.50	0.34	0.90	0.27	0.47	0.65	0.53	1.38	0.65	1.01	0.64	0.56	0.37	0.90	1.04	0.44	0.18	0.35	0.40	0.61	1
AFM-5	0.55	0.38	0.82	0.39	0.36	0.61	0.48	1.46	0.83	0.85	0.33	0.49	0.36	0.82	0.42	0.47	0.30	0.36	0.40	0.56	4
MFM-5	0.51	0.31	0.82	0.54	0.42	0.60	0.33	1.20	0.57	0.93	0.75	0.46	0.26	0.88	0.81	0.46	0.22	0.39	0.40	0.57	3
ADVI 5788	0.45	0.38	0.90	0.47	0.37	0.61	0.43	1.30	0.61	0.89	0.56	0.42	0.47	1.06	0.45	0.61	0.25	0.56	0.50	0.59	2
JHM-15-1	0.52	0.36	0.30	0.38	0.34	0.63	0.63	1.40	0.62	0.98	0.78	0.51	0.36	0.82	0.70	0.49	0.19	0.32	0.30	0.56	4
JHM-2	0.56	0.33	0.54	0.34	0.39	0.64	0.34	0.93	0.63	0.83	0.52	0.46	0.29	0.97	0.76	0.50	0.26	0.34	0.30	0.52	6
J-1006 (NC)	0.41	0.31	0.67	0.34	0.42	0.67	0.51	1.21	0.69	1.07	0.53	0.48	0.41	0.94	0.73	0.50	0.23	0.39	0.40	0.57	3
African Tall (NC)	0.45	0.37	0.60	0.27	0.46	0.68	0.44	0.79	0.61	1.12	0.4	0.62	0.33	0.76	0.84	0.57	0.21	0.34	0.30	0.54	5
Mean	0.49	0.35	0.69	0.38	0.40	0.64	0.46	1.21	0.65	0.96	0.56	0.50	0.36	0.89	0.72	0.51	0.23	0.38	0.38	0.57	

Table 1.9 IVTM: Initial Varietal Trial in Forage Maize (New): ADF (%), NDF (%), IVDMD (%) & DDM (q/ha)

Entrica		ADI	F (%)				NDF (%)			IVDM	D (%)	DDM	(q/ha)
Entries	Ludhiana	Jhansi	Average	Rank	Ludhiana	Anand	Jhansi	Average	Rank	Hisar	Rank	Hisar	Rank
MFM-8	33.1	38.0	35.5	2	42.4	81.9	64.2	62.8	2	62.0	5	51.1	7
AFM-5	32.8	40.6	36.7	3	41.5	77.4	68.3	62.4	1	63.2	4	63.1	4
MFM-5	40.4	39.9	40.1	6	46.4	86.7	69.7	67.6	8	63.4	3	49.7	8
ADVI 5788	35.2	38.3	36.7	3	44.8	82.4	66.8	64.7	6	61.4	7	67.7	2
JHM-15-1	38.6	42.1	40.3	7	45.2	78.8	72.4	65.5	7	65.6	1	51.8	6
JHM-2	36.1	43.0	39.5	5	44.1	82.6	66.6	64.4	5	61.7	6	58.1	5
J-1006 (NC)	35.1	39.0	37.0	4	45.3	78.2	67.6	63.7	3	60.6	8	72.9	1
African Tall (NC)	30.3	39.3	34.8	1	40.2	84.2	67.5	64.0	4	63.8	2	63.4	3
Mean	35.2	40.0	37.6		43.7	81.5	67.9	64.4		62.7		59.7	

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			Hill Zoi	ne					N	orth West Z	one			
Entries	Palam-	Sri-	Alm-	Aver-	Ra-	Superi-	Ludh-	His-	Udai-	Pant-	Jal-	Aver-	Ra-	Superi-
	pur	nagar	ora	age	nk	ority%	iana	ar	pur	nagar	ore	age	nk	ority%
PAC-746	817.0	318.0	302.0	479.0	1	15.0	343.6	691.7	306.8	265.1	330.8	387.6	3	
MFM-6	759.9	334.4	138.5	410.9	3		338.3	469.4	152.7	138.8	355.0	290.8	6	
AFM-4	614.7	355.7	239.5	403.3	4		503.2	672.2	243.0	250.0	311.8	396.0	2	
MFM-4	661.8	336.5	115.6	371.3	7		253.9	527.8	161.0	163.8	336.4	288.6	7	
MPC-1	632.9	345.5	202.0	393.5	5		365.3	547.2	320.7	155.4	374.0	352.5	5	
African Tall (NC)	629.6	309.2	236.4	391.7	6		330.7	636.1	280.4	196.6	348.8	358.5	4	
J-1006 (NC)	667.7	340.5	241.1	416.4	2		461.8	641.7	308.2	254.9	343.2	402.0	1	
Mean	683.4	334.3	210.7	409.5			371.0	598.0	253.3	203.5	342.8	353.7		
CD at 5%	NS	18.1	30.9				53.9	63.4	44.4	24.1	70.6			
CV%	12.9	6.3	8.1				5.7	6.2	10.0	6.4	13.9			

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

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

Entrics			Nor	th East Zone				A	ll India A	Average
Entries	Bhubaneswar	Ranchi	Jorhat	*Faizabad	Average	Rank	Superiority%	Average	Rank	Superiority%
PAC-746	213.6	152.8	227.1	73.9	197.8	7		360.8	1	0.3
MFM-6	253.2	194.5	193.5	50.0	213.7	5		302.6	6	
AFM-4	229.8	201.4	226.8	67.0	219.3	3		349.8	3	
MFM-4	277.2	218.8	238.7	55.1	244.9	1	5.5	299.2	7	
MPC-1	240.7	204.9	199.6	85.0	215.1	4		326.2	5	
African Tall (NC)	284.5	170.1	181.9	65.8	212.2	6		327.7	4	
J-1006 (NC)	301.7	201.4	193.2	90.7	232.1	2		359.6	2	
Mean	257.2	192.0	208.7	69.6	219.3			332.3		
CD at 5%	13.2	27.6	5.5	15.8						
CV%	2.9	7.9	8.1	12.8						

Note: * Not included in zonal & all India average due to low yield of data

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Entrics			Hill	Zone					North V	Vest Zone		
Lintites	Palampur	Srinagar	Almora	Average	Rank	Superiority%	Ludhiana	Hisar	*Pantnagar	Average	Rank	Superiority%
PAC-746	157.2	68.6	60.9	95.6	1	11.2	69.0	168.5	43.1	118.8	3	
MFM-6	146.9	72.9	33.4	84.4	4		67.7	119.7	21.2	93.7	6	
AFM-4	122.6	78.3	64.3	88.4	2	2.9	100.6	186.4	44.5	143.5	1	10.6
MFM-4	126.6	74.0	33.9	78.2	7		50.8	132.4	22.7	91.6	7	
MPC-1	122.1	76.6	52.6	83.8	6		73.1	142.5	26.0	107.8	4	
African Tall (NC)	118.5	67.0	67.5	84.3	5		66.3	134.8	44.4	100.5	5	
J-1006 (NC)	129.5	74.9	53.2	85.9	3		92.4	167.2	37.8	129.8	2	
Mean	131.9	73.2	52.3	85.8			74.3	150.2	34.2	112.2		
CD at 5%	NS	4.6	14.9				28.8	24.0	6.3			
CV%	13.5	3.2	17.1				15.1	9.4	10.3			

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

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

E 4			Nor	th East Zone				Al	l India A	lverage
Entries	Bhubaneswar	Ranchi	Jorhat	*Faizabad	Average	Rank	Superiority%	Average	Rank	Superiority%
PAC-746	44.8	38.4	45.4	18.1	42.9	7		81.6	3	
MFM-6	52.9	59.6	35.1	12.5	49.2	4		73.5	7	
AFM-4	48.6	62.7	41.5	16.6	50.9	3		88.1	1	2.3
MFM-4	57.9	69.0	44.7	14.1	57.2	2		73.7	6	
MPC-1	49.7	55.3	34.5	20.9	46.5	6		75.8	4	
African Tall (NC)	58.9	46.6	35.0	16.7	46.8	5		74.3	5	
J-1006 (NC)	62.8	77.5	31.6	21.5	57.3	1		86.1	2	
Mean	53.7	58.4	38.3	17.2	50.1			79.0		
CD at 5%	4.8	17.4	2.3	4.5						
CV%	5.0	16.6	7.8	14.6						

Note: * Not included in zonal & all India average due to low yield of data

Entries	Palam-	Sri-	Ludh-	His-	Pant-	Faiza-	Ran-	Jor-	Bhuban-	Aver-	Ra-
Littles	pur	nagar	iana	ar	nagar	bad	chi	hat	eswar	age	nk
PAC-746	12.30	3.82	4.20	10.64	4.50	1.17	2.59	3.66	3.45	5.15	2
MFM-6	11.10	4.01	4.10	7.22	2.35	0.77	3.89	2.89	4.06	4.49	6
AFM-4	9.50	4.27	6.10	10.34	4.31	1.00	3.80	3.29	3.54	5.13	3
MFM-4	9.30	4.04	3.10	8.12	2.73	0.79	4.29	3.85	4.22	4.49	6
MPC-1	9.50	4.15	4.50	8.42	2.55	1.25	3.79	3.22	4.01	4.60	5
African Tall (NC)	9.30	3.71	4.00	9.79	3.40	1.08	2.98	2.64	4.66	4.62	4
J-1006 (NC)	9.70	4.09	5.60	9.87	4.25	1.31	4.11	2.88	4.64	5.16	1
Mean	10.10	4.01	4.51	9.20	3.44	1.05	3.64	3.20	4.08	4.80	

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

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

Entries	Srinagar	Ludhiana	Hisar	Pantnagar	Bhubaneswar	Ranchi	Jorhat	*Faizabad	Average	Rank
PAC-746	0.85	0.80	2.59	0.73	0.72	0.65	0.73	0.29	1.01	3
MFM-6	0.89	0.80	1.84	0.36	0.85	1.19	0.52	0.19	0.92	6
AFM-4	0.95	1.20	2.87	0.77	0.75	1.18	0.60	0.24	1.19	1
MFM-4	0.90	0.60	2.04	0.38	0.88	1.35	0.72	0.20	0.98	4
MPC-1	0.92	0.90	2.19	0.43	0.83	1.02	0.56	0.31	0.98	4
African Tall (NC)	0.82	0.80	2.07	0.77	0.97	0.82	0.51	0.27	0.96	5
J-1006 (NC)	0.91	1.10	2.57	0.63	0.97	1.58	0.47	0.31	1.18	2
Mean	0.89	0.89	2.31	0.58	0.85	1.11	0.59	0.26	1.03	

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

Entries	Palampur	Hisar	Jorhat	Bhubaneswar	*Ludhiana	*Faizabad	Average	Rank
PAC-746	16.5	16.2	4.7	3.5	2.8	1.4	10.2	1
MFM-6	13.7	12.3	3.6	4.1	3.2	1.0	8.4	5
AFM-4	11.5	19.2	4.1	3.9	6.1	1.3	9.7	2
MFM-4	12.6	12.2	4.5	4.5	1.8	1.1	8.4	5
MPC-1	12.1	14.0	3.3	3.8	3.3	1.5	8.3	6
African Tall (NC)	11.4	14.5	3.6	4.7	3.3	1.3	8.5	4
J-1006 (NC)	11.0	15.4	3.3	5.0	3.7	1.7	8.6	3
Mean	12.7	14.8	3.9	4.2	3.5	1.3	8.9	

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Note: * not included in average due to low yield of data

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Entries	Palampur	Hisar	Faizabad	Jorhat	Bhubaneswar	*Ludhiana	Average	Rank
PAC-746	10.5	9.6	7.5	10.4	7.9	4.0	9.2	2
MFM-6	9.3	10.3	7.6	10.4	7.7	4.7	9.1	3
AFM-4	9.3	10.3	7.8	10.0	8.0	6.1	9.1	3
MFM-4	9.9	9.2	7.5	10.2	7.8	3.5	8.9	4
MPC-1	9.9	9.9	7.1	9.7	7.8	4.5	8.9	4
African Tall (NC)	9.6	10.7	7.6	10.4	8.0	5.0	9.3	1
J-1006 (NC)	8.5	9.2	7.9	10.4	7.9	4.0	8.8	5
Mean	9.6	9.9	7.6	10.2	7.9	4.5	9.0	

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

Note: * not included in average due to low yield of data

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

Entries	Palampur	Srinagar	Ludhiana	Hisar	Pantnagar	Udaipur	Ranchi	Faizabad	Jorhat	Bhubaneswar	Average	Rank
PAC-746	257.0	138.1	171.7	202.0	199.0	186.7	181.0	115.8	153.6	170.2	177.5	4
MFM-6	234.0	160.3	198.3	191.7	191.7	145.7	188.0	117.5	100.5	180.5	170.8	7
AFM-4	204.6	176.6	170.0	213.9	197.0	166.0	188.0	112.2	124.1	173.5	172.6	6
MFM-4	238.0	164.6	186.7	212.9	191.7	158.0	187.0	116.8	109.7	184.6	175.0	5
MPC-1	244.0	181.3	223.3	251.1	194.0	164.7	188.0	112.5	136.9	177.6	187.3	2
African Tall (NC)	225.6	148.1	266.7	233.3	210.3	181.3	186.0	125.2	116.3	187.4	188.0	1
J-1006 (NC)	229.0	172.3	223.3	227.8	194.0	140.7	189.0	115.3	131.8	191.6	181.5	3
Mean	233.2	163.0	205.7	219.0	196.8	163.3	186.7	116.5	124.7	180.8	179.0	

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Entries	Palampur	Srinagar	Ludhiana	Hisar	Pantnagar	Bhubaneswar	Ranchi	Jorhat	Faizabad	Average	Rank
PAC-746	0.34	0.33	0.67	0.74	0.42	0.81	0.49	1.32	0.68	0.64	4
MFM-6	0.44	0.34	0.67	0.56	0.42	0.97	0.43	1.35	0.61	0.64	4
AFM-4	0.40	0.31	1.00	0.85	0.37	0.85	0.43	1.63	0.63	0.72	1
MFM-4	0.46	0.36	0.67	0.68	0.34	1.03	0.38	1.19	0.70	0.65	3
MPC-1	0.37	0.36	0.82	0.60	0.37	0.93	0.46	1.29	0.68	0.65	3
African Tall (NC)	0.41	0.33	0.60	0.70	0.34	1.06	0.60	0.77	0.67	0.61	5
J-1006 (NC)	0.39	0.36	0.90	0.89	0.34	1.14	0.49	1.15	0.64	0.70	2
Mean	0.40	0.34	0.76	0.72	0.37	0.97	0.47	1.24	0.66	0.66	

Table 2.8 AVTM-1: First Advanced Varietal Trial in Forage Maize: Leaf Stem Ratio

Table 2.9 AVTM-1: First Advanced Varietal Trial in Forage Maize: ADF (%), NDF (%), IVDMD (%) & DDM (q/ha)

Entries		ADF (%)			NDF (%)		IVDM	D (%)	DDM	(q/ha)
Lintres	Palampur	Ludhiana	Average	Rank	Ludhiana	Palampur	Average	Rank	Hisar	Rank	Hisar	Rank
PAC-746	52.0	46.6	49.3	7	67.4	71.2	69.3	6	62.4	4	105.2	3
MFM-6	51.4	45.6	48.5	4	65.7	68.0	66.9	2	64.0	1	76.6	7
AFM-4	49.8	41.2	45.5	1	63.1	68.8	66.0	1	63.6	3	118.6	1
MFM-4	51.0	47.1	49.1	6	68.5	73.4	71.0	7	64.0	1	84.8	5
MPC-1	49.8	44.6	47.2	2	66.3	68.6	67.5	4	62.4	4	88.9	4
African Tall (NC)	52.6	45.1	48.9	5	65.1	69.4	67.3	3	62.4	4	84.1	6
J-1006 (NC)	52.4	43.4	47.9	3	68.0	70.0	69.0	5	63.8	2	106.7	2
Mean	51.3	44.8	48.0		66.3	69.9	68.1		63.2		95.0	

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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 six entries along with two national checks *i.e.* Giant Bajra and Raj Bajra Chari-2 and two zonal checks was conducted at 19 centres located in four zones *viz.*, North-West, North-East, Central and South Zone of the country.

For green forage yield (q/ha), entry TSFB-10-5 (7.4%) in North East Zone was superior over the best check Giant Bajra. At national level and in other zones, none of entry performed better than the checks. For dry matter yield (q/ha), entries TSFB-13-12 (5.6%) and entry TSFB -10-5 (11.1%) were superior over the best checks in north-west and north-east zones respectively. At all India level, entry TSFB-14-10 was superior by a margin of 6.6% over the best check Giant Bajra.

For green forage production potential (q/ha/day), national check Giant Bajra was best performer, whereas for dry matter yield potential (q/ha/day), entry TSFB-14-10 was best followed by Giant Bajra. In growth parameter, entry TSFB-13-12 (213.6cm) was marginally superior over Giant Bajra (213.4 cm). For leaf stem ratio, entry RBB-6 was best followed by TSFB-14-10.

In quality parameters, for crude protein yield (q/ha), entry TSFB-14-10 ranked first (10.0q/ha) followed by Giant Bajra (9.4 q/ha). For crude protein content, entries RBB-6 and RBB-7 ranked joint first with 9.1% CP. It was followed by TSFB-14-10 (8.8%). For other quality parameters, entry RBB-6 for ADF (%), national check Giant Bajra for IVDMD (%) and DDM (q/ha) recorded their superiority.

4. AVTPM-2: SECOND ADVANCED VARIETAL TRIAL IN FORAGE PEARL MILLET

(Reference Tables: 4.1 to 4.6)

In forage pearl millet, single entry namely DFMH -30 along with three national checks *i.e.* Raj Bajra Chari-2 (RBC-2), AVKB-19 and Giant Bajra was evaluated in second advanced varietal trial conducted at seven locations situated in northwest and south zone. Results reported from different centres clearly revealed that national check Giant Bajra excelled in performance for green forage yield, crude protein yield, green and dry fodder production potential (q/ha/day). For dry matter yield (q/ha), entry DFMH -30 showed marginal superiority over the best check.

For crude protein content (%), check Raj Bajra Chari -2 (9.5%) ranked first. For IVDMD% entry DFMH -30 and Raj Bajra chari-2 ranked joint first. For other quality parameters, checks were superior.

5. AVTPM-2 (SEED): SECOND ADVANCED VARIETAL TRIAL IN FORAGE PEARL MILLET FOR SEED

(Reference Table: 5.1)

Results of the second advanced varietal trial in forage pearl millet for seed with single entry *i.e.* DFMH-30 along with three national checks *i.e.* Giant Bajra, RBC-2 and AVKB-19 conducted at six locations, three each in north west and south zone revealed national checks were superior in both zones as well as at all India level.

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			Ν	orth West	Zone					North	n East Zoi	ne		
Entries	Ludh-	His-	Bika-	Jal-	Mee-	Aver-	Ra-	Faiza-	Pu-	Bhuban-	Ran-	Aver-	Ra-	Superi-
	iana	ar	ner	ore	rut	age	nk	bad	sa	eswar	chi	age	nk	ority%
RBB-6	634.3	618.5	428.8	244.0	635.7	512.3	4	213.2	335.0	351.0	333.3	308.1	5	
TSFB-14-10	877.8	625.9	304.1	260.0	521.7	517.9	3	238.6	377.0	272.9	333.3	305.4	6	
RBB-7	638.9	570.4	347.6	239.3	705.2	500.3	6	185.5	440.0	335.4	314.7	318.9	3	
AFB-36	518.5	670.4	371.7	190.0	801.1	510.3	5	312.1	399.0	245.8	277.8	308.7	4	
TSFB-10-5	513.9	470.4	407.5	230.7	670.7	458.6	8	298.2	418.0	321.8	398.1	359.0	1	7.4
TSFB-13-12	685.2	700.0	476.8	225.3	712.1	559.9	2	295.7	378.0	216.6	296.4	296.7	7	
Giant Bajra (NC)	688.9	711.1	353.4	272.7	785.4	562.3	1	208.3	396.0	362.4	370.3	334.3	2	
Raj Bajra Chari-2 (NC)	450.5	355.6	225.3	269.3	598.6	379.9	9	173.2	335.0	302.0	351.9	290.5	8	
AFB-3 (ZC-NWZ)	659.7	629.6	341.3	250.7	602.8	496.8	7							
APFB-9-1 (ZC-NEZ)								266.3	396.0	260.4	222.2	286.2	9	
Mean	629.7	594.7	361.8	242.4	670.4	499.8		243.5	386.0	296.5	322.0	312.0		
CD at 5%	24.1	137.2	97.9	76.8	5.4			43.9	33.2	23.7	56.9			
CV%	4.3	13.6	15.6	18.3	6.4			10.4	10.7	4.6	10.1			

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

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

				Cen	tral Zone						South Z	one			A	l India
Entries	Ana-	Dha-	Jabal-	Rah-	Urulikan-	Jha-	Aver-	Ra-	Coimb-	Hydera-	Man-	Rai-	Aver-	Ra-	Aver-	Ra-
	nd	ri	pur	uri	chan	nsi	age	nk	atore	bad	dya	chur	age	nk	age	nk
RBB-6	728.0	249.1	535.3	306.0	646.3	666.7	521.9	4	379.6	319.7	224.7	213.4	284.4	5	424.3	4
TSFB-14-10	1070.0	347.2	412.4	259.7	975.5	852.8	652.9	2	527.8	472.6	249.6	325.0	393.8	2	489.7	2
RBB-7	626.0	273.1	400.0	258.8	842.3	591.7	498.7	6	356.5	296.5	154.6	300.9	277.1	7	414.6	5
AFB-36	808.0	235.2	547.8	248.6	593.1	455.6	481.4	7	407.4	333.6	159.7	249.8	287.6	4	411.8	6
TSFB-10-5	674.0	241.2	416.6	249.1	741.8	438.9	460.3	8	310.2	375.3	136.1	267.8	272.3	8	399.0	7
TSFB-13-12	668.0	338.9	493.6	414.2	670.8	452.8	506.4	5	523.1	417.0	205.3	186.8	333.1	3	439.8	3
Giant Bajra (NC)	814.0	334.7	460.3	454.2	723.9	897.2	614.1	3	629.6	528.2	217.2	339.6	428.7	1	502.5	1
Raj Bajra Chari-2 (NC)	562.0	204.6	337.4	262.1	598.0	458.3	403.7	9	379.6	319.7	171.1	261.8	283.1	6	348.2	8
BAIF Bajra 1 (ZC-CZ)	982.0	393.8	564.5	416.7	915.9	938.9	702.0	1								
Mean	770.2	290.9	463.1	318.8	745.3	639.2	537.9		439.2	382.8	189.8	268.1	320.0		428.7	
CD at 5%	49.6	53.9	101.3	51.3	84.5	56.3			69.3	33.8	34.7	70.2				
CV%	3.8	10.7	12.6	9.3	6.5	5.7			9.0	5.0	10.4	7.6				

Entrica			North	West Zone		· · · · · · · · · · · · · · · · · · ·			Nor	th East Zo	one		
Entries	Ludhiana	Hisar	Bikaner	Average	Rank	Superiority%	Faizabad	Pusa	Bhubaneswar	Ranchi	Average	Rank	Superiority%
RBB-6	114.8	147.7	115.7	126.1	4		53.5	76.5	74.1	91.1	73.8	3	
TSFB-14-10	158.6	155.3	70.5	128.1	3		58.6	85.3	57.1	85.3	71.6	6	
RBB-7	115.5	149.8	90.1	118.5	6		44.0	100.0	69.9	78.6	73.1	4	
AFB-36	93.7	159.3	91.1	114.7	7		76.7	90.3	53.5	70.0	72.6	5	
TSFB-10-5	93.0	116.6	102.3	104.0	8		73.0	96.1	66.3	99.7	83.8	1	11.1
TSFB-13-12	123.9	173.1	109.5	135.5	1	5.6	73.4	86.3	47.8	70.0	69.4	7	
Giant Bajra (NC)	125.0	176.3	83.6	128.3	2		52.9	88.6	76.4	83.6	75.4	2	
Raj Bajra Chari-2 (NC)	81.4	96.0	55.3	77.6	9		43.1	77.2	64.0	90.3	68.6	8	
AFB-3 (ZC-NWZ)	119.2	148.0	97.4	121.5	5								
APFB-9-1 (ZC-NEZ)							67.9	89.8	53.8	59.7	67.8	9	
Mean	113.9	146.9	90.6	117.1			60.4	87.8	62.5	80.9	72.9		
CD at 5%	18.6	32.3	29.1				12.9	7.8	5.8	18.9			
CV%	18.2	12.9	18.6				12.4	9.3	5.4	13.4			

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

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

					Central Zone						S	outh Zon	ie				All India	
Entries	Ana-	Dha-	Jaba-	Rah-	Urulikan-	Jha-	Aver-	Ra-	Superi-	Coimb-	Hydera-	Man-	Aver-	Ra-	Superi-	Aver-	Ra-	Superi-
	nd	ri	lpur	uri	chan	nsi	age	nk	ority%	atore	bad	dya	age	nk	ority%	age	nk	ority%
RBB-6	109.2	70.9	130.8	65.2	146.7	121.9	107.4	7		58.2	61.9	39.2	53.1	5		92.3	4	
TSFB-14-10	297.6	86.8	96.0	52.0	223.1	155.9	151.9	2		78.5	106.3	47.8	77.5	1		113.4	1	6.6
RBB-7	131.4	76.3	88.7	51.8	188.4	108.2	107.5	6		47.8	58.7	28.9	45.1	8		89.3	6	
AFB-36	198.2	72.8	133.3	52.5	132.4	83.3	112.1	5		58.2	59.9	35.1	51.1	6		91.3	5	
TSFB-10-5	183.6	68.3	97.0	54.3	154.2	80.3	106.3	8		45.3	70.0	29.5	48.3	7		89.3	6	
TSFB-13-12	158.4	95.3	119.9	95.1	144.2	82.8	116.0	4		71.9	75.0	41.8	62.9	3		98.0	3	
Giant Bajra (NC)	190.3	78.5	111.4	92.2	158.0	164.1	132.4	3		81.6	103.0	36.2	73.6	2		106.4	2	
Raj Bajra Chari-2 (NC)	121.6	58.7	77.9	58.0	139.2	83.8	89.9	9		55.5	67.3	39.1	54.0	4		75.5	7	
BAIF Bajra 1 (ZC-CZ)	277.4	73.2	138.1	81.0	228.8	171.8	161.7	1										
Mean	185.3	75.6	110.3	66.9	168.3	116.9	120.6			62.1	75.3	37.2	58.2			94.4		
CD at 5%	11.6	17.8	22.2	10.9	19.0	10.9				16.7	13.2	7.8						
CV%	3.8	13.6	11.7	9.4	6.4	5.4				15.4	10.0	11.9						

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

E at the	Ludh-	His-	Bika-	Pu-	Bhuban-	Faiza-	Ran-	Ana-	Jabal-	Rah-	Urulikan-	Dha-	Hydera-	Coimb-	Man-	Aver-	Ra-
Entries	iana	ar	ner	sa	eswar	bad	chi	nd	pur	uri	chan	ri	bad	atore	dya	age	nk
RBB-6	9.20	10.66	7.66	5.32	5.11	3.43	8.77	13.00	6.01	5.67	11.14	3.48	7.30	8.08	6.47	7.42	4
TSFB-14-10	12.70	10.10	4.17	5.89	4.20	3.78	9.52	14.46	4.74	3.88	13.55	3.83	8.40	9.96	5.20	7.62	2
RBB-7	9.30	10.19	6.21	6.98	5.06	3.09	8.28	10.61	4.44	5.18	13.16	3.79	6.70	7.75	4.55	7.02	5
AFB-36	7.50	11.97	6.64	6.23	3.53	5.11	6.61	12.44	6.36	4.52	8.99	3.11	7.60	8.67	3.82	6.87	7
TSFB-10-5	7.40	7.97	7.28	6.53	4.73	4.73	9.04	10.37	4.84	4.98	14.84	3.30	8.20	6.60	3.79	6.97	6
TSFB-13-12	9.90	11.67	8.51	5.91	3.23	4.77	7.41	9.82	5.54	7.14	9.86	4.00	9.30	10.26	4.78	7.47	3
Giant Bajra (NC)	10.00	11.85	4.84	6.19	5.33	3.25	9.49	12.15	5.23	7.70	9.78	3.74	9.00	11.88	4.53	7.66	1
Raj Bajra Chari-2 (NC)	6.50	6.24	4.02	5.32	4.51	2.93	10.05	9.07	3.79	5.24	9.97	2.83	7.40	8.44	4.74	6.07	8
AFB-3 (ZC-NWZ)	9.60	11.24	6.09														
APFB-9-1 (ZC-NEZ)				6.19	3.67	4.22	6.17										
BAIF Bajra 1 (ZC-CZ)								13.27	6.41	6.95	12.05	4.27					
Mean	9.12	10.21	6.16	6.06	4.37	3.92	8.37	11.69	5.26	5.69	11.48	3.59	7.99	8.95	4.74	7.14	

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

Entrica	Ludh-	His-	Bika-	Pu-	Ran-	Bhuban-	Faiza-	Ana-	Rah-	Jabal-	Urulikan-	Hydera-	Coimb-	Aver-	Ra-
Elitries	iana	ar	ner	sa	chi	eswar	bad	nd	uri	pur	chan	bad	atore	age	nk
RBB-6	1.70	2.55	2.07	1.21	2.40	1.08	0.86	1.95	1.21	1.46	2.53	1.40	1.24	1.67	4
TSFB-14-10	2.30	2.50	0.97	1.33	2.44	0.88	0.93	4.02	0.78	1.10	3.10	1.90	1.48	1.83	1
RBB-7	1.70	2.68	1.61	1.59	2.07	1.05	0.73	2.23	1.04	0.98	2.94	1.30	1.04	1.61	7
AFB-36	1.40	2.85	1.63	1.41	1.66	0.77	1.25	3.05	0.96	1.55	2.01	1.40	1.24	1.63	6
TSFB-10-5	1.30	1.98	1.83	1.50	2.26	0.98	1.15	2.82	1.09	1.12	3.08	1.50	0.96	1.66	5
TSFB-13-12	1.80	2.89	1.96	1.35	1.75	0.71	1.18	2.33	1.64	1.34	2.12	1.70	1.41	1.71	3
Giant Bajra (NC)	1.80	2.94	1.15	1.38	2.14	1.12	0.83	2.84	1.56	1.26	2.14	1.70	1.54	1.72	2
Raj Bajra Chari-2 (NC)	1.20	1.68	0.99	1.23	2.58	0.95	0.73	1.96	1.16	0.89	2.32	1.60	1.23	1.42	8
AFB-3 (ZC-NWZ)	1.70	2.64	1.74												
APFB-9-1 (ZC-NEZ)				1.40	1.66	0.76	1.08								
BAIF Bajra 1 (ZC-CZ)								3.75	1.35	1.56	3.01				
Mean	1.66	2.52	1.55	1.38	2.11	0.92	0.97	2.77	1.20	1.25	2.58	1.56	1.27	1.66	

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

Entries	Hisar	Bikaner	Faizabad	Bhubaneswar	Anand	Jabalpur	Rahuri	Urulikanchan	Coimbatore	Hyderabad	*Ludhiana	Average	Rank
RBB-6	15.2	10.2	4.7	5.6	11.7	10.2	5.4	13.0	7.1	5.1	5.7	8.8	4
TSFB-14-10	16.0	6.5	4.8	4.6	16.9	7.5	5.2	21.0	9.7	8.4	8.9	10.0	1
RBB-7	16.4	4.8	3.6	5.5	13.5	6.6	5.1	16.4	5.9	5.9	3.6	8.4	6
AFB-36	17.1	7.9	6.2	4.0	12.5	10.0	4.7	11.8	5.1	6.0	5.1	8.5	5
TSFB-10-5	13.3	8.1	5.8	5.5	12.0	7.5	5.4	13.2	5.2	5.5	4.8	8.1	7
TSFB-13-12	18.6	5.8	5.8	3.5	11.6	8.9	8.3	13.2	8.8	6.2	4.5	9.1	3
Giant Bajra (NC)	18.1	8.1	4.2	6.0	11.2	8.5	8.3	14.8	8.8	5.4	5.9	9.4	2
Raj Bajra Chari-2 (NC)	9.9	4.5	3.8	5.3	11.4	5.6	5.3	12.9	6.1	3.9	4.0	6.9	8
AFB-3 (ZC-NWZ)	15.5	9.2									6.8		
APFB-9-1 (ZC-NEZ)			5.4	4.3									
BAIF Bajra 1 (ZC-CZ)					17.0	10.8	6.8	21.5					
Mean	15.6	7.2	4.9	4.9	13.1	8.4	6.1	15.3	7.1	5.8	5.5	8.6	

Note: * not included in average due to low yield of data

Entries	Hisar	Faizabad	Anand	Jabalpur	Rahuri	Urulikanchan	Bikaner	Bhubaneswar	Coimbatore	Hyderabad	*Ludhiana	Average	Rank
RBB-6	10.3	8.7	10.7	7.9	8.3	8.9	8.8	7.5	12.3	8.1	5.0	9.1	1
TSFB-14-10	10.3	8.2	5.7	7.3	9.9	9.4	9.2	8.0	12.3	7.9	5.6	8.8	2
RBB-7	10.9	8.1	10.2	7.7	9.9	8.7	5.3	7.9	12.3	10.1	3.1	9.1	1
AFB-36	10.7	8.1	6.3	7.7	9.0	8.9	8.7	7.4	8.7	10.1	5.4	8.6	4
TSFB-10-5	11.4	7.9	6.6	7.8	9.9	8.6	7.9	8.2	11.4	7.9	5.2	8.8	2
TSFB-13-12	10.7	7.9	7.4	7.4	8.7	9.2	5.3	7.3	12.3	8.3	3.6	8.4	5
Giant Bajra (NC)	10.3	8.0	5.9	7.8	9.0	9.4	9.7	7.8	10.9	5.2	4.7	8.4	5
Raj Bajra Chari-2 (NC)	10.3	8.8	9.4	7.4	9.2	9.3	8.2	8.3	10.9	5.7	4.9	8.7	3
AFB-3 (ZC-NWZ)	10.5						9.4				5.7		
APFB-9-1 (ZC-NEZ)		7.9						7.9					
BAIF Bajra 1 (ZC-CZ)			6.1	7.9	8.4	9.4							
Mean	10.6	8.2	7.6	7.6	9.2	9.1	8.0	7.8	11.4	7.9	4.8	8.7	

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

Note: * Not included in average due to CP (%) is very low

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

Entrico	Ludh-	His-	Bika-	Bhuban-	Faiza-	Ran-	Ana-	Dha-	Jabal-	Rah-	Urulikan-	Jha-	Hydera-	Coimba-	Man-	Rai-	Aver-	Ra-
Entries	iana	ar	ner	eswar	bad	chi	nd	ri	pur	uri	chan	nsi	bad	tore	dya	chur	age	nk
RBB-6	278.3	263.9	190.0	231.4	182.5	169.0	207.0	168.1	225.2	189.1	217.6	270.2	177.0	220.0	152.9	150.0	205.8	5
TSFB-14-10	280.0	212.0	140.0	202.3	179.4	174.0	240.0	186.9	194.8	234.8	231.9	314.3	220.9	205.0	148.8	155.0	207.5	3
RBB-7	282.3	286.7	144.0	226.5	180.7	174.0	208.0	158.4	194.5	205.6	205.4	270.9	156.2	227.9	146.9	207.0	204.7	8
AFB-36	281.7	273.6	179.0	189.5	189.4	152.0	236.0	172.6	221.0	199.2	220.5	304.6	172.7	241.5	128.4	143.0	206.5	4
TSFB-10-5	275.0	262.4	161.0	218.4	190.2	170.0	224.0	159.9	199.7	190.0	217.3	273.5	171.9	229.1	140.2	204.0	205.4	6
TSFB-13-12	293.3	275.2	134.0	175.7	195.7	169.0	225.0	183.8	219.3	209.4	251.3	333.4	197.8	242.9	160.5	151.0	213.6	1
Giant Bajra (NC)	283.3	226.9	150.0	237.5	175.5	176.0	216.0	196.7	204.9	203.2	216.4	314.9	205.6	257.9	152.9	197.0	213.4	2
Raj Bajra Chari-2 (NC)	303.3	251.3	164.0	207.6	188.5	162.0	214.0	157.2	182.4	207.0	245.6	277.7	179.9	235.5	127.3	174.0	204.8	7
AFB-3 (ZC-NWZ)	310.0	255.1	178.0															
APFB-9-1 (ZC-NEZ)				194.6	199.8	170.0												
BAIF Bajra 1 (ZC-CZ)							247.0	207.4	233.3	226.2	234.5	320.1						
Mean	287.5	256.3	160.0	209.3	186.9	168.4	224.1	176.8	208.3	207.2	226.7	297.7	185.3	232.5	144.7	172.6	207.7	

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Entrico	Ludh-	His-	Bika-	Faiza-	Ran-	Bhuban-	Jaba-	Rah-	Ana-	Urulikan-	Jha-	Hydera-	Coimb-	Man-	Aver-	Ra-
Elitries	iana	ar	ner	bad	chi	eswar	lpur	uri	nd	chan	nsi	bad	atore	dya	age	nk
RBB-6	0.43	0.62	0.24	0.75	0.38	1.07	0.60	0.33	1.34	0.52	0.33	0.20	0.29	0.28	0.53	1
TSFB-14-10	0.82	0.61	0.79	0.76	0.40	0.86	0.45	0.29	0.73	0.45	0.21	0.20	0.25	0.31	0.51	2
RBB-7	0.25	0.76	0.44	0.78	0.34	0.98	0.45	0.36	0.56	0.48	0.36	0.20	0.19	0.25	0.46	5
AFB-36	0.35	0.54	0.38	0.71	0.34	0.83	0.57	0.38	0.61	0.52	0.51	0.20	0.18	0.27	0.46	5
TSFB-10-5	0.72	0.65	0.33	0.72	0.31	0.95	0.48	0.31	1.07	0.48	0.22	0.30	0.20	0.28	0.50	3
TSFB-13-12	0.29	0.60	0.25	0.72	0.37	0.79	0.52	0.25	1.00	0.58	0.34	0.20	0.23	0.28	0.46	5
Giant Bajra (NC)	0.25	0.42	0.59	0.77	0.45	1.02	0.50	0.32	1.18	0.46	0.21	0.20	0.18	0.28	0.49	4
Raj Bajra Chari-2 (NC)	0.35	0.53	0.37	0.74	0.35	0.93	0.48	0.46	0.56	0.37	0.29	0.20	0.18	0.27	0.43	6
AFB-3 (ZC-NWZ)	0.18	0.70	0.38													
APFB-9-1 (ZC-NEZ)				0.75	0.24	0.89										
BAIF Bajra 1 (ZC-CZ)							0.60	0.28	1.67	0.54	0.20					
Mean	0.40	0.60	0.42	0.74	0.35	0.92	0.52	0.33	0.97	0.49	0.30	0.21	0.21	0.28	0.48	

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

Table 3.9 IVTPM: Initial Varietal Trial in Forage Pearl millet (New): ADF (%), NDF (%), IVDMD (%) & DDM (q/ha)

Entrico	ADF (%)		NDF	(%)		IVDMD (%)		DDM(q/ha)
Entries	Ludhiana	Rank	Ludhiana	Rank	Hisar	Rank	Hisar	Rank
RBB-6	40.6	1	63.5	5	52.4	7	77.4	7
TSFB-14-10	41.2	2	63.2	4	59.4	2	92.2	3
RBB-7	45.2	8	67.2	9	54.6	6	81.8	6
AFB-36	41.2	2	62.2	3	55.0	5	87.6	4
TSFB-10-5	41.8	4	63.7	6	50.6	8	59.0	8
TSFB-13-12	44.3	7	64.8	7	58.2	3	100.8	2
Giant Bajra (NC)	41.9	5	65.3	8	59.6	1	105.1	1
Raj Bajra Chari-2 (NC)	43.4	6	60.3	2	57.0	4	54.7	9
AFB-3 (ZC-NWZ)	41.4	3	58.4	1	57.0	4	84.3	5
APFB-9-1 (ZC-NEZ)								
BAIF Bajra 1 (ZC-CZ)								
Mean	42.3		63.2		56.0		82.5	

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

			North W	Vest Zon	e				South Zon	e			All	India
Entries	Ludh-	His-	Bika-	Jal-	Aver-	Ra-	Coimb-	Hydera-	Man-	Karai-	Aver-	Ra-	Aver-	Ra-
	iana	ar	ner	ore	age	nk	atore	bad	dya	Kal	age	nk	age	nk
DFMH-30	795.0	581.7	354.6	367.7	524.7	2	548.3	558.1	373.7	296.1	444.0	2	484.4	2
Raj Bajra Chari-2 (NC)	453.3	425.0	285.9	403.3	391.9	4	463.3	301.5	174.5	359.5	324.7	4	358.3	4
AVKB-19 (NC)	528.3	501.7	264.3	388.7	420.7	3	428.3	333.2	242.3	346.3	337.5	3	379.1	3
Giant Bajra (NC)	826.7	590.0	531.5	384.7	583.2	1	581.7	579.8	398.2	219.0	444.7	1	513.9	1
Mean	650.8	524.6	359.0	386.1	480.1		505.4	443.2	297.2	305.2				
CD at 5(%)	80.8	73.2	77.9				29.4	32.7	26.2	51.2				
CV (%)	6.3	10.6	15.8	3.3			4.2	5.4	6.4	12.2				

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

		N	orth Wes	t Zone				Sou	uth Zone				All	India
Entries	Ludh-	His-	Bika-	Avon ago	Ra-	Coimb-	Hydera-	Man-	Karai-	Aver-	Ra-	Superi-	Aver-	Ra-
	iana	ar	ner	Aver-age	nk	atore	bad	dya	Kal	age	nk	ority%	age	nk
DFMH-30	143.9	155.3	77.8	125.7	2	82.0	121.5	71.9	55.7	82.8	1	0.24	101.2	2
Raj Bajra Chari-2 (NC)	82.2	110.2	77.0	89.8	4	72.5	54.6	31.5	78.4	59.2	4		72.3	4
AVKB-19 (NC)	95.8	131.4	70.5	99.2	3	64.6	56.5	58.3	69.0	62.1	3		78.0	3
Giant Bara (NC)	149.8	169.2	118.3	145.8	1	96.9	118.3	77.4	37.9	82.6	2		109.7	1
Mean	117.9	141.5	85.9	115.1		79.0	87.7	59.8	60.2	71.7			90.3	
CD at 5(%)	22.6	25.2	20.5			4.2	13.0	9.8	9.2					
CV (%)	9.7	13.6	17.3			3.9	10.8	11.9	11.1					

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

				GF	Y (q/na/da	y)							DNIY (C	q/na/day)			
Entries	Ludh-	His-	Bika-	Coimb-	Hydera-	Man-	Karai-	Aver-	Ra-	Ludh-	His-	Bika-	Coimb-	Hydera-	Karai-	Aver-	Ra-
	iana	ar	ner	atore	bad	dya	kal	age	nk	iana	ar	ner	atore	bad	kal	age	nk
DFMH-30	11.70	9.38	6.45	10.97	9.10	7.82	5.31	8.68	2	2.10	2.50	1.41	1.64	2.00	1.00	1.78	2
Raj Bajra Chari-2 (NC)	6.70	6.85	5.20	10.07	6.30	4.45	7.75	6.76	4	1.20	1.78	1.40	1.58	1.10	1.69	1.46	4
AVKB-19 (NC)	7.80	8.50	4.80	9.31	6.50	6.44	7.65	7.29	3	1.40	2.23	1.28	1.41	1.10	1.52	1.49	3
Giant Bara (NC)	12.20	9.52	7.38	11.19	9.30	8.13	3.41	8.73	1	2.20	2.73	1.64	1.86	1.90	0.59	1.82	1
Mean	9.60	8.56	5.96	10.38	7.80	6.71	6.03	7.86		1.73	2.31	1.43	1.62	1.53	1.20	1.64	

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				CPY (q/ha	ı)						СР	(%)			
Entries	Ludh-	His-	Bika-	Coimb-	Hydera-	Aver-	Ra-	Ludh-	His-	Bika-	Coimba-	Hydera-	Karai-	Aver-	Ra-
	iana	ar	ner	atore	bad	age	nk	iana	ar	ner	tore	bad	kal	age	nk
DFMH-30	9.4	17.3	5.1	10.1	15.4	11.5	2	6.5	11.2	6.6	12.3	12.7	5.3	9.1	2
Raj Bajra Chari-2 (NC)	7.0	11.8	5.5	7.9	6.2	7.7	4	8.5	10.7	7.1	10.9	11.4	8.3	9.5	1
AVKB-19 (NC)	5.8	15.2	3.7	7.6	6.7	7.8	3	6.1	11.6	5.2	11.8	11.8	6.1	8.8	3
Giant Bara (NC)	12.0	18.9	7.3	11.0	12.4	12.3	1	8.0	11.2	6.2	11.4	10.5	4.4	8.6	4
Mean	8.6	15.8	5.4	9.2	10.2	9.8		7.3	11.2	6.3	11.6	11.6	6.0	9.0	

Table 4.4 AVTPM-2: Second Advanced Varietal Trial in Forage Pearl millet: Crude Protein Yield (q/ha) & Crude Protein (%)

Table 4.5 AVTPM-2: Second Advanced Varietal Trial in Forage Pearl millet: Plant Height (cm) & Leaf Stem Ratio

				Plant	: Height (cm	ı)							Lea	of Stem Rati	io			
Entries	Ludh-	His-	Bika-	Coimba-	Hydera-	Man-	Karai-	Aver-	Ra-	Ludh-	His-	Bika-	Coimb-	Hydera-	Man-	Karai-	Aver-	Ra-
	iana	ar	ner	tore	bad	dya	kal	age	nk	iana	ar	ner	atore	bad	dya	kal	age	nk
DFMH-30	295.0	231.9	154.0	252.9	219.5	196.0	182.5	218.8	3	0.27	0.51	0.34	0.19	0.19	0.22	0.36	0.30	3
Raj Bajra Chari-2 (NC)	325.0	248.0	245.0	214.9	173.4	187.1	197.4	227.2	1	0.30	0.63	0.21	0.17	0.21	0.22	0.46	0.31	2
AVKB-19 (NC)	310.0	239.9	213.0	231.7	173.3	196.0	198.1	223.2	2	0.33	0.55	0.17	0.18	0.18	0.23	0.40	0.29	4
Giant Bara (NC)	292.3	225.1	175.0	262.1	237.1	192.3	178.8	223.2	2	0.67	0.56	0.50	0.23	0.22	0.28	0.32	0.40	1
Mean	305.6	236.2	196.8	240.4	200.8	192.9	189.2	223.1		0.39	0.56	0.31	0.19	0.20	0.24	0.39	0.33	

Table 4.6 AVTPM-2: Second Advanced Varietal Trial in Forage Pearl millet: ADF (%), NDF (%), IVDMD (%) & DDM (q/ha)

Entries	ADF (%	(j)	NDF (%	()	ÍVDM	ID (%)	DDM	(q/ha)
Entries	Ludhiana	Rank	Ludhiana	Rank	Hisar	Rank	Hisar	Rank
DFMH-30	43.4	4	72.1	4	59.8	1	92.9	2
Raj Bajra Chari-2 (NC)	36.1	1	63.3	1	59.8	1	65.9	4
AVKB-19 (NC)	43.0	3	68.1	3	59.0	2	77.5	3
Giant Bara (NC)	41.1	2	67.9	2	57.8	3	97.8	1
Mean	40.9		67.9		59.1		83.5	

		Ν	orth West	Zone			So	outh Zone			Α	ll India
Entries	Ludh-	His-	Bika-	Aver-	Ra-	Coimb-	Hydera-	Man-	Aver-	Ra-	Aver-	Ra-
	iana	ar	ner	age	nk	atore	bad	dya	age	nk	age	nk
DFMH-30	12.80	6.38	5.75	8.31	4	13.27	7.90	11.10	10.76	4	9.53	4
Raj Bajra Chari-2 (NC)	12.90	8.32	11.51	10.91	2	4.67	9.80	20.50	11.66	3	11.28	3
AVKB-19 (NC)	14.70	9.98	13.42	12.70	1	17.42	6.20	12.60	12.07	2	12.39	2
Giant Bajra (NC)	13.70	8.00	3.48	8.39	3	26.05	15.50	9.30	16.95	1	12.67	1
Mean	13.5	8.2	8.5	10.1		15.3	9.9	13.4	12.9		11.5	
CD at 5(%)	2.1	1.9	2.2			2.3	2.3	2.3				
CV (%)	6.7	17.9	18.7			11.4	17.1	13.0				

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

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6. IVTC: INITIAL VARIETAL TRIAL IN FORAGE COWPEA

(Reference Tables: 6.1 to 6.9)

In forage cowpea, six entries along with two national checks namely Bundel Lobia-1 and UPC-5286 and five 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 -8-14 for south zone were evaluated in initial varietal trial at 27 locations across the five zones.

For green forage yield (q/ha), entry TSFC-12-15 in north east, central and south zones exhibited superiority over best national/zonal check. At national level entry TSFC-12-15 (7.5%) and entry MFC 09-3 (1.2%) were superior over best check.

For dry matter yield (q/ha), entries UPC 1501 and Vellyani -1 showed superiority in north west zone by a margin of 8.3% and 7.3% respectively. In north east and central zone, entry TSFC-12-15 exhibited superiority by a margin of 5.3% and 6.3% respectively.

For green and dry fodder production potential (q/ha/day), entry TSFC-12-15 ranked first followed by national check Bundel Lobia-1. For crude protein yield (q/ha), entries TSFC-12-15 and MFC-09-13 ranked first and second respectively. For plant height, check variety Bundel Lobia-1 (147.9 cm) and for leafiness (L/S ratio), entry UPC 1501 ranked first.

For crude protein content (%), entries MFC-09-3, MFC -09-13 and mFC -09-4 ranked joint first with average CP % of 15.7, which was closely followed by TSFC-12-15 (15.6%). were superior. For other quality parameters, entry MFC -09-13 for ADF (%), entry TSFC-12-15 for NDF%, entry MFC 09-3 for IVDMD % and national check Bundle Lobia -1 for DMD q/ha ranked first.

7. AVTC-2: SECOND ADVANCED VARIETAL TRIAL IN FORAGE COWPEA

(Reference Tables: 7.1 to 7.4)

In forage cowpea, single entry namely TNFC-0926 along with national checks namely Bundel Lobia-1 (BL-1) and UPC-5286 and one zonal check *i.e.* UPC-622 was tested at 05 locations in north east zone.

For green forage yield (q/ha), zonal check ranked first followed by test entry TNFC-0926. For dry matter yield (q/ha), entry TNFC-0926 ranked first with 8.7 per cent superiority over the best check. For fodder production potential (q/ha/day), zonal check UPC 622 maintained superiority both for green forage and dry matter production potential.

For crude protein yield, test entry TNFC 0926 ranked first with marginal superiority over the best check. For crude protein percent however, zonal check UPC 622 was adjudged best.

For plant height, zonal check UPC 622 (160.9 cm) and for leafiness, test entry TNFC 0926 was superior.

8. AVTC-2: SECOND ADVANCED VARIETAL TRIAL IN FORAGE COWPEA (SEED) (Reference Table: 8.1)

In forage cowpea, single entry namely TNFC-0926 along with national checks namely Bundel Lobia-1 (BL-1) and UPC-5286 and one zonal check *i.e.* UPC-622 was tested at 05 locations in north east zone. National check Bundel Lobia -1 ranked first.

		Hill Z	one					Nort	h West Zor	ne			
Entries	Alm-	Sri-	Aver-	Ra-	Ludh-	Hi-	Pant-	Bika-	Udai-	Jal-	Mee-	Aver-	Ra-
	ora	nagar	age	nk	iana	sar	nagar	ner	pur	ore	rut	age	nk
TSFC-12-15	130.7	142.3	136.5	4	465.3	440.7	237.5	204.5	194.4	281.0	509.8	333.3	4
MFC-09-3	132.5	136.2	134.4	6	421.3	411.1	260.4	226.8	199.9	291.0	466.0	325.2	6
MFC-09-13	47.2	183.4	115.3	9	425.9	400.0	272.0	247.2	166.4	267.7	494.5	324.8	7
UPC-1501	120.1	149.2	134.7	5	467.6	370.4	359.1	294.2	98.2	256.3	533.1	339.8	2
MFC-09-4	153.9	126.7	140.3	2	425.9	385.2	165.0	213.4	177.8	262.0	493.5	303.3	9
Vellayani-1	121.1	135.5	128.3	7	486.1	403.7	245.4	271.2	140.4	265.7	521.9	333.5	3
UPC-5286 (NC)	98.3	156.3	127.3	8	384.3	374.1	246.3	314.7	136.9	331.0	522.3	329.9	5
Bundel Lobia-1 (NC)	120.3	172.2	146.3	1	458.3	466.7	200.0	317.4	217.4	281.7	550.8	356.0	1
UPC-622 (ZC-HZ)	114.9	162.9	138.9	3									
Bundel Lobia-2 (ZC-NWZ)					444.4	433.3	246.6	208.0	190.6	255.0	444.5	317.5	8
Mean	115.4	151.6	133.5		442.1	409.5	248.0	255.3	169.1	276.8	504.0	329.3	
CD at 5%	38.0	8.2			NS	71.4	29.9	67.2	34.3	43.6	3.3		
CV%	18.8	5.6			8.0	10.3	7.0	15.2	11.6	9.1	6.4		

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

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

				Nort	h East Zo	one							С	entral Zo	ne			
Entries	Faiza-	Kal-	Bhuban-	Jor-	Ran-	Imp-	Aver-	Ra-	Superi-	Ana-	Jha-	Rah-	Urulikan-	Kan-	Rai-	Aver-	Ra-	Superi-
	bad	yani	eswar	hat	chi	hal	age	nk	ority%	nd	nsi	uri	chan	pur	pur	age	nk	ority%
TSFC-12-15	183.0	300.5	308.3	405.9	240.8	278.7	286.2	1	4.9	317.0	325.0	360.2	448.6	379.6	318.1	358.1	1	4.0
MFC-09-3	96.4	294.4	287.5	308.7	305.6	287.4	263.3	5		346.0	165.3	444.0	347.2	347.2	281.1	321.8	4	
MFC-09-13	178.9	302.8	252.0	355.5	222.2	299.0	268.4	3		345.0	187.1	371.3	421.7	240.7	257.8	303.9	7	
UPC-1501	159.3	266.6	297.9	329.6	231.4	303.3	264.7	4		435.0	252.4	318.1	255.1	231.5	221.0	285.5	9	
MFC-09-4	107.8	261.1	248.9	278.8	250.0	272.9	236.6	8		339.0	163.4	372.3	430.5	305.6	305.6	319.4	5	
Vellayani-1	140.5	290.7	239.6	190.5	231.4	279.3	228.7	9		349.0	128.3	338.0	375.9	250.0	322.4	293.9	8	
UPC-5286 (NC)	134.0	272.2	244.8	253.8	222.2	321.5	241.4	6		326.0	150.9	299.1	363.8	370.4	433.4	323.9	3	
Bundel Lobia-1 (NC)	142.2	296.8	281.2	220.9	194.4	307.3	240.5	7		337.0	243.1	380.1	429.6	231.5	266.4	314.6	6	
UPC-628 (ZC-NEZ)	135.6	344.4	319.7	296.7	175.8	363.9	272.7	2										
UPC-9202 (ZC-CZ)										424.0	194.9	409.3	424.5	291.7	320.8	344.2	2	
Mean	142.0	292.2	275.5	293.4	230.4	301.5	255.8			357.6	201.1	365.8	388.5	294.2	303.0	318.4		
CD at 5 (%)	30.1	23.5	20.8	10.2	61.7	19.5				24.8	5.5	49.7	45.9	32.8	24.1			
CV (%)	12.2	6.8	3.5	11.4	15.3	3.7				4.0	15.9	7.8	6.8	6.4	4.0			

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Entries		8		Sout	th Zone	/					All In	dia
Littles	Coimbatore	Karaikkal	Mandya	Hyderabad	Dharwad	Vellayani	Average	Rank	Superiority%	Average	Rank	Superiority%
TSFC-12-15	347.2	302.1	294.1	224.7	329.0	305.6	300.4	1	4.0	306.5	1	7.5
MFC-09-3	319.4	287.0	306.4	296.5	324.1	201.4	289.1	2	0.1	288.5	2	1.2
MFC-09-13	319.4	324.8	259.3	254.8	310.2	187.5	276.0	4		281.3	5	
UPC-1501	277.8	176.7	163.9	171.4	300.9	201.1	215.3	9		268.2	8	
MFC-09-4	356.5	242.9	241.6	217.8	300.9	250.0	268.3	6		272.2	6	
Vellayani-1	310.2	199.5	207.3	291.9	361.1	187.5	259.6	8		269.8	7	
UPC-5286 (NC)	342.6	323.4	279.0	217.8	319.4	250.0	288.7	3		284.8	4	
Bundel Lobia-1 (NC)	351.9	277.8	172.1	305.8	277.8	194.5	263.3	7		285.0	3	
MFC-8-14 (ZC-SZ)	361.1	418.1	199.2	164.5	305.6	173.6	270.3	5				
Mean	331.8	283.6	235.9	238.4	314.3	216.8	270.1			282.0		
CD at 5 (%)	37.9	58.7	51.0	42.8	51.3	14.1						
CV (%)	6.6	12.0	12.5	10.4	9.4	3.7						

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

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

Entrica			Hill Zone						North W	est Zone			
Entries	Almora	Srinagar	Average	Rank	Superiority%	Ludhiana	Hisar	Pantnagar	Bikaner	Meerut	Average	Rank S	Superiority%
TSFC-12-15	29.8	23.2	26.5	4		81.4	94.3	31.8	28.1	161.6	79.4	4	
MFC-09-3	32.5	23.5	28.0	3		73.7	93.4	26.3	32.4	146.1	74.4	9	
MFC-09-13	9.6	29.6	19.6	9		74.5	98.9	37.5	34.6	147.9	78.7	5	
UPC-1501	27.6	25.0	26.3	5		81.7	82.7	56.4	46.5	169.2	87.3	1	8.3
MFC-09-4	38.6	21.6	30.1	2		74.5	97.0	22.5	33.5	157.1	76.9	6	
Vellayani-1	24.8	21.7	23.2	7		85.1	99.9	30.6	35.2	181.6	86.5	2	7.3
UPC-5286 (NC)	19.2	25.5	22.3	8		67.2	77.5	34.4	38.4	162.6	76.0	7	
Bundel Lobia-1 (NC)	33.0	28.4	30.7	1		80.3	101.2	28.8	41.7	151.2	80.6	3	
UPC-622 (ZC-HZ)	26.0	26.5	26.2	6									
Bundel Lobia-2 (ZC-NWZ)						77.8	98.2	35.1	26.8	137.9	75.2	8	
Mean	26.8	25.0	25.9			77.4	93.7	33.7	35.3	157.2	79.4		
CD at 5%	8.8	2.8				NS	16.0	4.6	11.1	2.2			
CV%	18.7	3.7				13.4	9.8	7.8	18.2	13.0			

				North	East Zo	ne							Centr	al Zone				
Entries	Faiza-	Kal-	Bhuban-	Jor-	Imp-	*Ran-	Aver-	Ra-	Superi-	Ana-	Jha-	Rah-	Urulikan-	Kan-	Rai-	Aver-	Ra-	Superi-
	bad	yani	eswar	hat	hal	chi	age	nk	ority%	nd	nsi	uri	chan	pur	pur	age	nk	ority%
TSFC-12-15	41.5	66.4	67.8	79.2	50.1	49.4	61.0	1	5.3	45.4	79.4	47.9	65.1	35.3	52.2	54.2	1	6.3
MFC-09-3	23.0	63.3	62.5	60.2	49.2	67.5	51.6	5		49.0	43.5	57.1	43.5	22.2	52.6	44.7	8	
MFC-09-13	43.4	68.1	52.0	69.7	57.2	37.8	58.1	2	0.3	49.0	51.3	49.3	54.1	30.3	45.3	46.5	5	
UPC-1501	37.6	54.6	64.0	60.7	49.6	45.8	53.3	4		63.9	63.1	42.5	39.1	22.0	48.7	46.5	5	
MFC-09-4	25.8	54.3	56.2	47.3	45.2	43.9	45.8	8		46.7	44.1	53.4	61.3	27.1	47.1	46.6	4	
Vellayani-1	32.7	59.6	50.6	29.8	46.0	47.2	43.7	9		51.5	33.0	48.9	56.5	23.8	64.2	46.3	6	
UPC-5286 (NC)	31.9	59.2	54.5	48.0	60.7	48.1	50.9	6		53.0	37.7	45.0	48.4	25.7	79.2	48.2	3	
Bundel Lobia-1 (NC)	34.1	61.7	58.3	41.1	50.5	34.7	49.1	7		44.7	60.8	45.7	63.3	22.1	40.9	46.2	7	
UPC-628 (ZC-NEZ)	33.2	74.6	66.8	48.7	66.3	20.8	57.9	3										
UPC-9202 (ZC-CZ)										69.0	53.4	52.9	64.2	21.2	45.6	51.0	2	
Mean	33.7	62.4	59.2	53.8	52.7	43.9	52.4			52.5	51.8	49.2	55.1	25.5	52.9	47.8		
CD at 5 (%)	7.9	9.7	3.3	2.6	8.4	15.6				3.7	11.4	6.5	6.5	2.9	7.2			
CV (%)	13.7	4.5	3.2	6.8	9.2	20.5				4.1	12.8	7.7	6.7	6.5	6.9			

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

Note: * Not included in zonal and All India Average due to CV≥ 20

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

Entries				S	outh Zone						All	India
Entries	Coimbatore	Karaikkal	Mandya	Hyderabad	Dharwad	Vellayani	Average	Rank	Superiority%	Average	Rank	Superiority%
TSFC-12-15	46.6	39.4	49.0	48.1	69.0	48.9	50.1	2		57.6	1	8.1
MFC-09-3	34.9	51.8	50.8	58.6	69.9	22.8	48.1	3		51.8	5	
MFC-09-13	51.6	61.9	29.9	55.7	65.5	18.1	47.1	4		53.5	2	0.4
UPC-1501	41.9	39.7	26.5	38.1	64.2	21.5	38.6	9		52.8	4	
MFC-09-4	49.4	39.9	36.2	50.2	62.5	35.1	45.5	6		51.1	6	
Vellayani-1	49.3	33.4	34.4	50.5	81.0	19.4	44.7	7		51.8	5	
UPC-5286 (NC)	49.9	56.4	54.8	50.2	62.6	37.5	51.9	1		53.3	3	
Bundel Lobia-1 (NC)	57.8	48.4	30.0	64.6	58.8	18.8	46.4	5		52.8	4	
MFC-8-14 (ZC-SZ)	55.8	53.6	35.8	36.1	62.2	16.2	43.3	8				
Mean	48.6	47.2	38.6	50.2	66.2	26.5	46.2			53.1		
CD at 5 (%)	7.1	12.7	9.1	13.6	11.8	3.6						
CV (%)	8.4	15.6	13.7	15.4	10.3	7.9						

Entrico	Sri-	Ludh-	His-	Pant-	Bika-	Faiza-	Bhuban-	Jor-	Ran-	Ana-	Jha-	Rah-	Urulikan-	Rai-	Coimba-	Karai-	Man-	Hydera-	Dhar-	Vella-	Aver-	Ra-
Entries	nagar	iana	ar	nagar	ner	bad	eswar	hat	chi	nd	nsi	uri	chan	pur	tore	kkal	dya	bad	wad	yani	age	nk
TSFC-12-15	1.83	4.50	6.78	3.50	2.84	2.61	4.67	5.34	3.88	4.60	6.87	6.11	6.69	5.68	6.81	4.10	6.25	3.60	5.06	4.70	4.82	1
MFC-09-3	1.72	4.10	6.32	3.89	3.15	1.40	4.49	4.06	4.77	5.02	2.89	7.28	5.99	4.32	6.03	4.41	6.34	5.20	4.98	3.09	4.47	3
MFC-09-13	2.27	4.10	6.15	4.46	3.43	2.45	3.67	4.68	3.90	5.00	3.22	5.71	6.11	4.03	6.14	5.53	5.64	4.30	4.77	2.88	4.42	4
UPC-1501	1.90	4.50	5.70	5.36	4.09	2.34	4.32	4.34	3.50	5.96	4.30	6.00	4.18	4.25	5.24	2.96	3.56	2.80	4.63	3.09	4.15	7
MFC-09-4	1.63	4.10	5.93	2.85	2.96	1.52	3.70	3.67	3.85	5.47	2.77	6.10	7.17	4.93	6.60	4.62	5.33	3.90	4.62	3.85	4.28	5
Vellayani-1	1.68	4.70	6.21	3.66	3.77	2.10	3.42	2.51	3.40	5.06	1.98	4.97	5.87	6.08	5.85	3.08	4.32	4.70	5.56	2.88	4.09	8
UPC-5286 (NC)	1.93	3.70	5.75	3.85	4.37	1.89	3.60	3.34	3.77	4.46	2.63	4.40	5.60	6.99	6.72	4.53	5.90	3.20	4.91	3.85	4.27	6
Bundel Lobia-1 (NC)	2.13	4.40	7.18	3.45	4.41	2.03	3.96	2.91	3.24	5.44	4.10	7.92	6.71	4.84	6.90	5.22	3.75	5.60	4.27	2.99	4.57	2
UPC-622 (ZC-HZ)	2.01																					
Bundel Lobia-2 (ZC-NWZ)		4.30	6.67	3.68	2.89																	
UPC-628 (ZC-NEZ)						1.99	4.52	3.90	2.48													
UPC-9202 (ZC-CZ)										5.81	3.34	6.60	7.58	5.26								
MFC-8-14 (ZC-SZ)															7.22	6.28	4.27	2.60	4.70	2.67		
Mean	1.90	4.27	6.30	3.86	3.55	2.04	4.04	3.86	3.64	5.20	3.57	6.12	6.21	5.15	6.39	4.53	5.04	3.99	4.83	3.33	4.38	

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

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

Entrico	Sri-	Ludh-	His-	Pant-	Bika-	Faiza-	Bhuban-	Jor-	Ran-	Ana-	Jha-	Rah-	Urulikan-	Rai-	Coimb-	Karai-	Hydera-	Dhar-	Aver-	Ra-
Entries	nagar	iana	ar	nagar	ner	bad	eswar	hat	chi	nd	nsi	uri	chan	pur	atore	kkal	bad	wad	age	nk
TSFC-12-15	0.29	0.80	1.45	0.47	0.39	0.59	1.03	1.04	0.80	0.66	1.68	0.81	0.97	0.93	0.91	0.53	0.80	1.00	0.84	1
MFC-09-3	0.28	0.70	1.44	0.39	0.45	0.33	0.98	0.79	1.05	0.71	0.76	0.94	0.75	0.81	0.66	0.79	1.00	1.08	0.77	5
MFC-09-13	0.38	0.70	1.52	0.61	0.48	0.59	0.76	0.92	0.66	0.71	0.89	0.76	0.78	0.71	0.99	1.05	0.90	1.01	0.80	3
UPC-1501	0.31	0.80	1.27	0.84	0.65	0.55	0.93	0.80	0.69	0.88	1.08	0.80	0.64	0.94	0.79	0.66	0.60	0.98	0.79	4
MFC-09-4	0.26	0.70	1.49	0.39	0.47	0.36	0.84	0.62	0.67	0.75	0.75	0.88	1.02	0.76	0.91	0.76	0.90	0.96	0.75	7
Vellayani-1	0.28	0.80	1.54	0.46	0.49	0.49	0.72	0.39	0.69	0.75	0.51	0.72	0.88	1.21	0.93	0.51	1.00	1.25	0.76	6
UPC-5286 (NC)	0.32	0.60	1.19	0.54	0.53	0.45	0.80	0.63	0.81	0.73	0.66	0.66	0.74	1.28	0.98	0.79	0.70	0.96	0.74	8
Bundel Lobia-1 (NC)	0.35	0.80	1.56	0.50	0.58	0.49	0.82	0.54	0.58	0.72	1.02	0.95	0.99	0.74	1.13	0.91	1.20	0.90	0.82	2
UPC-622 (ZC-HZ)	0.34																			
Bundel Lobia-2 (ZC-NWZ)		0.70	1.51	0.52	0.37															
UPC-628 (ZC-NEZ)						0.48	0.95	0.64	0.29											
UPC-9202 (ZC-CZ)										0.94	0.91	0.85	1.15	0.75						
MFC-8-14 (ZC-SZ)															1.12	0.80	0.60	0.96		
Mean	0.31	0.73	1.44	0.52	0.49	0.48	0.87	0.71	0.69	0.76	0.92	0.82	0.88	0.90	0.94	0.76	0.86	1.01	0.78	

Entries	Ludh-	His-	Bika-	Faiza-	Kal-	Bhuban-	Jor-	Imp-	Ana-	Rah-	Urulikan-	Rai-	Coimb-	Karai-	Hydera-	Vella-	Aver-	Ra-
Entries	iana	ar	ner	bad	yani	eswar	hat	hal	nd	uri	chan	pur	atore	kkal	bad	yani	age	nk
TSFC-12-15	12.2	14.4	4.1	7.0	6.4	10.5	10.6	6.3	6.5	8.0	10.9	7.5	8.2	6.2	7.7	19.7	9.1	1
MFC-09-3	12.2	14.5	4.9	4.0	9.4	9.8	8.4	5.9	7.2	9.2	6.1	6.9	6.8	7.9	7.5	13.1	8.4	4
MFC-09-13	13.6	15.6	5.1	7.1	7.6	8.6	9.6	7.7	7.1	8.8	9.8	5.0	12.6	7.6	4.0	14.9	9.0	2
UPC-1501	12.6	12.1	6.7	6.2	4.8	10.2	8.3	7.0	9.1	6.7	6.7	5.6	8.3	4.7	3.6	14.9	8.0	6
MFC-09-4	9.9	14.9	4.9	4.4	5.5	8.4	6.3	6.5	6.7	7.6	9.1	6.5	10.0	7.0	5.0	15.8	8.0	6
Vellayani-1	12.2	15.1	5.1	5.6	9.1	8.2	3.8	6.1	7.4	7.0	10.1	8.8	6.9	5.1	8.2	10.5	8.1	5
UPC-5286 (NC)	9.9	11.9	5.5	5.6	9.9	8.3	6.5	6.5	7.6	7.1	7.7	10.5	7.6	7.4	5.8	17.9	8.5	3
Bundel Lobia-1 (NC)	9.1	15.5	5.6	5.8	8.4	9.6	5.5	5.3	6.7	6.5	10.4	4.6	8.1	8.0	4.9	13.1	7.9	7
UPC-622 (ZC-HZ)																		
Bundel Lobia-2 (ZC-NWZ)	8.8	15.5	3.9															
UPC-628 (ZC-NEZ)				5.7	8.9	10.9	6.5	7.3										
UPC-9202 (ZC-CZ)									10.0	7.6	11.3	5.7						
MFC-8-14 (ZC-SZ)													11.2	5.9	4.6	14.9		
Mean	11.2	14.4	5.1	5.7	7.8	9.4	7.3	6.5	7.6	7.6	9.1	6.8	8.9	6.6	5.7	15.0	8.4	

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

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

Entries	Ludh-	His-	Bika-	Faiza-	Bhuban-	Jor-	Imp-	Ana-	Jha-	Rah-	Urulikan-	Rai-	Coimb-	Karai-	Man-	Hydera-	Aver-	Ra-
Entries	iana	ar	ner	bad	eswar	hat	hal	nd	nsi	uri	chan	pur	atore	kkal	dya	bad	age	nk
TSFC-12-15	15.0	15.3	14.5	16.9	15.5	13.4	12.5	14.4	18.4	16.6	16.7	14.3	17.5	15.8	17.5	16.0	15.6	2
MFC-09-3	16.6	15.5	15.3	17.5	15.7	14.1	11.9	14.8	20.1	16.2	14.0	13.1	19.7	15.3	19.3	12.9	15.7	1
MFC-09-13	18.2	15.8	14.7	16.5	16.5	13.9	13.5	14.4	19.9	15.0	18.0	10.9	24.5	12.3	20.6	7.2	15.7	1
UPC-1501	15.4	14.7	14.4	16.5	15.9	13.9	14.2	14.2	22.8	17.1	17.2	11.6	19.7	11.8	16.2	9.4	15.3	3
MFC-09-4	13.3	15.3	14.5	17.0	15.0	13.5	14.5	14.4	22.6	14.3	14.8	13.8	20.1	17.5	20.1	10.5	15.7	1
Vellayani-1	14.4	15.1	14.5	17.1	16.1	13.2	13.2	14.4	20.2	14.3	17.9	13.7	14.0	15.3	17.5	13.6	15.3	3
UPC-5286 (NC)	14.8	15.3	14.4	17.4	15.2	13.6	10.8	14.4	19.1	15.8	16.0	13.3	15.3	13.1	17.5	11.6	14.8	4
Bundel Lobia-1 (NC)	11.3	15.3	13.3	17.0	16.4	13.8	10.6	15.0	24.1	17.9	16.5	11.3	14.0	16.6	16.6	7.7	14.8	4
UPC-622 (ZC-HZ)																		
Bundel Lobia-2 (ZC-NWZ)	11.3	15.8	14.4															
UPC-628 (ZC-NEZ)				17.2	16.3	13.6	11.0											
UPC-9202 (ZC-CZ)								14.5	21.0	15.9	17.7	12.5						
MFC-8-14 (ZC-SZ)													20.1	10.9	18.4	12.9		
Mean	14.5	15.3	14.4	17.0	15.8	13.7	12.5	14.5	20.9	15.9	16.5	12.7	18.3	14.3	18.2	11.3	15.4	

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Entries	Srinagar	Ludhiana	Hisar	Pantnagar	Bikaner	Udaipur	Faizabad	Kalyani	Bhubaneswar	Jorhat	Ranchi
TSFC-12-15	116.9	200.0	170.7	101.7	120.0	69.2	170.5	112.7	233.3	200.3	100.0
MFC-09-3	115.8	230.0	161.1	107.5	80.0	69.1	167.8	103.8	225.4	243.3	99.0
MFC-09-13	130.4	248.3	182.8	123.0	70.0	63.1	180.5	109.8	214.6	197.5	97.0
UPC-1501	118.4	238.3	193.1	95.3	150.0	58.2	184.5	98.4	228.5	209.8	92.0
MFC-09-4	109.8	255.0	188.0	89.7	170.0	59.9	160.4	100.3	209.5	194.7	98.0
Vellayani-1	107.7	226.0	173.9	101.3	90.0	54.9	165.7	105.8	195.7	221.0	96.0
UPC-5286 (NC)	121.7	193.3	172.8	99.2	170.0	63.4	160.6	109.5	204.6	214.6	101.0
Bundel Lobia-1 (NC)	125.8	242.3	190.6	104.7	130.0	69.1	190.5	102.8	219.6	249.6	98.0
UPC-622 (ZC-HZ)	132.4										
Bundel Lobia-2 (ZC-NWZ)		257.7	195.1	116.7	130.0	66.1					
UPC-628 (ZC-NEZ)							164.5	114.7	239.0	222.1	99.0
UPC-9202 (ZC-CZ)											
MFC-8-14 (ZC-SZ)											
Mean	119.9	232.3	180.9	104.3	123.3	63.7	171.7	106.4	218.9	217.0	97.8

Table 6.7 IVTC: Initial Varietal Trial in Forage Cowpea: Plant height (cm)

Table 6.7 IVTC: Initial Varietal Trial in Forage Cowpea: Plant height (cm)

Entries	Imphal	Anand	Jhansi	Rahuri	Urulikanchan	Kanpur	Raipur	Coimbatore	Karaikkal	Mandya	Hyderabad	Vellayani	Average	Rank
TSFC-12-15	139.0	134.0	55.6	153.8	115.6	138.1	163.5	98.2	129.8	90.3	196.8	160.7	137.9	5
MFC-09-3	135.3	142.0	48.0	174.4	128.1	139.4	87.4	94.4	168.2	69.1	122.1	123.7	132.0	7
MFC-09-13	151.9	137.0	52.8	168.0	135.2	141.5	93.6	97.2	176.2	90.9	129.2	142.1	136.2	6
UPC-1501	143.4	125.0	55.0	162.2	99.6	136.6	59.6	90.8	143.1	76.6	122.6	128.7	130.9	8
MFC-09-4	133.8	133.0	59.5	160.7	127.0	132.1	160.5	94.2	150.9	88.5	168.0	159.7	139.3	3
Vellayani-1	149.4	138.0	49.2	196.4	120.4	134.7	193.9	88.8	157.0	88.1	188.8	149.5	138.8	4
UPC-5286 (NC)	159.3	122.0	55.5	186.6	182.4	135.0	159.6	98.1	162.9	101.1	166.8	157.9	143.4	2
Bundel Lobia-1 (NC)	154.3	142.0	69.7	197.2	171.6	121.7	117.8	98.2	140.9	95.5	173.4	195.7	147.9	1
UPC-622 (ZC-HZ)														
Bundel Lobia-2 (ZC-														
NWZ)														
UPC-628 (ZC-NEZ)	158.6													
UPC-9202 (ZC-CZ)		124.0	53.1	187.9	151.6	126.9	150.6							
MFC-8-14 (ZC-SZ)								95.2	176.5	106.6	117.1	167.1		
Mean	147.2	133.0	55.4	176.4	136.8	134.0	131.8	95.0	156.2	89.6	153.9	153.9	138.3	

Entries	Ludh-	Pant-	Bika-	His-	Faiza-	Kal-	Bhuban-	Jor-	Ran-	Imp-	Jha-	Rah-	Urulikan-	Rai-	Coimb-	Karai-	Man-	Hydera-	Vella-	Aver-	Ra-
	iana	nagar	ner	ar	bad	yani	eswar	hat	chi	hal	nsi	uri	chan	pur	atore	kkal	dya	bad	yani	age	nk
TSFC-12-15	0.90	0.71	0.86	0.79	0.69	0.79	1.04	0.80	0.45	1.62	1.08	0.60	1.33	0.87	0.33	0.66	0.68	0.30	1.30	0.83	2
MFC-09-3	0.82	0.60	0.98	0.64	0.67	0.72	1.09	0.83	0.67	1.72	1.18	0.64	0.83	0.65	0.32	0.67	0.66	0.40	1.38	0.81	3
MFC-09-13	0.60	0.59	1.00	0.72	0.70	0.81	0.87	0.76	0.72	1.35	1.02	0.47	0.86	0.69	0.36	0.74	0.64	0.20	1.20	0.75	5
UPC-1501	0.90	0.73	0.88	0.84	0.62	0.83	1.15	0.66	0.67	1.34	0.91	0.72	1.67	0.79	0.36	0.72	0.79	0.20	1.46	0.85	1
MFC-09-4	0.54	0.66	1.02	0.86	0.67	0.78	0.84	1.01	0.79	1.54	1.01	0.54	1.07	0.67	0.40	0.94	0.89	0.20	1.33	0.83	2
Vellayani-1	0.97	0.76	0.69	0.85	0.68	0.75	0.79	0.72	0.60	1.52	1.04	0.30	1.10	0.58	0.33	0.71	0.67	0.30	1.33	0.77	4
UPC-5286 (NC)	0.67	0.56	0.97	0.86	0.67	0.84	0.91	0.56	0.54	1.69	0.99	0.26	1.27	0.73	0.33	0.71	0.87	0.30	1.57	0.81	3
Bundel Lobia-1 (NC)	0.30	0.62	0.82	0.65	0.65	0.82	0.92	0.81	0.67	1.32	0.97	0.62	1.16	0.58	0.15	0.88	0.53	0.30	1.42	0.75	5
UPC-622 (ZC-HZ)																					
Bundel Lobia-2 (ZC-NWZ)	0.82	0.65	1.04	0.76																	
UPC-628 (ZC-NEZ)					0.70	0.83	0.95	0.70	0.70	1.36											
UPC-9202 (ZC-CZ)											0.96	0.59	1.39	0.73							
MFC-8-14 (ZC-SZ)															0.34	0.50	0.92	0.10	1.05		
Mean	0.72	0.65	0.92	0.77	0.67	0.80	0.95	0.76	0.65	1.50	1.02	0.53	1.19	0.70	0.32	0.72	0.74	0.26	1.34	0.80	

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

Table 6.9 IVTC: Initial Varietal Trial in Forage Cowpea: ADF (%), NDF (%), IVDMD (%) & DDM (q/ha)

Fratier		ADF (%)			NDF (%)		IVDMD	(%)	DDM	(q/ha)
Entries	Ludhiana	Jhansi	Average	Rank	Ludhiana	Jhansi	Average	Rank	Hisar	Rank	Hisar	Rank
TSFC-12-15	33.1	29.8	31.5	2	42.4	39.5	41.0	1	67.8	3	64.0	7
MFC-09-3	32.8	32.4	32.6	3	41.5	42.2	41.8	2	68.8	1	64.3	6
MFC-09-13	30.3	32.5	31.4	1	40.2	43.7	41.9	3	66.4	4	65.7	2
UPC-1501	35.2	32.7	34.0	7	44.8	42.9	43.9	6	68.4	2	56.6	8
MFC-09-4	36.1	30.6	33.4	5	44.1	40.2	42.2	4	66.4	4	64.4	5
Vellayani-1	35.8	31.3	33.5	6	45.1	42.7	43.9	6	64.8	7	64.8	4
UPC-5286 (NC)	35.1	30.4	32.7	4	45.3	40.5	42.9	5	64.4	8	49.9	9
Bundel Lobia-1 (NC)	38.6	31.1	34.8	8	45.2	44.2	44.7	7	65.4	6	66.2	1
UPC-622 (ZC-HZ)												
Bundel Lobia-2 (ZC-NWZ)	40.4				46.4				66.2	5	65.0	3
UPC-628 (ZC-NEZ)												
UPC-9202 (ZC-CZ)		29.7				42.4						
MFC-8-14 (ZC-SZ)												
Mean	35.3	31.2	33.0		43.9	42.0	42.8		66.5		62.3	

				GFY (q/ł	na)						DMY (q	/ha)			
Entries	Faiza-	Bhuban-	Ran-	Jor-	Kal-	Aver-	Ra-	Faiza-	Bhuban-	Ran-	Jor-	Kal-	Aver-	Ra-	Superi-
	bad	eswar	chi	hat	yani	age	nk	bad	eswar	chi	hat	yani	age	nk	ority
TNFC-0926	152.7	274.1	139.6	276.8	310.2	230.7	2	31.9	59.6	32.9	48.3	71.2	48.8	1	8.7
UPC-5286 (NC)	146.1	299.6	104.2	259.3	289.1	219.6	4	30.8	63.4	20.3	50.9	58.3	44.7	3	
Bundel Lobia-1 (NC)	142.4	319.4	104.2	290.5	277.5	226.8	3	30.2	69.9	21.3	49.2	54.1	44.9	2	
UPC-622 (ZC-NEZ)	137.0	338.7	154.2	277.1	252.5	231.9	1	28.4	72.7	27.0	52.0	43.4	44.7	3	
Mean	144.5	307.9	125.5	275.9	282.3	227.2		30.3	66.4	25.4	50.1	56.8	45.8		
CD at 5%	24.2	18.3	34.6	2.6	13.4			0.8	4.6	6.9	0.9	7.2			
CV%	12.2	4.3	19.7	12.9	3.8			10.8	5.1	19.1	10.0	6.2			

Table 7.1: AVTC-2: Second Advanced Varietal Trial in Cowpea: Green Forage Yield (q/ha) & Dry Matter Yield (q/ha)

Table 7.2: AVTC-2: Second Advanced Varietal Trial in Cowpea: Green Forage Yield (q/ha/day) & Dry Matter Yield (q/ha/day)

		G	GFY (q/ha/da	ay)					DMY (q/ha	/day)		
Entries	Faiza-	Bhuban-	Ran-	Jor-	Aver-	Ra-	Bhuban-	Ran-	Jor-	Faiza-	Aver-	Ra-
	bad	eswar	chi	hat	age	nk	eswar	chi	hat	bad	age	nk
TNFC-0926	2.15	4.03	2.63	3.74	3.14	2	0.88	0.62	0.65	0.45	0.65	2
UPC-5286 (NC)	2.08	4.61	2.12	3.50	3.08	3	0.98	0.41	0.69	0.44	0.63	3
Bundel Lobia-1 (NC)	2.06	4.26	1.96	3.93	3.05	4	0.93	0.40	0.66	0.43	0.61	4
UPC-622 (ZC-NEZ)	1.83	4.64	3.08	3.74	3.32	1	1.00	0.54	0.70	0.40	0.66	1
Mean	2.03	4.39	2.45	3.73	3.15		0.95	0.49	0.68	0.43	0.64	

Table 7.3: AVTC-2: Second Advanced Varietal Trial in Cowpea: Crude Protein Yield (q/ha) & Crude Protein (%)

Entrico			CPY (q/ha)						CP (%)			
Entries	Faizabad	Bhubaneswar	Jorhat	Kalyani	Average	Rank	Faizabad	Bhubaneswar	Jorhat	Kalyani	Average	Rank
TNFC-0926	5.6	9.3	6.5	8.1	7.4	1	17.6	15.6	13.6	11.3	14.5	3
UPC-5286 (NC)	5.2	9.8	7.0	6.8	7.2	3	16.8	15.4	14.0	11.7	14.5	3
Bundel Lobia-1 (NC)	5.1	10.9	6.9	6.5	7.3	2	16.7	15.6	14.2	12.0	14.6	2
UPC-622 (ZC-NEZ)	5.0	11.3	7.2	5.7	7.3	2	17.5	15.5	14.0	13.1	15.0	1
Mean	5.2	10.3	6.9	6.8	7.3		17.1	15.5	13.9	12.0	14.7	

Table 7.4: AVTC-2: Second Advanced Varietal Trial in Cowpea: Plant Height (cm) & Leaf Stem Ratio

Entries			Plant I	Height (cm)					Leaf Ster	n Ratio			
Entries	Faizabad	Bhubaneswar	Ranchi	Jorhat	Kalyani	Average	Rank	Faizabad	Bhubaneswar	Ranchi	Jorhat	Kalyani	Average	Rank
TNFC-0926	160.5	201.5	108.0	179.5	103.3	150.6	4	0.70	0.89	0.46	0.96	0.98	0.80	1
UPC-5286 (NC)	175.6	211.4	113.0	159.2	95.2	150.9	3	0.72	0.95	0.52	0.67	0.78	0.73	4
Bundel Lobia-1 (NC)	190.8	223.9	111.0	163.3	97.8	157.3	2	0.67	1.03	0.47	0.74	0.97	0.78	3
UPC-622 (ZC-NEZ)	195.2	228.5	105.0	181.1	94.5	160.9	1	0.68	1.09	0.57	0.67	0.92	0.79	2
Mean	180.5	216.3	109.3	170.8	97. 7	154.9		0.69	0.99	0.51	0.76	0.91	0.77	

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Entries				North East Zo	one			
Entries	Faizabad	Bhubaneswar	Kalyani	Jorhat	*Ranchi	Average	Rank	Superiority
TNFC-0926	1.13	6.77	1.31	3.06	5.21	3.07	3	
Bundel Lobia-1(NC)	2.25	8.23	2.62	3.89	3.12	4.25	1	
UPC-5286 (NC)		7.40	1.04	3.64	3.64	4.03	2	
UPC-622 (ZC-NEZ)	1.42	8.86	1.33	2.89	2.19			
Mean	1.60	7.82	1.58	3.37	3.54	3.78		
CD at 5%	0.3	0.5	0.3	0.3	0.9			
CV%	17.5	5.2	3.3	12.7	20.9			

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Table 8.1: AVTC-2 (Seed): Second Advanced Varietal Trial in Cowpea for (Seed): Seed Yield (q/ha)

Note: * Not included in zonal average due to CV≥20

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9. IVT RICE BEAN: INITIAL VARIETAL TRIAL IN FORAGE RICE BEAN (Reference Tables: 9.1 to 9.5)

An initial varietal trial in forage rice bean with seven entries along with three national checks *i.e.* Bidhan-1, Bidhan-2 and RBL-6 was conducted at 9 locations across the country.

For green forage as well as dry matter yield (q/ha), entry JRBJ-07-1 ranked first with 7.9% and 9.5 % superiority over the best check respectively. Other entries showing superiority are JOR-15-1 (0.7%), JOR -15-5 (1.7%) for green forage yield and entries JOR -15-6 (0.4%), JOR-15-1 (8.6%), JOR -15-5 (3.5%) for dry matter yield. For fodder production potential (q/ha/day), national check RBL-6 showed superiority both for green forage and dry matter production potential.

For crude protein yield (q/ha) entry JOR 15-1 and JOR 15-5 ranked first with 8.4 q/ha as against the best check Bidhan -2 (7.6 q/ha). For crude protein per cent, entry JOR 15-1 performed best (13.4%) as against the best check (12.9%).

For plant height, entry JOR-15-1 ranked first with 158.9 cm in comparison to best check 153.4 cm. For leafiness, national check ranked first.

10. VT Cenchrus ciliaris – 2015 (1st Year): VARIETAL TRIAL IN Cenchrus ciliaris (PERENNIAL)

The trial was established in 2015. The year being establishment year, the data will be reported from next year.

11. VT Cenchrus setigerus – 2015 (1st Year): VARIETAL TRIAL IN Cenchrus setigerus (PERENNIAL)

The trial was established in 2015. The year being establishment year, the data will be reported from next year.

12. VTBN – 2015 (1st Year): VARIETAL TRIAL IN Bajra Napier Hybrid (PERENNIAL) The trial was established in 2015. The year being establishment year, the data will be reported from next year.

13. VTBN - 2013 (3rd Year): VARIETAL TRIAL IN Bajra Napier Hybrid (PERENNIAL) (Reference Tables: 13.1 to 13.7)

In Bajra x Napier hybrid, a varietal evaluation trial comprising of eleven entries was established during *Kharif*-2013. The results obtained from all the 14 testing locations clearly revealed that for green forage yield (q/ha), entry VTBN-2013-8 in North West Zone (1381.2 q), VTBN-2013-1 in North East Zone (753.7 q), VTBN-2013-4 in Central Zone (2379.2 q), VTBN-2013-7 in South Zone (1191 q) and VTBN-2013-4 at all India level ranked first. For dry matter yield (q/ha), entry VTBN-2013-8 (316.6 q) in North West Zone, VTBN-2013-1 in North East Zone (181.3 q), VTBN-2013-4 (506.7 q) in Central Zone, VTBN-2013-1 (214.1 q) in South Zone and VTBN-2013-4 (506.7 q) in Central Zone, VTBN-2013-1 (214.1 q) in South Zone and VTBN-2013-4 at all India level established their superiority. For forage production potential (q/ha/day), entry VTBN-2013-4 for green forage and entry VTBN-2013-4 for dry matter production potential exhibited their superiority. For crude protein yield, entry VTBN-2013-4 (31.7 q/ha) and for crude protein content, entry VTBN-2013-4 (8.9%) ranked first. Entry VTBN-2013-10 for plant height and VTBN-2013-11 for leafiness was adjudged best performer. For other quality parameters, entry VTBN-2013-4 for ADF (%), NDF (%), and IVDMD (%) was adjudged best performer.

(This Trial will continue in coded form)

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Entries	Kalyani	Ranchi	Pusa	Jorhat	Imphal	Bhubaneswar	Jabalpur	Palghar	Vellayani	Average	Rank	Superiority%
JOR-15-2	255.5	314.7	104.0		309.3	267.7	252.0	262.8	152.8	239.9	10	
JOR-15-6	297.2	398.1	151.0	292.9	356.1	237.5	247.8	235.2	180.4	266.2	5	
JOR-15-1	266.6	407.5	192.0	289.9	306.3	304.1	302.0	208.8	157.3	270.5	3	0.7
JRBJ-07-1	293.1	444.4	253.0	248.2	364.3	218.7	341.6	185.6	259.2	289.8	1	7.9
JOR-15-3	257.1	361.1	116.0	320.3	311.6	257.3	249.9	302.5	171.3	260.8	8	
JOR-15-5	262.5	416.7	115.0	288.5	298.1	233.3	458.2	230.4	157.4	273.3	2	1.7
JOR-15-4	290.2	342.5	114.0	240.7	330.5	316.6	206.2	265.5	129.4	248.4	9	
RBL-6 (NC)	279.2	490.3	104.0	315.8	383.3	242.7	243.7	254.5	51.3	262.8	6	
Bidhan-2 (NC)	276.3	370.3	153.0	287.0	306.2	287.5	268.7	274.5	194.3	268.6	4	
K-1 (Bidhan-1) (NC)	316.6	361.1	176.0	241.7	289.2	226.0	312.4	284.2	148.2	261.7	7	
Mean	279.4	390.7	147.8	280.6	325.5	259.1	288.3	250.4	160.2	264.2		
CD at 5%	22.4	80.6	11.7	7.5	24.4	29.8	67.2	36.1	8.8			
CV%	8.6	11.6	9.8	8.7	4.4	6.7	13.6	8.4	3.2			

Table 9.1 IVT (R. bean): Initial Varietal Trial in Rice bean: Green Forage Yield (q/ha)

Table 9.2 IVT (R. bean): Initial Varietal Trial in Rice bean: Dry Matter Yield (q/ha)

Entries	Kalyani	Ranchi	Pusa	Imphal	Bhubaneswar	Jabalpur	Palghar	Vellayani	*Jorhat	Average	Rank	Superiority%
JOR-15-2	53.3	80.6	21.7	76.4	55.8	47.5	52.6	19.4		50.9	10	
JOR-15-6	66.2	109.7	31.6	70.4	50.5	46.0	47.0	24.7	59.1	55.8	4	0.4
JOR-15-1	59.9	110.8	40.0	81.7	64.4	56.0	41.8	28.7	54.3	60.4	2	8.6
JRBJ-07-1	65.3	112.8	52.9	72.2	46.6	64.1	37.1	36.1	51.4	60.9	1	9.5
JOR-15-3	58.3	90.0	24.2	76.1	54.2	46.0	60.5	26.4	62.0	54.5	7	
JOR-15-5	57.7	95.6	24.0	74.5	49.5	87.0	46.1	26.3	53.5	57.6	3	3.5
JOR-15-4	63.8	95.0	23.8	71.2	66.9	37.0	53.1	19.4	34.6	53.8	8	
RBL-6 (NC)	58.6	142.5	21.6	45.6	50.8	45.6	50.9	10.6	60.6	53.3	9	
Bidhan-2 (NC)	61.6	91.7	31.9	70.6	60.8	49.7	54.9	23.3	55.8	55.6	5	
K-1 (Bidhan-1) (NC)	72.1	94.7	36.7	51.5	49.0	58.7	56.8	23.7	45.3	55.4	6	
Mean	61.7	102.3	30.8	69.0	54.9	53.8	50.1	23.9	53.0	55.8		
CD at 5%	3.4	23.1	2.4	16.9	7.1	12.4	4.9	5.9	8.4			
CV%	5.6	13.0	10.7	14.3	7.5	13.7	5.7	14.4	22.3			

Note: * Not included in all India average due to CV ≥20

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Table 9.3 IVT (R. bean): Ini	tial Varietal Trial in Rice bean:	Green Forage Yield (a	g/ha/day) & Dr	v Matter Yield (q/ha/day)
		a (

Entries					GFY (q/ł	na/day)							DMY	' (q/ha/day)		
Linti les	Ranchi	Pusa	Jorhat	Jabalpur	Palghar	Vellayani	Bhubaneswar	Average	Rank	Ranchi	Pusa	Jorhat	Jabalpur	Palghar	Bhubaneswar	Average	Rank
JOR-15-2	2.97	1.24		2.83	3.84	1.79	3.31	2.66	9	0.76	0.26		0.53	0.77	0.69	0.60	8
JOR-15-6	4.10	1.78	3.12	2.60	3.45	2.12	3.04	2.89	6	1.13	0.37	0.63	0.48	0.69	0.65	0.66	5
JOR-15-1	3.99	2.29	3.08	3.14	3.07	1.85	4.06	3.07	4	1.09	0.48	0.58	0.58	0.61	0.86	0.70	3
JRBJ-07-1	4.53	2.94	2.64	4.67	2.74	3.05	2.84	3.34	2	1.15	0.62	0.55	0.88	0.54	0.61	0.72	2
JOR-15-3	3.01	1.38	3.41	2.47	4.45	2.02	3.73	2.92	5	0.75	0.29	0.66	0.45	0.88	0.79	0.64	6
JOR-15-5	3.36	1.37	3.07	3.34	3.38	1.85	3.11	2.78	8	0.77	0.29	0.57	0.62	0.67	0.66	0.60	8
JOR-15-4	2.85	1.36	2.56	2.02	3.88	1.53	4.09	2.61	10	0.79	0.28	0.37	0.36	0.77	0.87	0.57	9
RBL-6 (NC)	7.11	1.25	4.00	3.24	3.74	1.16	4.26	3.54	1	2.06	0.26	0.77	0.60	0.75	0.89	0.89	1
Bidhan-2 (NC)	3.98	1.80	3.05	2.68	4.04	2.29	3.80	3.09	3	0.98	0.38	0.59	0.49	0.81	0.80	0.68	4
K-1 (Bidhan-1) (NC)	2.96	2.07	2.57	3.18	4.18	1.74	2.97	2.81	7	0.77	0.43	0.48	0.59	0.88	0.64	0.63	7
Mean	3.89	1.75	3.06	3.02	3.68	1.94	3.52	2.97		1.03	0.37	0.58	0.56	0.74	0.75	0.67	

 Table 9.4 IVT (R. bean): Initial Varietal Trial in Rice bean: Crude Protein Yield (q/ha) & Crude Protein (%)

Entries				CPY (q/ha)							CP (%)			
Entries	Kalyani	Jorhat	Jabalpur	Bhubaneswar	Imphal	Average	Rank	Jorhat	Imphal	Jabalpur	Bhubaneswar	Kalyani	Average	Rank
JOR-15-2	5.2		7.0	8.5	8.0	7.2	6		10.5	15.3	15.2	9.7	12.7	5
JOR-15-6	7.7	7.3	6.8	7.7	7.0	7.3	5	12.5	9.9	15.1	15.3	11.6	12.9	4
JOR-15-1	5.9	7.4	8.5	9.6	10.4	8.4	1	13.9	12.7	15.5	14.9	9.8	13.4	1
JRBJ-07-1	7.3	7.0	9.8	6.9	7.3	7.7	2	13.9	10.1	15.5	14.8	11.2	13.1	2
JOR-15-3	5.9	7.7	7.0	8.1	9.0	7.5	4	12.5	11.9	15.4	15.0	10.1	13.0	3
JOR-15-5	5.7	7.1	13.3	7.4	8.4	8.4	1	13.4	11.3	15.5	14.9	9.8	13.0	3
JOR-15-4	6.5	4.4	4.5	10.0	7.1	6.5	8	12.7	10.0	12.3	14.9	10.2	12.0	6
RBL-6 (NC)	5.9	7.6	6.8	7.6	4.7	6.5	8	12.5	10.4	15.4	15.0	10.0	12.7	5
Bidhan-2 (NC)	6.1	7.0	7.5	9.0	8.3	7.6	3	12.7	11.7	15.3	14.9	9.9	12.9	4
K-1 (Bidhan-1) (NC)	8.2	6.0	8.9	7.1	5.1	7.1	7	13.4	9.9	15.5	14.5	11.4	12.9	4
Mean	6.4	6.8	8.0	8.2	7.5	7.4		13.0	10.8	15.1	14.9	10.4	12.8	

Table 9.5 IVT (R. bean): Initial Varietal Trial in Rice bean: Plant Height (cm) & Leaf Stem Ratio

					Plant Heig	ht (cm)									Lea	f Stem Ra	itio			
Entries	Kal-	Ran-	Jor-	Imp-	Jabal-	Pal-	Vella-	Bhuban-	Aver-	Ra-	Kal-	Ran-	Jor-	Imp-	Jabal-	Pal-	Vella-	Bhuba-	Aver-	Ra-
	yani	chi	hat	hal	pur	ghar	yani	eswar	age	nk	yani	chi	hat	hal	pur	ghar	yani	neswar	age	nk
JOR-15-2	116.7	178.0		149.2	115.0	192.2	142.1	191.2	154.9	5	0.81	0.38		1.61	0.62	0.78	1.49	1.01	0.96	2
JOR-15-6	120.8	173.0	173.1	157.7	110.7	175.8	161.1	175.6	156.0	4	0.98	0.29	0.67	1.31	0.56	0.81	1.21	0.89	0.84	7
JOR-15-1	117.5	176.0	172.3	148.8	128.6	168.6	158.3	201.4	158.9	1	0.85	0.33	0.71	1.48	0.71	0.74	1.30	1.15	0.91	3
JRBJ-07-1	118.5	189.0	161.6	141.3	152.8	182.5	138.4	182.2	158.3	3	0.91	0.23	0.76	1.32	0.83	0.78	1.18	0.94	0.87	5
JOR-15-3	114.1	185.0	175.0	163.8	99.8	198.2	145.5	184.7	158.3	3	0.96	0.40	0.67	1.38	0.51	0.91	1.37	0.97	0.90	4
JOR-15-5	118.2	179.0	167.2	152.4	131.1	188.6	160.6	170.3	158.4	2	0.85	0.34	0.71	1.45	0.72	0.85	1.22	0.79	0.87	5
JOR-15-4	119.5	175.0	136.7	149.9	89.1	190.5	123.8	210.2	149.3	8	0.96	0.36	0.66	1.66	0.50	0.79	1.51	1.24	0.96	2
RBL-6 (NC)	115.8	189.0	185.5	159.8	108.4	184.6	69.1	131.2	142.9	9	0.99	0.19	0.65	0.85	0.63	0.84	1.40	0.69	0.78	8
Bidhan-2 (NC)	114.6	186.0	162.0	139.2	100.4	203.2	123.8	197.7	153.4	6	0.87	0.36	0.98	1.54	0.50	0.95	1.50	1.09	0.97	1
K-1 (Bidhan-1) (NC)	123.5	187.0	143.2	134.2	126.0	205.7	137.9	165.2	152.8	7	0.93	0.38	0.59	1.36	0.67	0.88	1.19	0.76	0.85	6
Mean	117.9	181.7	164.1	149.6	116.2	189.0	136.1	181.0	154.3		0.91	0.33	0.71	1.40	0.63	0.83	1.34	0.95	0.89	

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Entrica	Hill Zor	ne		N	orth West Zone			North E	ast Zone
Entries	**Palampur	Rank	Ludhiana	Hisar	Bikaner	Average	Rank	Jorhat	Rank
VTBN-2013-1			1028.4	633.3	1853.2	1171.6	6	753.7	1
VTBN-2013-2	443.5	1	1106.9	674.1	1923.2	1234.7	4	583.3	9
VTBN-2013-3	401.7	3	1266.7	596.3	1444.1	1102.4	8	747.1	2
VTBN-2013-4			1514.7	574.1	1659.5	1249.4	3	700.5	4
VTBN-2013-5			1284.8	925.9	1553.6	1254.8	2	633.6	6
VTBN-2013-6			1136.1	625.9		881.0	10	739.0	3
VTBN-2013-7	307.9	6	1029.1	574.1		801.6	11	548.8	11
VTBN-2013-8	440.8	2	1622.9	722.2	1798.5	1381.2	1	699.1	5
VTBN-2013-9			1370.8	618.5	1478.3	1155.9	7	597.7	8
VTBN-2013-10	370.6	5	1154.9	840.7	1552.5	1182.7	5	557.4	10
VTBN-2013-11	400.8	4	1292.9	481.5		887.2	9	626.7	7
Mean	394.2		1255.3	660.6	1657.9	1118.4		653.3	
CD at 5%	29.7		159.6		279.6			8.2	
CV%	6.3		4.7		9.6			5.7	

Table 13.1 VTBN-2013 (3rd Year) Varietal Trial in Bajra Napier hybrid (Perennial): Green Forage Yield (q/ha)

Table 13.1 VTBN-2013 (3rd Year) Varietal Trial in Bajra Napier hybrid (Perennial): Green Forage Yield (q/ha)

				Central Zo	one						South Zon	e		All I	ndia
Entries	Ana-	Rah-	Urulikan-	Pal-	Jabal-	*Jha-	Aver-	Ra-	Coimb-	Man-	Dhar-	Aver-	Ra-	Aver-	Ra-
	nd	uri	chan	ghar	pur	nsi	age	nk	atore	dya	wad	age	nk	age	nk
VTBN-2013-1	1875.8	1736.7	5418.9	1425.2	575.7	679.4	2206.5	4	1422.2	885.3	527.0	944.8	5	1511.3	3
VTBN-2013-2	1988.1	1921.1	5942.0	1130.7	586.8	468.7	2313.7	2	2049.9	718.7	548.2	1105.6	2	1597.7	2
VTBN-2013-3	1822.2	1531.8	6063.4	1033.9	590.7	879.5	2208.4	3	1363.8	735.3	556.5	885.2	10	1479.3	6
VTBN-2013-4	2047.8	2090.8	6019.5	1109.1	628.8	463.5	2379.2	1	1544.4	683.7	628.7	952.3	4	1600.1	1
VTBN-2013-5	1850.3	1628.9	5156.0	1138.1	613.7	610.9	2077.4	8	1349.9	743.7	545.4	879.7	11	1452.0	8
VTBN-2013-6	1918.3	1597.9	5763.5	978.5	600.3	524.0	2171.7	5	1394.4	778.6	583.3	918.8	9	1465.1	7
VTBN-2013-7	1470.6	1263.6	5081.8	953.5	613.7	445.0	1876.6	10	2108.2	923.1	541.6	1191.0	1	1373.5	10
VTBN-2013-8	1355.3	1853.7	5282.2	922.9	533.6	616.2	1989.5	9	1674.9	880.0	577.8	1044.2	3	1493.6	4
VTBN-2013-9	1651.7	1877.1	5315.4	957	602.4	795.3	2080.7	7	1338.8	870.8	550.9	920.2	8	1435.8	9
VTBN-2013-10	1242.5	1919.6	6100.2	965.2	625.6	963.8	2170.6	6	1324.9	780.7	689.8	931.8	7	1479.5	5
VTBN-2013-11	770.8	1152.1	5048.2	1326	656.6	911.1	1790.8	11	1447.2	743.0	619.4	936.5	6	1287.7	11
Mean	1635.8	1688.5	5562.8	1085.5	602.5	668.9	2115.0		1547.2	794.8	579.0	973.6		1470.5	
CD at 5%	114.3	220.7	251.2	137.6	124.3	N.S.			108.8	95.2	60.7				
CV%	4.2	7.7	2.6	10.5	12.1	44.3			4.1	7.0	6.2				

Note: * not included in zonal and all India average due to CV≥20 Note: ** Not included in all India average due to not report in previous years also many gap

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E	Hill Zor	ne		North	West Zone	•		North	East Zone
Entries	**Palampur	Rank	Ludhiana	Hisar	Bikaner	Average	Rank	Jorhat	Rank
VTBN-2013-1			209.7	179.8	459.0	282.8	4	181.3	1
VTBN-2013-2	83.8	2	226.4	200.0	449.6	292.0	2	132.8	11
VTBN-2013-3	76.2	3	259.2	164.2	291.9	238.4	8	170.3	3
VTBN-2013-4			306.8	164.9	371.1	280.9	6	168.3	4
VTBN-2013-5			259.3	256.2	339.7	285.1	3	145.8	7
VTBN-2013-6			229.3	172.6		201.0	9	172.0	2
VTBN-2013-7	59.8	6	208.3	165.9		187.1	11	137.7	10
VTBN-2013-8	84.7	1	326.1	202.6	420.9	316.6	1	167.7	5
VTBN-2013-9			276.9	173.7	348.3	266.3	7	150.7	6
VTBN-2013-10	69.8	5	233.4	248.0	366.1	282.5	5	142.4	9
VTBN-2013-11	76.0	4	260.2	119.8		190.0	10	142.8	8
Mean	75.1		254.1	186.2	380.8	256.6		155.6	
CD at 5%	8.1		42.4		56.2			7.4	
CV%	5.9		17.9		8.4			10.6	

Table 13.2 VTBN-2013 (3rd Year) Varietal Trial in Bajra Napier hybrid (Perennial): Dry Matter Yield (q/ha)

Table 13.2 VTBN-2013 (3rd Year) Varietal Trial in Bajra Napier hybrid (Perennial): Dry Matter Yield (q/ha)

Entrica			Cent	ral Zone					So	uth Zone			All In	dia
Entries	Anand	Rahuri	Urulikanchan	Jabalpur	Palghar	Average	Rank	Coimbatore	Mandya	Dharwad	Average	Rank	Average	Rank
VTBN-2013-1	471.2	368.5	1028.9	107.2	267.9	448.7	3	232.7	78.2	153.0	154.6	11	311.4	3
VTBN-2013-2	399.3	431.9	1150.0	109.8	210.1	460.2	2	377.3	49.9	185.0	204.1	2	326.8	2
VTBN-2013-3	343.8	367.9	1193.0	110.8	196.4	442.4	4	225.5	58.7	200.9	161.7	8	298.5	7
VTBN-2013-4	494.1	514.3	1193.6	119.8	211.9	506.7	1	258.8	38.0	208.3	168.4	5	337.5	1
VTBN-2013-5	364.2	365.4	944.0	115.7	216.0	401.1	9	228.5	67.9	183.7	160.0	9	290.5	9
VTBN-2013-6	392.6	368.5	1088.4	113.1	180.4	428.6	7	231.5	54.7	202.1	162.8	7	291.4	8
VTBN-2013-7	284.5	248.7	1028.0	117.0	178.7	371.4	11	370.2	88.5	183.6	214.1	1	273.7	10
VTBN-2013-8	287.4	467.7	1047.5	97.4	174.5	414.9	8	279.8	65.4	196.9	180.7	3	311.2	4
VTBN-2013-9	381.5	471.1	1046.9	115.7	181.5	439.3	5	227.5	64.8	176.1	156.1	10	301.2	6
VTBN-2013-10	249.5	449.8	1190.2	119.9	182.2	438.3	6	225.1	63.6	229.8	172.8	4	308.3	5
VTBN-2013-11	184.7	278.4	1019.6	126.2	258.6	373.5	10	232.8	55.7	213.3	167.3	6	262.9	11
Mean	350.3	393.8	1084.5	113.9	205.3	429.6		262.7	62.3	193.9	173.0		301.2	
CD at 5%	24.8	51.5	49.1	23.3	31.2			19.8	13.7	24.5				
CV%	4.2	7.7	2.6	12.0	8.1			4.4	12.9	7.4				

Entries			GF	'Y (q/ha/day	()						DMY (q/ha/d	ay)		
Entres	Ludhiana	Bikaner	Anand	Jabalpur	Dharwad	Average	Rank	Ludhiana	Bikaner	Anand	Jabalpur	Dharwad	Average	Rank
VTBN-2013-1	5.50	5.45	5.13	1.58	9.00	5.33	9	1.10	1.35	1.29	0.29	3.00	1.41	6
VTBN-2013-2	6.00	5.66	5.43	1.61	9.14	5.57	4	1.20	1.32	1.09	0.30	3.08	1.40	7
VTBN-2013-3	6.80	4.25	4.98	1.62	9.27	5.38	8	1.40	0.86	0.94	0.30	3.34	1.37	8
VTBN-2013-4	8.10	4.88	5.60	1.72	10.47	6.15	1	1.60	1.09	1.35	0.32	3.47	1.57	1
VTBN-2013-5	6.90	4.57	5.06	1.68	9.08	5.46	6	1.40	1.00	1.00	0.31	3.06	1.35	10
VTBN-2013-6	6.10		5.24	1.64	9.72	5.68	3	1.20		1.07	0.31	3.36	1.49	2
VTBN-2013-7	5.50		4.02	1.68	9.02	5.05	11	1.10		0.78	0.32	3.06	1.31	11
VTBN-2013-8	8.70	5.29	3.70	1.46	9.62	5.75	2	1.80	1.24	0.79	0.26	3.28	1.47	3
VTBN-2013-9	7.40	4.35	4.51	1.65	9.18	5.42	7	1.50	1.02	1.04	0.31	2.94	1.36	9
VTBN-2013-10	6.20	4.57	3.39	1.71	11.49	5.47	5	1.30	1.08	0.68	0.32	3.82	1.44	5
VTBN-2013-11	7.00		2.11	1.80	10.32	5.31	10	1.40		0.50	0.34	3.56	1.45	4
Mean	6.75	4.88	4.47	1.65	9.66	5.51		1.36	1.12	0.96	0.31	3.27	1.42	

Table 13.3 VTBN-2013 (3rd Year) Varietal Trial in Bajra Napier hybrid (Perennial): Green Forage Yield (q/ha/day) & Dry Matter Yield (q/ha/day)

Table 13.4 VTBN-2013 (3rd Year) Varietal Trial in Bajra Napier hybrid (Perennial): Crude Protein Yield (q/ha) & Crude Protein (%)

					(CPY (q/ha)											CP (%)					
Entries	**Palam-	Ludh-	Jor-	Ana-	Rah-	Urulikan-	Jabal-	Man-	Palg-	Aver-	Ra-	**Palam-	Ludh-	Bika-	Jor-	Ana-	Rah-	Urulikan-	Jabal-	Man-	Aver-	Ra-
	pur	iana	hat	nd	uri	chan	pur	dya	har	age	nk	pur	iana	ner	hat	nd	uri	chan	pur	dya	age	nk
VTBN-2013-1		25.0	13.9	49.1	30.6	73.4	8.4	6.1	18.2	28.1	3		11.9	9.0	7.3	10.5	8.3	7.1	7.9	7.9	8.7	3
VTBN-2013-2	6.1	26.9	8.5	40.2	42.1	88.2	8.3	3.3	14.4	29.0	2	7.3	11.9	9.9	6.4	10.0	9.8	7.7	7.6	6.6	8.7	3
VTBN-2013-3	5.8	27.5	10.8	37.2	32.2	89.4	8.5	3.6	13.1	27.8	4	7.6	10.6	9.7	6.3	11.0	8.7	7.5	7.7	6.1	8.4	6
VTBN-2013-4		40.5	9.8	46.5	39.0	91.4	9.5	3.2	13.5	31.7	1		13.2	10.7	6.1	9.7	7.6	7.7	8.0	8.3	8.9	1
VTBN-2013-5		23.1	10.2	31.6	30.3	68.6	9.1	5.4	14.7	24.1	9		8.9	8.4	7.1	9.5	8.3	7.3	7.9	7.9	8.2	7
VTBN-2013-6		29.3	12.7	38.7	35.4	79.6	8.9	3.4	13	27.6	5		12.8		7.5	10.1	9.6	7.3	7.9	6.1	8.8	2
VTBN-2013-7	4.9	26.2	10.6	26.2	17.4	76.0	9.2	5.8	12.4	23.0	11	8.2	12.6		7.2	10.1	7.0	7.4	7.9	6.6	8.4	6
VTBN-2013-8	6.9	23.1	10.6	28.3	40.9	77.1	7.2	5.1	12.5	25.6	8	8.2	7.1	9.9	6.2	10.3	8.7	7.4	7.5	7.9	8.1	8
VTBN-2013-9		23.3	9.9	35.0	39.8	80.4	9.2	4.8	10.9	26.7	6		8.4	9.0	5.9	9.3	8.5	7.7	7.9	7.4	8.0	9
VTBN-2013-10	4.7	22.9	10.0	22.4	41.3	89.9	9.6	4.2	12.3	26.6	7	6.7	9.8	9.3	6.1	9.0	9.2	7.6	8.0	6.6	8.2	7
VTBN-2013-11	5.8	33.8	11.7	16.9	21.9	74.6	10.0	3.9	16.8	23.7	10	7.6	13.0		7.9	9.3	7.9	7.3	8.0	7.0	8.6	5
Mean	5.7	27.4	10.8	33.8	33.7	80.8	8.9	4.4	13.8	26.7		7.6	10.9	9.5	6.7	9.9	8.5	7.4	7.8	7.1	8.5	

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Palghar
110.4
80.9
116.2
106.4
72.5
95.4
87.8
105.3
101.2

150.0

198.9

178.1

Table 13.5 VTBN-2013 (3rd Year) Varietal Trial in Bajra Napier hybrid (Perennial): Plant Height (cm)

Table 13.6 VTBN-2013 (3rd Year) Varietal Trial in Bajra Napier hybrid (Perennial): Leaf Stem Ratio

147.0

145.8

340.1

168.7

194.4

Entries	**Palampur	Ludhiana	Bikaner	Jorhat	Rahuri	Urulikanchan	Jabalpur	Mandya	Palghar	Average	Rank
VTBN-2013-1		0.80	1.35	0.89	0.65	0.53	0.74	0.83	0.75	0.82	1
VTBN-2013-2	2.79	0.90	1.02	0.83	0.61	0.52	0.69	0.57	0.72	0.73	4
VTBN-2013-3	2.22	1.00	0.74	0.89	0.68	0.67	0.72	0.77	0.57	0.75	3
VTBN-2013-4		0.90	0.94	0.88	0.99	0.49	0.66	0.57	0.7	0.77	2
VTBN-2013-5		0.90	0.88	0.88	0.87	0.47	0.72	0.6	0.55	0.73	4
VTBN-2013-6		1.00		0.89	0.50	0.62	0.78	0.47	0.58	0.69	6
VTBN-2013-7	2.48	0.90	1.08	0.95	0.61	0.45	0.74	0.90	0.53	0.77	2
VTBN-2013-8	2.37	0.80	0.95	0.82	0.61	0.51	0.60	0.8	0.6	0.71	5
VTBN-2013-9		0.90	0.78	0.90	0.70	0.48	0.75	0.53	0.68	0.71	5
VTBN-2013-10	2.57	1.00		0.87	0.47	0.46	0.81	0.57	0.65	0.69	6
VTBN-2013-11	2.06	1.00		0.89	1.08	0.62	0.84	0.57	0.71	0.82	1
Mean	2.42	0.92	0.97	0.88	0.71	0.53	0.73	0.65	0.64	0.75	

170.4

155.5

173.1

170.9

102.5

151.7

125.9

118.0

126.7

87.7

88.1

74.8

175.1

118.7

157.5

Table 13.7 VTBN-2013 (3rd Year) Varietal Trial in Bajra Napier hybrid (Perennial): ADF (%), NDF (%) & IVDMD (%)

Entrics			ADF (%)					NDF (%)			IVD	MD (%)
Littles	Ludhiana	Rahuri	**Palampur	Average	Rank	Ludhiana	Rahuri	**Palampur	Average	Rank	Rahuri	Rank
VTBN-2013-1	37.9	45.4		41.7	4	64.3	60.2		62.2	4	53.5	2
VTBN-2013-2	36.5	47.9	57.4	42.2	5	65.1	60.9	74.0	63.0	7	51.6	7
VTBN-2013-3	36.8	46.7	58.6	41.7	4	65.8	58.6	72.6	62.2	4	52.5	6
VTBN-2013-4	35.3	41.5		38.4	1	62.2	57.6		59.9	1	56.6	1
VTBN-2013-5	38.3	51.4		44.9	11	66.3	60.8		63.5	8	48.8	9
VTBN-2013-6	34.5	51.8		43.2	8	59.6	61.6		60.6	2	48.5	10
VTBN-2013-7	30.0	53.1	58.6	41.6	3	58.3	63.6	75.8	61.0	3	47.5	11
VTBN-2013-8	39.2	48.7	59.4	44.0	9	64.0	60.7	69.8	62.3	5	50.9	8
VTBN-2013-9	40.3	45.6		43.0	7	66.9	65.6		66.2	9	53.3	3
VTBN-2013-10	40.0	45.8	56.0	42.9	6	65.3	59.6	71.8	62.4	6	53.2	4
VTBN-2013-11	36.3	46.0	55.8	41.2	2	63.7	62.2	71.0	63.0	7	53.0	5
Mean	36.8	47.7	57.6	42.2		63.8	61.0	72.5	62.4		51.8	

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VTBN-2013-10

VTBN-2013-11

Mean

87.2

69.4

86.8

133.2

124.1

115.9

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Average

147.9

131.7

134.8

140.7

138.7

134.2

138.0 148.2

149.2

157.9

131.5

141.2

78.3

109.3

96.7

Rank

4

10

8

5

6

9 7

3

2

1

14. VT Sehima – 2013 (3rd year): VARIETAL TRIAL IN *SEHIMA NERVOSUM* (PERENNIAL) (Reference Table: 14.1 to 14.3)

Only two centre data was reported, hence the trial will be abandoned.

15. VT Dichanthium–2013 (3rd YEAR): VARIETAL TRIAL IN Dichanthium annulatum (PERENNIAL)

(Reference Table: 15.1 to 15.6)

In *Dichanthium annulatum*, a varietal evaluation trial comprising of eight entries was established initially in *Kharif*-2013 at fifteen locations of the country. The trial was finally established at eight locations of the country. Crop being perennial in nature, entries are in coded form as from VTD-1 to VTD-8. Decoding of entries will be done after completion of the trial.

Results obtained from different centres revealed that for green forage yield (q/ha), entry VTD-3 (407.0 q/ha) ranked first followed by entry VTD -7 (400.3 q/ha). For dry matter yield (q/ha) entry VTD-7 ranked first with yield of 108.1 q/ha followed by VTD-3 (105 q/ha).

For fodder production potential, entry VTD-8 for green forage and dry matter production potential ranked first. Entry VTD-7 and VTD -8 were best for crude protein yield (q/ha) and entry VTD-1 for crude protein content (%). For plant height (cm) and leafiness, entry VTD-3 was best performers. For other quality parameters, entry VTD-4 for ADF (%), NDF (%) and IVDMD (%) ranked first.

(This Trial will continue in coded form)

16. VTCC-2013 (3rd YEAR): VARIETAL TRIAL IN *Cenchrus ciliaris* (PERENNIAL)

(Reference Table: 16.1 to 16.6)

In *Cenchrus ciliaris*, a varietal evaluation trial comprising nine entries was established in *Kharif*-2013. Crop being perennial in nature, entries are in coded form as from VTCC-1 to VTCC-9. Decoding of entries will be done after completion of the trial.

Results obtained from seven testing locations revealed that for green forage yield (q/ha), test entry VTCC-9 was superior in North West zone. VTCC-4 ranked first in South zone and Central zone as well as at all India level. For dry matter yield, entry VTCC-9 in northwest, central zone and all India level, whereas entry VTCC -4 for south zone ranked first.

For forage production potential (q/ha/day), entry VTCC-98 (0.88 q/ha/day) for green forage whereas VTCC-2 for dry matter production potential (0.37 q/ha/day) was best performer. For crude protein yield, entry VTCC-9 ranked first, whereas for crude protein percent entry VTCC-1 and VTCC-7 were jointly ranked first with 7.0% crude protein. For plant height, entry VTCC-9 (97.5 cm) and for leafiness, entry VTCC-4 (1.14) ranked first. For NDF (%), ADF (%), and IVDMD (%) entry VTCC-7 ranked first.

(This Trial will continue in coded form)

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Entries		GFY (q/ha)		DMY (q/ha)				
Entries	*Rahuri	Jhansi	Rank	*Rahuri	Jhansi	Rank		
VTS-1	9.3	195.6	3	3.9	29.0	4		
VTS-2	46.4	135.9	6	21.3	23.6	7		
VTS-3	23.3	136.9	5	10.6	26.5	6		
VTS-4	32.1	188.4	4	12.7	33.3	3		
VTS-5	81.4	135.3	7	35.2	27.9	5		
VTS-6	106.1	231.8	2	41.4	42.0	2		
VTS-7	35.5	263.1	1	14.5	50.4	1		
Mean	47.7	183.9		19.9	33.2			
CD at 5%	25.2	6.3		10.8	20.6			
CV%	35.5	3.5		36.5	11.6			

Table 14.1 VTSehima-2013 (3rd Year): Varietal Trial in Sehima nervosum (Perennial): Green Forage Yield (q/ha) & Dry Matter Yield (q/ha)

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

Table 14.2 VT	Sehima-2013 (3	3 rd Year)	: Varietal Trial in	Sehima nervosum ((Perennial)	: Crude Protein	Yield (a/ha).	CP (%).	Plant Height	(cm) &	& Leaf Stem F	Ratio
		/			/			~~ \/ */		·/ -		

Entries	CPY (q/ha)		CP (%)	Plant Heig	ght (cm)	Leaf Stem Ratio		
Lintres	Rahuri	Rank	Rahuri	Rank	Rahuri	Rank	Rahuri	Rank	
VTS-1	0.4	7	11.2	1	56.0	6	1.14	3	
VTS-2	2.4	3	11.1	2	62.4	2	1.29	1	
VTS-3	1.1	6	10.5	3	60.4	3	1.19	2	
VTS-4	1.2	5	9.8	4	58.9	4	0.81	5	
VTS-5	3.4	2	9.6	5	43.6	7	0.47	6	
VTS-6	4.0	1	9.8	4	68.0	1	1.09	4	
VTS-7	1.4	4	9.8	4	58.8	5	0.81	5	
Mean	2.0		10.3		58.3		0.97		

Table 14.3 VTSehima-2013 (3rd Year): Varietal Trial in Sehima nervosum (Perennial): ADF (%), NDF (%) & IVDMD (%)

Entries	ADF	%)	NDF ((%)	IVDMD (%)		
Entries	Rahuri	Rank	Rahuri	Rank	Rahuri	Rank	
VTS-1	50.6	6	64.8	5	49.5	6	
VTS-2	47.0	3	65.8	6	52.3	3	
VTS-3	49.8	5	63.9	3	50.1	5	
VTS-4	45.6	1	59.9	1	53.0	2	
VTS-5	47.6	4	61.9	2	51.8	4	
VTS-6	59.2	7	78.5	7	42.8	7	
VTS-7	46.6	2	64.6	4	53.4	1	
Mean	49.5		65.6		50.4		

Entries	Ludh-	Bika-	Ana-	Jha-	Jabal-	Rah-	Urulikan-	Coimb-	Aver-	Ra-
Littles	iana	ner	nd	nsi	pur	uri	chan	atore	age	nk
VTD-1	462.0	49.7	71.9	600.0	435.6	169.4	464.7	906.6	395.0	4
VTD-2	304.0		24.5	397.5	363.1	115.0	403.0	783.6	341.5	8
VTD-3	406.0	110.9	139.6	642.3	475.6	159.3	433.2	889.4	407.0	1
VTD-4	338.0		29.4	628.7	281.5	142.2	361.4	791.9	367.6	7
VTD-5	508.0	124.2	126.0	648.7	342.3	141.1	412.3	861.1	395.5	3
VTD-6	584.0	227.3	156.2	501.7	303.2	190.3	395.6	779.4	392.2	5
VTD-7	532.0	198.0	231.3	506.7	401.5	129.5	379.0	824.1	400.3	2
VTD-8	473.0	235.4	261.9	497.0	263.2	158.9	356.4	762.5	376.0	6
Mean	450.9	157.6	130.1	552.8	358.3	150.7	400.7	824.8	384.4	
CD at 5%	94.8	45.8	19.6	18.8	82.8	29.0	N.S.	67.9		
CV%	12.0	19.3	8.2	10.7	13.2	11.3	10.4	4.7		

Table 15.1 VT Dichanthium-2013 (3rd Year): Varietal Trial in *Dichanthium* (Perennial): Green Forage Yield (q/ha)

Table 15.2 VT Dichanthium-2013 (3rd Year): Varietal Trial in *Dichanthium* (Perennial): Dry Matter Yield (q/ha)

Entrice	Ludh-	Bika-	Ana-	Jha-	Jabal-	Rah-	Urulikan-	Coimb-	Average	Rank
Entries	iana	ner	nd	nsi	pur	uri	chan	atore		
VTD-1	181.0	12.9	27.1	209.3	80.9	62.4	105.2	143.0	102.7	5
VTD-2	109.0		10.2	110.5	67.2	47.5	85.6	128.5	79.8	8
VTD-3	156.0	31.1	51.9	204.3	88.7	68.7	99.5	139.8	105.0	2
VTD-4	120.0		12.5	161.0	51.2	58.7	74.3	125.5	86.2	6
VTD-5	188.0	36.8	44.2	68.3	66.9	51.8	90.6	137.6	85.5	7
VTD-6	213.0	67.8	52.7	151.6	55.3	72.8	84.4	125.6	102.9	4
VTD-7	205.0	60.6	79.2	167.0	74.5	56.1	87.9	134.1	108.1	1
VTD-8	187.0	78.1	93.8	161.3	47.4	63.7	74.4	122.5	103.5	3
Mean	169.9	47.9	46.4	154.2	66.5	60.2	87.7	132.1	96. 7	
CD at 5%	44.9	12.2	6.4	12.3	15.5	12.0	16.3	11.1		
CV%	14.7	16.9	7.3	7.0	13.6	11.6	10.5	4.8		

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Entrico	GFY (q/na/day)							DMY (q/ha/day)						
Entries	Bika	ner	Anan	d Jabalpu	ir Ave	erage F	Rank	Bikaner	A	nand .	Jabalpur	Average	Ran	k
VTD-1	0.6	51	0.19	1.19	0	.66	6	0.16	().07	0.22	0.15	5	
VTD-2			0.07	0.99	0	.53	7		(0.03	0.18	0.10	6	
VTD-3	1.3	7	0.37	1.30	1	.01	4	0.38	().14	0.24	0.25	4	
VTD-4			0.08	0.77	0	.42	8		(0.03	0.14	0.09	7	
VTD-5	1.5	3	0.33	0.94	0	.93	5	0.45	(0.12	0.18	0.25	4	
VTD-6	2.8	31	0.41	0.83	1	.35	3	0.84	().14	0.15	0.38	3	
VTD-7	2.4	4	0.61	1.10	1	.38	2	0.75	().21	0.20	0.39	2	
VTD-8	2.9	1	0.69	0.72	1	.44	1	0.96	().25	0.13	0.45	1	
Mean	1.9	5	0.35	0.98	0	.97		0.59	().12	0.18	0.26		
Table 15.4 V	Г Dichanth	ium-201	13 (3 rd Ye	ear): Varietal T	rial in <i>Di</i> e	chanthiun	ı (Peren	nial): Cru	de Prote	in Yield (q/	/ha) & Cru	de Protein (%)		
Entwice				CPY (q/ha)							CP (%)			
Entries	Anand Ja	abalpur	Rahuri	Urulikanchan	Bikaner	Average	Rank	Bikaner	Anand	Jabalpur	Rahuri	Urulikanchan	Average	Rank
VTD-1	1.6	5.6	4.6	7.9	1.1	4.2	4	8.5	6.0	7.1	7.4	7.5	7.3	1
VTD-2	0.6	4.6	3.3	6.8		3.8	6		5.8	7.0	7.0	8.0	6.9	4
VTD-3	3.1	6.2	4.8	7.5	2.6	4.8	2	85	56	7.1	7.0	7.5	7.1	2
VTD 4								0.5	5.0					
V I D-4	0.7	3.5	4.3	6.1		3.7	7	0.5	6.3	6.8	7.3	8.2	7.1	2
VTD-4 VTD-5	0.7 2.6	3.5 4.3	4.3 3.2	6.1 6.8	2.9	3.7 4.0	7 5	7.9	6.3 5.9	6.8 6.8	7.3 6.3	8.2 7.5	7.1 6.9	2 4
VTD-4 VTD-5 VTD-6	0.7 2.6 3.0	3.5 4.3 3.7	4.3 3.2 4.2	6.1 6.8 6.1	2.9 5.4	3.7 4.0 4.5	7 5 3	7.9 7.9 7.9	6.3 5.9 5.5	6.8 6.8 6.8	7.3 6.3 5.8	8.2 7.5 7.2	7.1 6.9 6.6	2 4 5
VTD-4 VTD-5 VTD-6 VTD-7	0.7 2.6 3.0 3.9	3.5 4.3 3.7 5.1	4.3 3.2 4.2 3.9	6.1 6.8 6.1 7.2	2.9 5.4 4.5	3.7 4.0 4.5 4.9	7 5 3 1	7.9 7.9 7.4	6.3 5.9 5.5 4.8	6.8 6.8 6.8 7.1	7.3 6.3 5.8 7.0	8.2 7.5 7.2 8.1	7.1 6.9 6.6 6.9	2 4 5 4
VTD-4 VTD-5 VTD-6 VTD-7 VTD-8	0.7 2.6 3.0 3.9 4.9	3.5 4.3 3.7 5.1 2.9	4.3 3.2 4.2 3.9 3.9	6.1 6.8 6.1 7.2 5.4	2.9 5.4 4.5 7.4	3.7 4.0 4.5 4.9 4.9	7 5 3 1 1	7.9 7.9 7.4 9.5	6.3 5.9 5.5 4.8 5.7	6.8 6.8 6.8 7.1 6.4	7.3 6.3 5.8 7.0 6.1	8.2 7.5 7.2 8.1 7.3	7.1 6.9 6.6 6.9 7.0	2 4 5 4 3

 Table 15.3 VT Dichanthium-2013 (3rd Year): Varietal Trial in *Dichanthium* (Perennial): Green Forage Yield (q/ha/day) & Dry Matter Yield (q/ha/day)

 CEV (a/ba/day)

Mean2.64.54.06.74.04.38.35.76.96.7Table 15.5 VT Dichanthium-2013 (3rd Year): Varietal Trial in Dichanthium (Perennial): Plant Height (cm) & Leaf Stem Ratio

Entrico		Plant height (cm)							Leaf Stem Ratio						
Littles	Bikaner	Ludhiana	Anand	Jabalpur	Rahuri	Urulikanchan	Average	Rank	Bikaner	Anand	Jabalpur	Rahuri	Urulikanchan	Average	Rank
VTD-1	115.0	109.0	71.4	107.2	56.9	72.0	88.6	4	0.52	1.73	0.72	0.54	0.61	0.82	6
VTD-2		121.0	60.1	98.0	41.8	68.3	77.8	8		2.21	0.50	0.43	0.70	0.96	2
VTD-3	157.0	150.0	75.2	112.3	55.5	76.5	104.4	1	1.00	2.23	0.79	0.49	0.58	1.02	1
VTD-4		132.0	66.8	89.8	49.2	65.9	80.7	7		1.94	0.53	0.47	0.63	0.89	3
VTD-5	139.0	153.0	71.5	92.7	54.4	64.3	95.8	3	0.67	1.95	0.53	0.51	0.57	0.85	4
VTD-6	147.0	147.0	77.3	93.6	49.8	66.0	96.8	2	0.56	1.77	0.56	0.61	0.65	0.83	5
VTD-7	110.0	124.0	75.8	104.0	50.2	64.6	88.1	5	0.32	1.96	0.66	0.39	0.61	0.79	7
VTD-8	75.0	138.0	85.1	85.8	56.8	62.8	83.9	6	0.27	1.76	0.46	0.43	0.54	0.69	8
Mean	123.8	134.3	72.9	97.9	51.8	67.5	89.5		0.56	1.94	0.59	0.48	0.61	0.86	

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Entries	ADF (%	b)	NDF	· (%)	IVDMD (%)		
Entries	Rahuri	Rank	Rahuri	Rank	Rahuri	Rank	
VTD-1	47.4	6	62.3	4	52.0	6	
VTD-2	37.9	2	58.8	2	59.4	2	
VTD-3	48.5	7	61.0	3	51.1	7	
VTD-4	36.7	1	56.3	1	60.3	1	
VTD-5	44.2	4	62.6	5	54.4	4	
VTD-6	44.6	5	62.6	5	54.2	5	
VTD-7	49.7	8	65.6	7	50.2	8	
VTD-8	43.4	3	64.0	6	55.1	3	
Mean	44.0		61.7		54.6		

Table 15.6 VT Dichanthium-2013 (3rd Year): Varietal Trial in *Dichanthium* (Perennial): ADF (%), NDF (%) & IVDMD (%)

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		Nor	th West Zon	e	Central Zone						South Zone		All India	
Entries	Ludh-	Bika-	Aver-	Ra-	Ana-	Rah-	Urulikan-	Jha-	Aver-	Ra-	Coimb-	Ra-	Ave-	Ra-
	iana	ner	age	nk	nd	uri	chan	nsi	age	nk	atore	nk	rage	nk
VTCC-1	288.0	232.4	260.2	7	267.2	196.8	395.4	365.0	306.1	8	579.1	2	332.0	8
VTCC-2	275.0	297.0	286.0	6	323.0	266.5	408.7	497.7	374.0	5	554.1	6	374.6	4
VTCC-3														
VTCC-4	350.0	292.1	321.1	5	344.0	300.5	353.9	690.3	422.2	1	586.1	1	416.7	1
VTCC-5	344.0	306.7	325.4	4	213.6	266.8	361.1	408.9	312.6	7	579.1	2	354.3	7
VTCC-6	330.0	160.9	245.4	8	378.0	213.9	389.5	535.7	379.3	4	563.9	4	367.4	6
VTCC-7	418.0	265.3	341.6	3	249.0	302.6	364.6	428.0	336.1	6	573.9	3	371.6	5
VTCC-8	407.0	292.6	349.8	2	355.0	264.2	414.5	575.3	402.3	3	556.9	5	409.4	3
VTCC-9	454.0	275.4	364.7	1	376.0	324.1	387.1	565.0	413.1	2	534.7	7	416.6	2
Mean	358.3	265.3	311.8		313.2	266.9	384.4	508.2	368.2		566.0		380.3	
CD at 5%	50.2	78.1			39.0	46.5	N.S.	12.5			N.S.			
CV%	8.0	16.8			7.0	10.0	6.1	7.2			5.1			

Table 16.1 VT Cenchrus ciliaris-2013 (3rd Year): Varietal Trial in *Cenchrus ciliaris* (Perennial): Green Forage Yield (q/ha)

Table 16.2 VT Cenchrus ciliaris-2013 (3rd Year): Varietal Trial in *Cenchrus ciliaris* (Perennial): Dry Matter Yield (q/ha)

	North West Zone				Central Zone						South Zone		All India	
Entries	Ludhi-	Bika-	Aver-	Ra-	Ana-	Rah-	Urulikan-	Jha-	Aver-	Ra-	Coimba-	Ra-	Aver-	Ra-
	ana	ner	age	nk	nd	uri	chan	nsi	age	nk	tore	nk	age	nk
VTCC-1	84.0	142.5	113.3	7	90.7	68.2	86.4	42.5	71.9	8	83.8	3	85.4	7
VTCC-2	85.0	163.8	124.4	6	111.5	99.3	92.3	70.3	93.4	5	82.1	5	100.6	4
VTCC-3														
VTCC-4	112.0	141.4	126.7	5	113.4	105.4	75.1	98.9	98.2	3	91.5	1	105.4	3
VTCC-5	109.0	166.5	137.7	3	71.2	98.6	79.4	65.9	78.8	7	82.5	4	96.1	5
VTCC-6	105.0	87.4	96.2	8	128.4	80.6	81.6	91.7	95.6	4	78.5	7	93.3	6
VTCC-7	129.0	139.4	134.2	4	86.0	112.4	81.0	69.4	87.2	6	87.0	2	100.6	4
VTCC-8	122.0	156.6	139.3	2	112.6	100.9	97.4	94.4	101.3	2	80.2	6	109.1	2
VTCC-9	151.0	138.2	144.6	1	121.2	114.8	85.5	84.7	101.6	1	76.5	8	110.3	1
Mean	112.1	142.0	127.0		104.4	97.5	84.8	77.2	91.0		82.8		100.1	
CD at 5%	25.9	46.5			12.3	17.1	9.1	4.9			N.S.			
CV%	13.2	18.7			6.6	10.0	6.1	2.8			6.4			

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Entries	Green Forage Yield (q/ha/day)									Dry	Matter Yield	(q/ha/day)		
Entries	В	ikaner	Ana	nd	Average		Rank	Bi	kaner	Ana	nd	Average	R	lank
VTCC-1		0.64	0.7	1	0.68		7	(0.39	0.2	4	0.32		3
VTCC-2		0.81	0.8	6	0.84		4	(0.45	0.3	0	0.37		1
VTCC-3														
VTCC-4		0.80	0.9	2	0.86		3	(0.39	0.3	0	0.35		2
VTCC-5		0.84	0.5	7	0.70		6	(0.46	0.1	9	0.32		3
VTCC-6		0.44	1.0	1	0.72		5	(0.24	0.3	4	0.29		5
VTCC-7		0.73	0.6	6	0.70		6	(0.38	0.2	3	0.30		4
VTCC-8		0.80	0.9	5	0.87		2	(0.43	0.3	0	0.37		1
VTCC-9		0.75	1.0	0	0.88		1	(0.38	0.3	2	0.35		2
Mean		0.73	0.8	4	0.78			(0.39	0.2	8	0.33		
Table 16.4 VT (Cenchrus	ciliaris-2	013 (3 rd)	Year): V	arietal Trial iı	n <i>Cenchrus</i>	s ciliaris	s (Perei	nnial):	Crude Pro	tein Yield (q	/ha) & Crude	Protein	(%)
Entries			Crude	Protein Y	(ield (q/ha)						Crude Prote	i n (%)		
Entrics	Anand	Rahuri	Urulikanc	han	Bikaner	Average	Rank	A	Anand	Rahu	ri Urulikaı	ichan Bikaner	Averag	e Rank
VTCC-1	5.6	6.1	7.0		5.4	6.2	7		7.1	8.9	8.1	3.8	7.0	1
VTCC-2	6.9	8.1	7.4		5.1	7.4	3		6.7	8.1	8.0	3.1	6.5	3
VTCC-3														
VTCC-4	7.3	9.2	6.0		5.1	7.5	2		6.8	8.7	8.0	3.6	6.8	2
VTCC-5	4.3	8.5	6.4		5.0	6.4	6		7.4	8.6	8.1	3.0	6.8	2
VTCC-6	7.5	6.3	6.5		4.2	6.7	5		6.6	7.9	7.9	4.8	6.8	2
VTCC-7	5.4	10.7	6.5		4.0	7.5	2		7.6	9.5	8.0	2.9	7.0	1
VTCC-8	6.4	7.8	7.7		5.0	7.3	4		6.2	7.7	7.9	3.2	6.3	4
VTCC-9	6.8	9.4	6.8		5.1	7.7	1		6.2	8.2	8.0	3.7	6.5	3
Mean	6.3	8.2	6.8		4.9	7.1			6.8	8.4	8.0	3.5	6.7	
Table 16.5 VT (Cenchrus	ciliaris-2	013 (3 rd Y	Year): Va	arietal Trial ir	n <i>Cenchrus</i>	ciliaris	s (Perei	nnial):	Plant Heig	ht cm & Lea	af Stem Ratio		
				Plant H	leight (cm)						Leaf Ste	m Ratio		
Entries	Ludh	- Bika-	Ana-	Rah-	Urulikan-	Aver-	Ra	a-	Bika-	Rah-	Urulikan-	Aver-		Ra-
	iana	ner	nd	uri	chan	age	n	k	ner	uri	chan	age		nk
VTCC-1	103.0) 110.0	75.8	51.5	85.3	85.1	8	3	1.27	1.08	0.64	1.00		5
VTCC-2	116.) 120.0	79.0	69.4	77.2	92.3	4	ł	1.56	0.82	0.70	1.03		4
VTCC-3														
VTCC-4	128.) 109.0	89.2	75.1	76.9	95.6	2	2	1.43	1.33	0.67	1.14		1
VTCC-5	102.0) 106.0	74.2	68.5	86.7	87.5	6	5	1.06	1.38	0.69	1.04		3
VTCC-6	104.0) 95.0	88.9	58.4	83.7	86.0	7	7	0.88	1.17	0.63	0.89		8
VTCC-7	124.0) 115.0	79.8	74.8	75.1	93.7	3	3	1.57	0.61	0.72	0.97		6
VTCC-8	124.0) 112.0	85.4	65.8	70.0	91.4	5	5	1.60	1.00	0.58	1.06		2
VTCC-9	134.0) 105.0	88.5	75.4	84.7	97.5	1	L I	1.58	0.72	0.54	0.95		7
Mean	116.) 109.0	82.6	67.4	79.9	91.2			1.37	1.01	0.65	1.01		

Table 16.3 VT Cenchrus ciliaris-2013 (3rd Year): Varietal Trial in *Cenchrus ciliaris* (Perennial): Green Forage Yield (q/ha/day) & Dry Matter Yield (q/ha/day)

Entries	ADF	· (%)	NDI	F (%)	IVDMD (%)		
Lintres	Rahuri	Rank	Rahuri	Rank	Rahuri	Rank	
VTCC-1	49.6	7	60.7	3	50.3	7	
VTCC-2	44.4	6	62.5	4	54.3	6	
VTCC-3							
VTCC-4	40.2	2	63.9	5	57.6	2	
VTCC-5	44.2	5	65.0	7	54.5	5	
VTCC-6	52.3	8	64.2	6	48.2	8	
VTCC-7	39.8	1	59.8	1	57.9	1	
VTCC-8	42.6	3	60.7	3	55.7	3	
VTCC-9	43.5	4	60.1	2	55.0	4	
Mean	44.6		62.1		54.2		

Table 16.6 VT Cenchrus ciliaris-2013 (3rd Year): Varietal Trial in *Cenchrus ciliaris* (Perennial): ADF (%), NDF (%) & IVDMD (%)

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17. VT *Clitoria*-2013 (3rd YEAR): VARIETAL TRIAL IN *Clitoria ternatea* (PERENNIAL)

(Reference Tables: 17.1 to 17.6)

In *Kharif*-2013, a varietal trial in *Clitoria ternatea* comprising of seven entries was established in North West and Central Zone. Data received from eight testing locations revealed that for green forage yield and dry matter yield (q/ha), entry VTCT-1 was superior in both the zones and at national level also.

For fodder production potential (q/ha/day), entry VTCT-3 for green forage as well as for dry matter production potential ranked first. For crude protein yield (q/ha), entry VTCT-3 ranked first with 6.2 q/ha followed by VTCT-5 (5.7 q/ha). For crude protein content (%), VTCT-3 and VTCT-4 were ranked first showing marginal superiority over the other entries. For growth parameters, entry VTCT-5 for plant height (cm) and VTCT-1 and VTCT-7 for leafiness were adjudged best performer. For other quality parameters like NDF (%), ADF (%), IVDMD (%) entry VTCT-4 was superior.

(This Trial will continue in coded form)

18. VT Setaria grass – 2015 (1st Year): VARIETAL TRIAL IN Setaria anceps UNDER COOL SUB-TROPICAL AND SUB-TEMPERATE HIMALAYAN RANGELANDS (PERENNIAL)

The trial was established in 2015. The year being establishment year, the data will be reported from next year.

19. VT *Tall fescue* – 2015 (1st Year): VARIETAL TRIAL IN *Festuca arundinacea* UNDER COOL SUB-TROPICAL AND SUB-TEMPERATE HIMALAYAN RANGELANDS (PERENNIAL)

The trial was could not be established in 2015 as seed/planting material was not supplied by the proposers.

20. VT Orchard grass – 2015 (1st Year): VARIETAL TRIAL IN Dactylis glomerata UNDER COOL SUB-TROPICAL AND SUB-TEMPERATE HIMALAYAN RANGELANDS (PERENNIAL)

The trial was could not be established in 2015 as seed/planting material was not supplied by the proposers.

21. VT Pennisetum hybrid-2015 (1st year): (P. gluacum x P. squamulatum) (Perennial)

The trial was established in 2015. The year being establishment year, the data will be reported from next year.

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Entries			North West 2	Zone				C	entral Z	one			All India Average		
Entrics	Hisar	Bikaner	*Ludhiana	Average	Rank	Anand	Rahuri	Urulikanchan	Jhansi	Jabalpur	Average	Rank	Average	Rank	
VTCT-1	238.9	153.1	228.0	196.0	1	133.3	40.8	59.6	295.0	524.8	210.7	1	206.5	1	
VTCT-2	138.9	161.8	164.0	150.3	6	115.8	31.3	56.0	241.0	464.8	181.8	4	172.8	4	
VTCT-3	163.9	193.2	185.0	178.5	2	89.6	33.1	74.8	232.5	507.3	187.5	3	184.9	3	
VTCT-4	183.3	118.0	248.0	150.7	5	92.0	42.9	52.1	257.5	435.6	176.0	5	168.8	5	
VTCT-5	172.2	159.6	262.0	165.9	4	82.0	41.1	51.6	255.5	537.2	193.5	2	185.6	2	
VTCT-6	211.1	136.7	287.0	173.9	3	85.0	30.9	56.6	213.8	433.1	163.9	7	166.7	6	
VTCT-7	141.7	147.3	273.0	144.5	7	97.0	44.3	42.3	228.8	436.6	169.8	6	162.6	7	
Mean	178.6	152.8	235.3	165.7		99.2	37.8	56.1	246.3	477.1	183.3		178.3		
CD at 5%	25.5	47.6	128.4			15.5	6.3	7.7	36.9	118.0					
CV%	18.3	17.5	36.7			10.5	11.3	9.1	10.1	13.8					

Table 17.1 VT Clitoria-2013 (3rd Year) Varietal Trial in *Clitoria ternatea* (Perennial): Green Forage Yield (q/ha)

Note: * Not included in zonal and all India average due to CV≥ 20

Table 17.2 VT Clitoria-2013 (3rd Year) Varietal Trial in *Clitoria ternatea* (Perennial): Dry Matter Yield (q/ha)

Entrico			North West 2	Zone				All India Average						
Entries	Hisar	Bikaner	*Ludhiana	Average	Rank	Anand	Rahuri	Urulikanchan	Jhansi	Jabalpur	Average	Rank	Average	Rank
VTCT-1	82.4	67.4	49.0	74.9	1	35.9	9.6	13.2	68.2	103.0	46.0	1	54.2	1
VTCT-2	41.7	66.6	37.0	54.2	7	31.7	8.0	13.0	60.4	90.3	40.7	4	44.5	4
VTCT-3	48.5	90.8	43.0	69.7	2	25.5	9.5	17.7	57.8	99.0	41.9	3	49.8	2
VTCT-4	56.0	55.0	56.0	55.5	5	24.5	11.0	11.7	63.7	84.5	39.1	5	43.8	6
VTCT-5	50.2	71.9	61.0	61.0	4	23.4	10.8	11.7	68.5	105.6	44.0	2	48.9	3
VTCT-6	59.5	65.2	64.0	62.3	3	23.5	8.6	12.8	53.4	84.1	36.5	7	43.9	5
VTCT-7	41.3	68.2	63.0	54.7	6	28.0	10.9	9.7	56.8	87.6	38.6	6	43.2	7
Mean	54.2	69.3	53.3	61.8		27.5	9.8	12.8	61.2	93.4	41.0		46.9	
CD at 5%	19.9	24.4	25.0			4.3	1.7	1.8	10.4	23.1				
CV%	17.8	19.8	31.7			10.5	11.4	9.3	11.4	13.9				

Note: * Not included in zonal and all India average due to $CV \ge 20$

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Table 17.3 VT Clitoria-2013	(3 rd Year) Varietal Trial in	Clitoria ternatea (Perennial)	: Green Forag	e Yield (u/ha/dav)) & Dry	Matter	Yield (u/ha/da	v)
		,										., ,

Entries		Green	Forage Yi	eld(q/ha/day	()		Dry Matter Yield (q/ha/day)						
Entries	Hisar	Bikaner	Anand	Jabalpur	Average	Rank	Hisar	Bikaner	Anand	Jabalpur	Average	Rank	
VTCT-1	3.33	2.01	0.44	1.44	1.80	3	1.18	0.89	0.12	0.28	0.62	2	
VTCT-2	3.18	2.13	0.38	1.27	1.74	4	1.05	0.88	0.10	0.24	0.57	4	
VTCT-3	3.19	2.54	0.29	1.39	1.85	1	0.98	1.20	0.08	0.27	0.63	1	
VTCT-4	3.78	1.55	0.30	1.19	1.71	6	1.00	0.72	0.08	0.23	0.51	6	
VTCT-5	3.49	2.10	0.27	1.47	1.83	2	1.01	0.95	0.08	0.29	0.58	3	
VTCT-6	3.22	1.80	0.28	1.18	1.62	7	1.11	0.86	0.08	0.23	0.57	4	
VTCT-7	3.41	1.94	0.32	1.20	1.72	5	1.09	0.90	0.09	0.24	0.58	3	
Mean	3.37	2.01	0.33	1.31	1.75		1.06	0.91	0.09	0.25	0.58		

 Table 17.4 VT Clitoria-2013 (3rd Year) Varietal Trial in *Clitoria ternatea* (Perennial): Crude Protein Yield (q/ha) & Crude Protein (%)

Entries			Crude Prote	in Yield (q/	'ha)			Crude Protein (%)						
Entries	Anand	Rahuri	Urulikanchan	Jabalpur	Bikaner	Average	Rank	Bikaner	Anand	Rahuri	Urulikanchan	Jabalpur	Average	Rank
VTCT-1	6.4	1.8	1.9	12.6	2.5	5.0	5	3.7	17.9	18.2	14.3	12.3	13.3	4
VTCT-2	5.5	1.3	1.8	10.9	8.2	5.5	3	12.3	17.2	16.2	14.2	12.2	14.4	3
VTCT-3	4.2	1.7	2.6	12.0	10.5	6.2	1	11.6	16.2	18.4	14.8	12.2	14.6	1
VTCT-4	4.0	1.8	1.7	10.2	7.2	5.0	5	13.1	16.5	16.6	14.7	12.2	14.6	1
VTCT-5	3.9	2.1	1.6	12.9	7.8	5.7	2	10.9	16.8	18.9	13.6	12.3	14.5	2
VTCT-6	4.0	1.4	1.8	10.1	6.6	4.8	6	12.9	17.0	16.2	14.3	12.2	14.5	2
VTCT-7	4.6	2.1	1.4	10.6	7.6	5.2	4	11.1	16.3	18.8	14.3	12.2	14.5	2
Mean	4.6	1.7	1.8	11.3	7.2	5.3		10.8	16.8	17.6	14.3	12.2	14.3	

Table 17.5 VT Clitoria-2013 (3rd Year) Varietal Trial in *Clitoria ternatea* (Perennial): Plant Height (cm) & Leaf Stem Ratio

Entrica		Plant Height (cm)									Leaf Stem Ratio						
Entries	Ludhiana	Hisar	Anand	Rahuri	Urulikanchan	Bikaner	Jabalpur	Average	Rank	Ludhiana	Bikaner	Rahuri	Urulikanchan	Jabalpur	Average	Rank	
VTCT-1	125.0	87.1	66.9	29.8	57.6	90.0	129.9	83.8	5	1.43	0.26	2.21	1.71	0.92	1.31	1	
VTCT-2	116.0	83.0	66.9	30.7	46.8	89.0	120.4	79.0	7	1.38	0.39	2.30	1.16	0.88	1.22	5	
VTCT-3	121.0	67.8	66.8	28.7	67.1	137.0	124.8	87.6	2	1.59	0.27	1.78	1.94	0.81	1.28	3	
VTCT-4	119.0	93.9	67.9	32.8	47.0	110.0	119.9	84.4	4	1.47	0.41	1.46	1.54	0.85	1.15	6	
VTCT-5	125.0	93.4	65.0	31.0	38.7	170.0	133.1	93.7	1	1.42	0.41	1.43	1.66	0.85	1.15	6	
VTCT-6	114.0	89.3	67.4	27.2	45.0	105.0	111.7	79.9	6	1.28	0.43	2.15	1.54	0.82	1.24	4	
VTCT-7	117.0	90.0	72.6	29.3	39.1	125.0	127.2	85.7	3	1.34	0.37	2.22	1.64	0.89	1.29	1	
Mean	119.6	86.3	67.6	29.9	48. 7	118.0	123.9	84.9		1.42	0.36	1.94	1.60	0.86	1.23		

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Entring	ADF (%)		NDF (%)	IVDN	AD (%)
Entries	Rahuri	Rank	Rahuri	Rank	Rahuri	Rank
VTCT-1	44.9	7	53.1	6	53.9	6
VTCT-2	44.5	6	51.7	5	54.3	5
VTCT-3	43.0	4	53.5	7	55.4	4
VTCT-4	40.1	1	45.1	1	57.7	1
VTCT-5	42.0	3	51.3	4	56.2	3
VTCT-6	40.5	2	46.3	2	57.4	2
VTCT-7	43.3	5	48.7	3	53.9	7
Mean	42.6		49.9		55.5	

Table 17.6 VT Clitoria-2013 (3rd Year) Varietal Trial in *Clitoria ternatea* (Perennial): ADF (%), NDF (%) & IVDMD (%)

CHAPTER-2

FORAGE CROP PRODUCTION
Forage Crop Production

The programme on forage crop production was conducted at 20 locations. In total 12 experiments were conducted, out of which 6 in network (4 coordinated and two AVT based) and 6 in location specific mode with the aim to generate region specific forage production technologies for different growing condition.

Research aspect consisted of nutrient management for higher productivity of perennial grasses under low land conditions, use of straw mulch to economize the water requirement and improve the productivity of BN Hybrid, response of Congosignal grass to planting geometry and N levels, optimum seed rate and sowing methods for multicut sorghum and pearl millet mixture, enhancing the productivity of forage crops in coconut gardens through nutrient management, phosphorus management in sorghum-wheat-summer fodders cropping system, nitrogen management of perennial grasses under tree shade, compatibility of Stylosanthes hamata with Sewan and Dhaman Grasses in arid conditions, integrated nutrient management in fodder Rice bean, screening of genotypes of fodder bajra under sodic soil. Besides above, promising entries of pearl millet and cowpea were also evaluated for their responsiveness to nitrogen and phosphorus, respectively.

A. ON GOING COORDINATED TRIALS

PS-12-AST-1: Effect of nutrient management on productivity of perennial grasses under low land condition [(Table Reference: PS-12-AST-1 (a) to 1(d)]

Locations: Bhubaneswar, Jorhat, Jabalpur, Kalyani

A field experiment was started during *kharif* 2012 (establishment year) at four locations to evaluate the performance of lowland grasses in relation to crop establishment, forage productivity and nutrient management. The treatments consisted of three grasses (para grass, koronga dol (*Saciolapsis interupta*) and local dol (*Hymanchne emplexicalis*) at Jorhat; para grass (*Brachiaria mutica*), humidicola grass (*Brachiaria humidicola*) and dol grass (*Hymanchne emplexicalis*) at Bhubaneswar; para grass, humidicola and guinea grasses at Jabalpur and para, humidicola and *Arundo donax* grasses at Kalyani) and four nutrient management practices (M₁-100 % NPK through inorganic fertilizers; M₂- 50 % NPK through inorganic fertilizers + FYM@ 5t/ha; M₃-FYM@5t/ha and M₄-farmer practice (without nutrient) laid out in FRBD and replicated three times. Data of second year experimentation (first year of Kalyani) is presented in Tables PS-12-AST-1 (a) to (d-1).

At **Jorhat**, significantly higher green fodder and dry matter yield was observed with Karanga dol grass over para and Local dol grasses. All the nutrient management practices resulted in significantly higher GFY over farmerøs practice. However, highest GFY of low land grasses was obtained with application of 50 % NPK (inorganic fertilizers) + FYM 5t/ha but it remained at par with 10t/ha FYM. Application of 100 % (inorganic fertilizer), 50 % NPK (inorganic fertilizer) + FYM 5t/ha and 10 t FYM/ha increased green fodder yield by 28.5, 42.9 and 39.3%, respectively over farmerøs practice. The corresponding values for DMY were 28.8, 43.1 and 39.5% higher respectively. The data on interaction between grasses and nutrient management practices revealed that planting of local dol with 50 % NPK (inorganic fertilizer) + 5 tFYM/ha produced significantly highest GFY (989.7 q/ha) and DMY (210.1 q/ha) over rest of the combinations. Among the grasses growing of Karanga Dol recorded the highest CPY over Local dol and para grass being CPY of 16.0, 15.6 and 13.0q/ha, respectively. With respect to nutrient management application of 50 % NPK (inorganic fertilizer) + 5 tFYM/ha recorded significantly highest CPY (13.7 q/ha) over rest of the treatments.

At **Bhubaneswar**, para grass produced significantly highest GFY (552.5q/ha), DMY (93.7q/ha), CPY (3.23q/ha), net returns (Rs. 38471/ha) and benefit cost ratio (2.54) over *Humidicola* and dol grasses. Among nutrient management practices, application of 50 % NPK (inorganic fertilizer) + 5 t FYM/ha produced highest GFY (411q/ha) but at par with 100% NPK through inorganic. Highest DMY (70.4q/ha)was produced by 50% NPK + 5 t FYM/ha being at par with 100 % NPK through inorganic and FYM @ 10t/ha. CPY (2.74q/ha) was highest for 50 % NPK (inorganic fertilizer) + 5 t FYM/ha but at par with 100 % NPK through inorganic and FYM @ 10t/ha. CPY (2.74q/ha) was highest for 50 % NPK (inorganic fertilizer) + 5 t FYM/ha but at par with 100% NPK through inorganic. However, all nutrient management practices gave statistically higher GFY over farmer¢s practice. Application of 50 % NPK (inorganic fertilizer) + 5 t FYM/ha in low land grasses increased GFY by 3.5, 8.4 and 22.1 % over 100 % NPK through inorganic fertilizer, FYM 10 t/ha and farmer¢s practice, respectively. The corresponding values for DMY were 2.8, 6.8 and 20.8 % higher, respectively. The planting of para grass supplemented with 50 % NPK (inorganic fertilizer) + 5 t FYM/ha and inorganic fertilizer recorded higher GFY and DMY compared to rest of the treatment combinations.

At **Kalyani**, planting of para grass recorded significantly highest GFY (476.8q/ha), DMY (190.6 q/ha), and CPY (15.1 q/ha) over *Brachiaria humidicola* and *Arundo donax* grasses. With respect to nutrient management practices, application of 100 % NPK (inorganic fertilizer) to lowland grasses being at par with FYM 10t/ha recorded significantly highest GFY (322.9q/ha) over rest of the treatments. Whereas, highest DMY (129.5q/ha) was recorded with application of 50 % NPK through inorganic fertilizer + FYM 5t/ha in low land grasses. With respect to interaction effect, planting of para grass supplemented with 100 % NPK through inorganic fertilizers produced highest GFY (505 q/ha) of lowland grasses over rest of the combinations.

At **Jabalpur**, planting of para grass (*Brachiaria mutica*) recorded significantly highest GFY (408.5q/ha), DMY (53.4q/ha), CPY (2.8q/ha) and net monetary return (Rs. 24171/ha/year) over *Brachiaria humidicola* and guinea grasses. All nutrient management practices gave statistically higher GFY of grasses over farmerøs practice. Application of 100 % NPK through inorganic fertilizers recorded highest GFY (235.6q/ha), DMY (41.5q/ha), CPY (2.3 q/ha) and net monetary return (Rs. 12415/ha/yr). Growing of para grass supplemented with 100 % NPK through inorganic fertilizers recorded highest GFY (459.8q/ha) and DMY (60.2 q/ha) over rest of the combinations.

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Treatments		Green fodd	ler Yield (q	/ha)		Dry matter yield (q/ha)					
Treatments	Bhubaneswar	Jorhat	Kalyani	Jabalpur	Mean	Bhubaneswar	Jorhat	Kalyani	Jabalpur	Mean	
A. Grasses											
G ₁	552.5	978.9	480.4	413.4	606.30	93.7	209.1	196.9	58.6	139.58	
G ₂	402.8	1200.6	271.7	166.2	510.33	69.9	256.2	93.5	35.8	113.85	
G ₃	188.0	1171.4	177.8	59.6	399.20	33.8	250.4	74.5	32.6	97.83	
SEm <u>+</u>	6.8	22.4	3.6	10.2		1.9	4.8	2.2	2.2		
CD (P=0.05)	19.9	75.5	10.5	30.6		5.6	16.2	6.5	6.5		
B. Nutrient Management											
M ₁ : 100 % NPK (inorganic fertilizer)	397.3	1095.3	283.1	240.8	504.13	68.5	234.1	103.3	46.8	113.18	
M ₂ : 50 % NPK+FYM 5t/ha	411.0	1156.8	317.5	231.6	529.23	70.4	247.0	121.8	44.8	121.00	
M ₃ : FYM 10t/ha	379.3	1196.6	313.0	208.9	524.45	65.9	255.4	134.2	41.7	124.30	
M ₄ : Farmerøs practice (No nutrient)	336.7	1019.2	326.3	171.0	463.30	58.3	217.8	127.3	36.0	109.85	
SEm <u>+</u>	5.9	25.9	4.2	11.1		1.7	5.6	2.5	1.1		
CD (P=0.05)	17.3	87.2	12.6	34.4		4.8	18.7	7.6	3.4		

Table PS-12 AST-1 (a): Effect of nutrient management on productivity of perennial grasses under low land condition Green Fodder Yield & Dry Matter Yield (q/ha)

At Jorhat: G₁₌para grass; G₂₌ koronga dol; G₃ local dol (*Hymanchne emplexicalis*)

At Bhubaneswar: G₁=para grass (*Brachiaria mutica*); G₂=humidicola grass (*Brachiaria humidicola*); G₃=dol grass (*Hymanchne emplexicalis*)

At Jabalpur: G₁₌para grass; G₂₌humidicola; G₃₌guinea grasses

At Kalyani: G₁₌para, G₂₌humidicola G₃ Arundo donax grasses

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Entries		Greei	n fodder yield ((q/ha)		Dry matter yield (q/ha)					
	M1	M2	M3	M4	Mean	M1	M2	M3	M4	Mean	
G1	580.0	598.0	557.0	475.0	552.5	98.7	100.5	94.8	80.7	93.7	
G ₂	420.0	435.0	396.0	360.0	402.8	72.3	74.4	69.8	63.0	69.9	
G ₃	192.0	200.0	185.0	175.0	188.0	34.6	36.2	33.1	31.2	33.8	
Mean	397.3	411.0	379.3	336.7		68.5	70.4	65.9	58.3		
	Μ	G	M X G				Μ	G	M X G		
SEm <u>+</u>	5.9	6.8	11.8			SEm <u>+</u>	1.7	1.9	3.3		
CD (P=0.05)	17.3	20.0	34.5			CD (P=0.05)	4.8	5.6	9.7		
CV (%)		5.4				CV (%)		8.7			

Table PS-12-AST-1 (a-1): Interaction effect of nutrient management and grasses on green fodder and dry matter yields under Lowland Conditions at Bhubaneswar

Table PS-12-AST-1 (a-2): Interaction effect of nutrient management and grasses on green fodder and dry matter yields under Lowland Conditions at Jabalpur

Entries		Green	ı fodder yield (q	/ha)		Dry matter yield (q/ha)						
	M1	M2	M3	M4	Mean	M1	M2	M3	M4	Mean		
G ₁	464.5	456.2	406.6	326.3	413.4	65.1	63.9	58.3	47.0	58.6		
G ₂	188.6	177.2	163.7	135.2	166.2	40.3	38.1	35.3	29.4	35.8		
G ₃	69.1	61.5	56.6	51.3	59.6	35.0	32.3	31.4	31.5	32.6		
Mean	240.7	231.6	209.0	170.9		46.8	44.8	41.7	36.0			
	Μ	G	M X G				Μ	G	M X G			
SEm <u>+</u>	11.1	10.2	3.1			SEm <u>+</u>	1.13	2.2	0.3			
CD (p=0.05)	34.4	30.6	10.0			CD (p=0.05)	3.40	6.5	0.8			
CV (%)		11.2				CV (%)		8.0				

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Tuestments		Total CP	yield (kg/h	a)			СР (%	()	
Treatments	Bhubaneswar	Jorhat	Kalyani	Jabalpur	Mean	Bhubaneswar	Kalyani	Jabalpur	Mean
A. Grasses									
G ₁ : Para grass	320	1307.0	1580	280	871.8	3.4	8.0	4.8	5.4
G ₂ : Koronga Dol	290	1601.5	600	190	670.4	4.1	6.4	5.4	5.3
G ₃ : Local Dol	130	1564.9	580	150	606.2	3.9	7.6	4.7	5.4
SEm+	10	30.1	20	10		0.02		0.1	
CD (P=0.05)	20	30.1	50	20		0.06		0.4	
B. Nutrient Management									
M ₁ : 100 % NPK (inorganic	260	1463.0	670	230	655.8	3.8	62	49	
fertilizer)	200	1105.0	0/0	230	055.0	5.0	0.2	1.9	
M ₂ : 50 % NPK +FYM 5t/ha	270	1543.9	850	220	721.0	3.9	6.8	4.9	
M ₃ : FYM 10t/ha	250	1596.51	1070	210	781.6	3.8	7.8	5.0	
M ₄ : Farmerøs practice (No nutrient)	210	1361.06	1090	190	712.8	3.7	8.5	5.2	
SEm+	10	34.8	20	4		0.02		0.09	
CD (P=0.05)	20	117.1	60	12		0.05		0.27	

	Table PS-12-AST-1 (b):	: Effect of nutrient management o	n productivity of perennial	grasses under low land condi
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Table PS-12-AST-1 (c): Effect of nutrient management on productivity of perennial grasses under low land condition Net Monetary Return & B: C ratio

Treatments		Net Monetary Retur	n (Rs./ha)		B:C ratio		
	Bhubaneswar	Jabalpur	Jorhat	Mean	Bhubaneswar		
A. Grasses							
G ₁ : Para grass	38471.0	26171.3	118948.0	61196.8	2.49		
G ₂ : Koronga Dol (Saciolapsis interupta)	24746.0	9647.2	101411.0	45268.1	1.80		
G ₃ : Local Dol (<i>Hymanchne emplexicalis</i>)	5271.0	-6977.0	116784.0	38359.3	0.61		
SEm <u>+</u>	679.5	66.0	980.2	575.2	0.05		
CD (P=0.05)	1992.6	196.0	3299.3	1829.3	0.15		
B. Nutrient Management							
M ₁ : 100 % NPK (inorganic fertilizer)	26488.0	14414.7	116200.0	52367.6	1.89		
M ₂ : 50 % NPK (inorganic fert) +FYM 5t/ha	23961.0	9605.1	130531.0	54699.0	1.33		
M ₃ : FYM 10t/ha	16233.0	2786.7	124763.0	47927.6	0.73		
M ₄ : Farmerøs practice (No nutrient)	24633.0	11648.9	78029.0	38103.6	2.59		
SEm <u>+</u>	588.4	59.0	1131.9		0.05		
CD (P=0.05)	1725.7	167.0	3809.6		0.13		

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Treatment	лU	EC	00%		Kg/ha)	
Treatment	рп	dS/mhos	UC 70	Ν	Р	K
G ₁ M ₁	7.46	0.45	0.62	239.8	16.79	340.2
G ₁ M ₂	7.46	0.45	0.63	232.6	16.70	359.0
G ₁ M ₃	7.45	0.45	0.65	242.2	16.85	360.5
G ₁ M ₄	7.45	0.44	0.60	235.6	16.68	356.9
G ₂ M ₁	7.45	0.43	0.61	233.4	16.80	359.3
G ₂ M ₂	7.46	0.46	0.62	236.5	16.82	361.2
G ₂ M ₃	7.47	0.46	0.62	235.8	16.80	357.3
G ₂ M ₄	7.46	0.45	0.61	233.6	16.82	350.8
G ₃ M ₁	7.46	0.45	0.62	235.7	16.82	362.2
G ₃ M ₂	7.47	0.44	0.64	234.8	16.80	360.4
G ₃ M ₃	7.46	0.45	0.64	235.1	16.81	360.2
G ₃ M ₄	7.46	0.45	0.60	231.2	16.80	358.4
Initial status	7.46	0.45	0.62	236.8	16.79	360.2

Table PS-12-AST-1 (d): Interaction effect of nutrient management and grasses on soil fertility parameters after harvest of crop at Jabalpur

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PS-14-AST-1 Effect of straw mulch on the water requirement, weeds and productivity of B N Hybrid [(Table Reference: PS-14-AST-1 (a) to 1(d-2)]

Locations: Ludhiana, Bikaner and Raipur

A field experiment was started during kharif 2014 (establishment year) at three locations to evaluate the performance of B N Hybrid grass (PBN- 233) under three moisture regimes (0.8 IW/CPE, 1.0 IW/CPE, and 1.2 IW/CPE ratio) and four straw mulch quantities (No mulch control, 5, 7.5 and 10t/ha straw mulch). Total twelve treatment combinations were laid out in split plot design with irrigation in main plots and mulch treatments in sub plots and replicated thrice. Sowing of BN hybrid was done at 60cm x 60cm planting geometry. Irrigations were given during whole crop season as per treatment. During 2015 from the established trial, biomass, weeds and other observations were recorded and mean data for growth, yield, weed and quality parameters were statistically analyzed.

The data revealed that 1.2 IW/CP ratio recorded maximum mean green and dry matter yield, which was 17.7% and 11.0 % higher over 0.8 IW/CPE ratio in terms of green and dry matter, respectively. Among different locations, Ludhiana recorded highest biomass yield. IW/CPE ratio of 1.2 also recorded maximum plant height Leaf: stem ratio, mean net return (Rs. 63964 per ha) and B:C ratio (1.59). However it also recorded higher weed population and weed dry weight. As regards to straw mulch, applications of mulch @ 7.5 t/ha proved significantly superior to control as well as 5 t/ha. It was at par with 10 t mulch per ha in GFY, DMY and CP content. In monitory terms, mulch @ 7.5 t/ha proved more remunerative and economical over 10 t/ha (mean net return Rs. 59766/ha and BC ratio 1.51)

Treatments	Gre	en Fodder Y	/ield (q/ha)	Dry Matter yield (q/ha)						
Treatments	Ludhiana	Bikaner	Raipur	Mean	Ludhiana	Bikaner	Raipur	Mean			
A. I W/CPE Ra	ntio										
I ₁ - 0.8	1695.1	746.4	534.5	992.0	241.2	103.6	102.4	149.1			
I ₂ - 1.0	1776.6	992.4	553.3	1107.4	253.9	116.8	105.1	158.6			
I ₃ 1.2	1820.8	1087.8	595.3	1168.0	259.5	120.4	113.1	164.3			
SEm <u>+</u>	72.2	29.2	1.86		10.0	1.6					
CD (p=0.05)	282.8	114.8	7.3			6.2	2.6				
B. Straw mulch	(t/ha)										
M ₁ - Control	1433.0	834.6	520.7	929.4	202.3	106.2	98.2	135.6			
M ₂ - 5.0	1675.0	917.1	550.4	1047.5	236.9	113.3	105.0	151.7			
M ₃ - 7.5	1954.3	1033.9	572.4	1186.9	282.2	118.5	109.4	170.0			
M ₄ - 10	1994.3	983.1	600.6	1192.7	284.6	116.5	114.7	171.9			
SEm <u>+</u>	94.2	18.8	1.48		16.4	1.4	0.39				
CD (P=0.05)	N.S	55.9	4.4		N.S	4.1	1.2				

Table PS-14-AST-1 (a) Effect of straw mulch on the water requirement, weeds and productivity of B N Hybrid

Turetari		Plant Heigh	nt (cm)		Leaf s	stem rati	0	CP Yield (q/ha)	CP (%)
1 reatments	Ludh- iana	Bika- ner	Rai- pur	Mean	Ludh- iana	Bika ner	Mean	Rai- pur	Rai- pur
A. I W/CPE Ratio									
I1 0.8 IW/CPE	70.0	112.4	105.6	96.0	1.18	2.15	1.67	9.5	9.3
I ₂ 1.0 IW/CPE	73.5	118.4	109.0	100.3	1.22	2.36	1.79	10.2	9.7
I ₃ 1.2 IW/CPE	75.2	128.9	117.0	107.0	1.24	2.25	1.75	11.6	10.3
SEm <u>+</u>	4.3	3.1	1.0			0.05	0.05		
CD (P=0.05)	17.06	12.3	3.5			0.20	0.20		
B. Nutrient Manag	gement								
M ₁ Control	64.5	115.8	103.3	94.5	1.07	1.90	1.49	9.4	9.6
M ₂ 5.0	70.2	122.6	109.2	100.7	1.17	2.30	1.74	10.2	9.7
M ₃ 7.5	77.5	128.6	112.4	106.2	1.29	2.38	1.84	10.7	9.8
M ₄ 10	79.7	132.8	117.2	109.9	1.32	2.44	1.88	11.3	9.8
SEm <u>+</u>	5.6	1.8	1.56			0.06			
CD (P=0.05)	17.11	5.5	4.8			0.19			

Table PS-14-AST-1(b): Effect of straw mulch on the water requirement, weeds and productivity of B N Hybrid

Table PS-14-AST-1(c): Effect of straw mulch on the water requirement, weeds and productivity of B N Hybrid

Treatments	Net Return				B:C Ratio		WUE (kg/ha/mm)		
	Bikaner	Raipur	Mean	Bikaner	Raipur	Mean	Ludhiana	Bikaner	
A. I W/CPE Rati	0								
I1 0.8 IW/CPE	77029	4477	40753	2.20	0.20	1.20	2.06	12.0	
I ₂ 1.0 IW/CPE	109008	4913	56961	2.73	0.22	1.48	1.80	11.7	
I ₃ 1.2 IW/CPE	121413	6514	63964	2.90	0.28	1.59	1.76	10.9	
SEm <u>+</u>	4385			0.11			0.07	0.2	
CD (P=0.05)	17219			0.45			0.245	0.7	
B. Nutrient Man	agement								
M ₁ Control	88493	5533	47013	2.39	0.27	1.33	1.37	10.8	
M ₂ 5.0	99219	5021	52120	2.56	0.22	1.39	1.75	11.5	
M ₃ 7.5	114411	5120	59766	2.79	0.22	1.51	2.16	12.0	
M ₄ 10	107808	5532	56670	2.70	0.23	1.47	2.22	11.9	
SEm <u>+</u>	2823			0.07			0.10	0.1	
CD (P=0.05)	8387			0.22			0.4	0.4	

Treatments	Weed pop	ulation/m ² (N	No)	Weed d	ry weight (g	/m ²)	Weed control efficiency (%)
	Ludhiana	Bikaner	Mean	Ludhiana Bikaner M		Mean	Ludhiana
A. I W/CPE Ratio)						
I1 0.8 IW/CPE	9.65	16.00	12.82	13.92	2.67	8.29	-
I ₂ 1.0 IW/CPE	8.78	15.63	12.20	12.68	2.94	7.81	8.63
I ₃ 1.2 IW/CPE	8.42	19.63	14.02	12.08	4.55	8.31	36.3
SEm+	0.45	0.64		0.63	0.04		56.3
CD (P=0.05)		2.51			0.17		
B. Nutrient Mana	agement						
M ₁ Control	13.37	29.65	21.51	17.26	6.48	11.87	
M ₂ 5.0	10.25	20.98	15.615	15.77	4.47	10.12	31.1
M ₃ 7.5	6.93	11.02	8.975	11.00	1.68	6.34	74.1
M ₄ 10	5.26	6.68		7.54	0.91		86.0
SEm+	0.49	0.47		0.87	0.05		
CD (P=0.05)		1.39			0.14		

Table PS-14-AST-1 (d): Effect of straw mulch on the water requirement, weeds and productivity of B N Hybrid

Table PS-14-AST-1(d-1) Interaction Effect of straw mulch on the water requirement, weeds and productivity of B N Hybrid at Ludhiana

Treatments	Moisture content (%) at 1st cut					CP (%) at 1 st cut				Ether extract (%) at 1 st cut					
	M0	M1	M2	M3	Mean	M0	M1	M2	M3	Mean	MO	M1	M2	M3	Mean
I ₁ 0.8 IW/CPE	72.6	73.5	80.0	81.1	76.81	8.05	9.07	11.24	11.36	9.93	2.45	2.67	3.30	3.34	2.94
I ₂ 1.0 IW/CPE	72.8	76.0	81.2	82.0	77.99	8.93	9.92	11.66	11.65	10.54	2.64	2.92	3.38	3.40	3.08
I ₃ 1.2 IW/CPE	73.4	77.2	81.6	82.9	78.76	9.06	10.77	11.67	11.91	10.85	2.64	3.17	3.40	3.41	3.16
Mean	72.93	75.6	80.90	82.0		8.68	9.92	11.52	11.64		2.58	2.92	3.36	3.38	
CD (p=0.05)			1.87				0.84					0.72			

Table PS-14-AST-1(d-2) Interaction Effect of straw mulch on the water requirement, weeds and productivity of B N Hybrid at Ludhiana

Treatments	Crude fiber (%) at 1 st cut]	Minera a	ineral matter (%) at 1 st cut			Oxalate content (%) at 1 st cut						
	M0	M1	M2	M3	Mean	MO	M1	M2	M3	Mean	M0	M1	M2	M3	Mean
I1 0.8 IW/CPE	34.2	33.9	31.7	31.6	32.84	11.1	12.3	12.8	13.0	12.30	3.52	3.54	3.56	3.60	3.56
I ₂ 1.0 IW/CPE	33.9	33.0	30.2	29.8	31.73	12.0	12.4	13.0	13.8	12.81	3.53	3.55	3.63	3.64	3.59
I ₃ 1.2 IW/CPE	33.4	31.7	29.9	29.3	31.08	12.1	12.8	13.5	14.0	13.10	3.54	3.55	3.64	3.71	3.61
Mean	33.83	32.86	30.60	30.23		11.7	12.48	13.1	13.6		3.53	3.55	3.61	3.65	
CD (p=0.05)		•		1.14					0.30					0.16	

PS-14-AST-3: Response of Congo-signal grass (*Brachiaria ruziziensis* Cv. DBRS 1) to planting geometry and N levels [(Table Reference: PS-14-AST-3 (a) to (a-1)

Location: Dharwad and Mandya

A field experiment was started during kharif 2014 (establishment year) at two locations to evaluate the performance of Congo-signal grass (*Brachiaria ruziziensis* Cv DBRS 1) under different planting geometry and N levels and their interaction. However, at Mandya the establishment of Congo-signal grass was not proper. Hence, the crop was again planted in January 2015. The treatments consisted of two growing systems. i.e., irrigated and rainfed; two planting geometry i.e., 45 cm x 45 cm and 60 cm x 60 cm and four nitrogen levels i.e., 0 kg N/ha as basal & after each cut (N1), 10 kg N/ha as basal & after each cut (N2), 20 kg N/ha as basal & after each cut (N3), 30 kg N/ha as basal & after each cut (N4). Under rainfed conditions 3 cuts were taken whereas under irrigated conditions 5 cuts were taken. The treatments were replicated thrice in split ósplit plot design. The first year results indicated that planting geometry at 60 cm x 60 cm recorded higher plant height, tillers/clump, green fodder /clump at each cut as well as higher GFY and DFY. The improvement in GFY and DFY was recorded only upto 20 kg N/ha as basal and after each cut. The grass production under Irrigated conditions recorded 523.1 q green and 109.84 q dry matter/ha in comparison to 359.5 q green and 89.87q dry matter/ha. The interaction of 60 cm x 60 cm x 30 kg N/ha as basal & after each cut.

Treatment	Plant height (cm) at each cut	Tillers/clump at each cut	GFY yield /clump (kg) at	GFY (q/ha /year)	DFY(q /ha/Year)
			each cut		
Growing systems (2)					
G ₁ Rainfed	117.29	147.88	0.337	359.5	89.87
G ₂ Irrigated	136.75	160.96	0.298	523.1	109.84
SEm <u>+</u>	0.46	0.49	0.001	1.5	0.36
CD at 5%	2.82	2.98	0.007	9.4	2.20
Planting geometry (2)					
P ₁ 45 cm x 45 cm	124.54	144.79	0.223	430.1	97.53
P ₂ 60 cm x 60 cm	129.50	164.04	0.412	452.4	102.18
SEm <u>+</u>	1.29	2.37	0.002	2.2	0.50
CD at 5%	5.06	9.32	0.006	8.7	1.94
Nitrogen levels (4)					
$N_1 0$ kg N/ha as basal & after each cut	101.33	124.83	0.283	390.5	88.66
N ₂ 10 kg N/ha as basal & after each cut	120.50	150.42	0.310	431.9	97.78
N ₃ 20 kg N/ha as basal & after each cut	135.92	164.75	0.336	467.0	105.54
N ₄ 30 kg N/ha as basal & after each cut	150.33	177.67	0.341	475.7	107.45
SEm+	1.89	1.95	0.002	3.1	0.68
CD at 5%	5.53	5.68	0.005	9.1	1.97

Table PS-14-AST-3 (a): Effect of planting geometry and N levels on the growth and yield of *Brachiaria ruziziensis* Cv DBRS 1)

Treatments	P ₁	P ₂		Mean	
G ₁	360.55	358.43		359.49)
G ₂	499.66	546.46		523.06	j –
Mean	430.10	452.45			
SEm <u>+</u>		3.15			
CD at 5%		12.36			
(B) Growing system x N	Nitrogen management				
	N ₁	N ₂	N ₃	N ₄	Mean
G ₁	332.35	353.97	373.72	377.91	359.49
G ₂	448.72	509.84	560.24	573.44	523.06
Mean	390.54	431.90	466.98	475.68	
SEm <u>+</u>		3.13			
CD at 5%		9.14			
(C) Planting geometry	x Nitrogen management				
	N ₁	N ₂	N ₃	N ₄	Mean
P ₁	386.85	425.16	449.89	458.52	430.10
P ₂	394.22	438.65	484.08	492.83	452.45
Mean	390.54	431.90	466.98	475.68	
SEm+		4.43			
<u></u> CD at 5%		12.92			

Table PS-14-AST-3 (a-1): Interaction effect of treatments on GFY (q/ha/year)

K-15-AST-13 C: Performance of multicut sorghum and pearl millet mixture at various seed rates under different methods of sowing [(Table Reference: K-15-AST-13 (a)]

Locations: Ludhiana and Palampur

A field experiment was started during *kharif* 2015 at two locations to find out suitable method of sowing mixture of sorghum and pearl millet with optimum seed rate. The treatments consisted of five seed rate/ratio of Sorghum: pearl millet (100:0, 75:25, 50:50, 25:75 and 0:100) and two sowing methods (line sowing at 22.5 cm apart and broadcast). The PSC 4 variety of Sorghum and FBC 16 of Pearl millet were used at Ludhiana and respective varieties at Palampur were KH-105 and K-35. The trial was conducted in Randomized Block Design with three replications. Three cuts were obtained at Palampur whereas at Ludhiana only two cuts could be harvested. The results indicated that in terms of green and dry matter yields, sole pearl millet, 50:50, 25:75 Seed rate/ratio of Sorghum: Pearl millet remained at par with each other at both locations as well as on mean basis but were significantly superior to other ratios. The crude protein yield varied significantly only at Palampur centre, where sole pearl millet, 50:50, 25:75 seed rate/ratio of Sorghum: Pearl millet, 50:50, 25:75 seed rate/ratio of Sorghum: Pearl millet, 50:50, 25:75 seed rate/ratio of Sorghum: Pearl millet. As regards to method of sowing, line sowing proved superior to broadcasting in terms of green, dry matter and crude protein yields.

	Gi	een fodo	ler	D	ry matte	r	C	rude prot	ein	Crude protein		in
Treatments	yi	ield (q/h	a)	yi	ield (q/ha	ı)	c	ontent (%	b)	yi	eld (q/ha))
	Ludh-	Pala-	Mean	Ludh-	Pala-	Mean	Ludh	Palam-	mean	Ludh-	Palam-	Mean
	iana	mpur		iana	mpur		iana	pur		iana	pur	
Seed rate/ratio of Sorghum: Pearl millet												
100:0	594.4	375.6	485.0	115.6	85.55	100.6	6.91	9.13	8.02	8.03	7.83	7.9
75:25	619.9	422.3	521.1	116.5	95.45	106.0	6.81	9.10	7.96	7.94	8.79	8.4
50:50	651.6	438.2	544.9	123.6	98.85	111.2	6.16	9.28	7.72	7.65	9.2	8.4
25:75	671.9	457.6	564.7	132.2	102.51	117.4	5.83	9.50	7.67	7.73	9.83	8.8
0:100	671.0	441.0	556.0	135.3	98.49	116.9	5.97	9.60	7.79	8.05	9.46	8.8
SE(m)	11.69	9.51		3.02	2.17		0.16	0.13		0.33	0.27	
C.D.	35.00	28.47		9.04	6.51		0.49	NS		NS	0.81	
Method of sov	ving											
Line sowing	724.9	370.7	547.8	142.9	84.66	113.8	6.40	8.95	8.95	9.13	7.59	8.4
Broadcast	558.6	483.1	520.9	106.4	107.67	107.0	6.27	9.70	9.7	6.62	10.45	8.5
SE(m)	7.39	6.01		1.91	1.37		0.1	0.08		0.21	0.17	
C.D.	22.14	18.00		5.72	4.12		N/A	0.25		0.62	0.51	
Interaction												
SE(m)	16.53	13.44		4.27	3.07		0.23	0.19		0.46	0.38	
C.D.	49.50	40.26		12.79	9.22		N/A	NS		1.38		
CV (%)	4.46			5.93			6.32			10.15		

Table K-15-AST-13 (a): Performance of multicut sorghum and pearl millet mixture under varying seed rates and methods of sowing

B. LOCATION SPECIFIC TRIALS

PS-12-AST-3: Enhancing the production potential of various forage crops in coconut gardens through nutrient management. [(Table Reference: PS-12-AST-3 (a) to (c)]

(Location: Mandya)

The experiment was initiated during 2012 to assess the performance of different crops and nutrient levels on productivity, quality and economics of forage crops in coconut garden. The treatment consisted of three crops (C1-BN hybrid, C2-guinea and C3-signal grass) and three levels of NPK (100% RDNF, 125% RDNF, and 150% RDNF) laid out in FRBD & replicated three times. The recommended doses used for BN hybrid grass was 180:120:80 NPK kg/ha, for Guinea grass was 200:50:25 NPK kg/ha and for Signal grass it was 100:60:40 NPK kg/ha. Pooled data of three years experimentation revealed that BN hybrid recorded significantly highest GFY (1127.4 q/ha), DMY (248.0 q/ha), net monetary returns (Rs.42987/ha) & benefit cost ratio (2.03) over Guinea & Signal grass. The application of 150% RDF to different crop(s) recorded highest GFY (880.1 q/ha), DMY (211.4 q/ha), net monetary returns (Rs.28149/ha) & benefit cost ratio (1.74). Interaction effect among the crops & nutrient levels were found non significant. The maximum light interception was observed in the bottom of the canopy and middle of the canopy in BN hybrid with application of 150% RDNF (39.19% and 29.18%) respectively.

Сгор	Plant height (cm)	GFY (q/ha)	DMY (q/ha)	CPY (q/ha)	CP (%)	Leaf stem ratio			
Napier Bajra hybrid	107.30	1127.41	248.03	17.75	7.11	0.66			
Guinea grass	85.92	794.54	174.79	13.11	7.50	0.61			
Signal grass	55.87	511.78	117.71	9.54	8.10	0.50			
S.Em <u>+</u>	2.31	17.01	5.02	0.36	0.10	0.015			
C.D (p=0.05)	6.82	51.80	15.41	1.05	0.29	0.046			
Nutrient levels (Kg/ha)	Nutrient levels (Kg/ha)								
100% RDN	68.31	695.07	139.01	9.87	7.11	0.52			
125% RDN	82.38	782.13	172.06	12.93	7.51	0.57			
150% RDN	98.37	880.13	211.40	16.25	7.69	0.65			
S.Em <u>+</u>	2.31	17.01	5.02	0.36	0.10	0.015			
C.D (p=0.05)	6.82	51.80	15.42	1.05	0.29	0.046			
Interaction									
S.Em <u>+</u>	3.83	29.65	9.17	0.59	0.20	0.025			
C.D(p=0.05)	NS	NS	NS	NS	NS	NS			

Table PS-12-AST-3 (a): Performance of grasses in coconut gardens under varying nutrient levels

100% RDF for BN hybrid grasses -180:120:80 NPK kg/ha, 100% RDF for Guinea grass - 200:50:25 NPK kg/ha, 100% RDF for Signal grass - 100:60:40 NPK kg/ha.

A. Crops	Gross returns (Rs/ha)	Net returns (Rs/ha)	B:C ratio					
BN Hybrid	84556	42987	2.03					
Guinea grass	59591	24513	1.70					
Signal grass	38384	8604	1.29					
B. Nutrient Levels (kg/ha)								
100% RDF	52130	18425	1.54					
125% RDF	58660	22518	1.63					
150% RDF	66062	28149	1.74					

Table PS-12 AST-3 (b): Economics as influenced by different crops in coconut garden under different levels of nutrients (Pooled data of three years).

Table PS-12 AST-3 (c): Effect of forage crops and nutrients level on light interception at bottom and middle of the canopy (Mean of three years)

	Bottom of	the canopy	Middle of the canopy		
Treatments	Percent light	Percent light	Percent light	Percent light	
	availability	Interception	availability	Interception	
BN hybrid + 100% Nutrients level	67.23	32.77	77.90	22.10	
BN hybrid + 125% Nutrients level	62.80	37.20	74.91	25.09	
BN hybrid + 150% Nutrients level	60.81	39.19	70.82	29.18	
Guinea grass + 100% Nutrients level	70.81	29.19	83.95	16.02	
Guinea grass + 125% Nutrients level	70.82	29.18	81.61	18.39	
Guinea grass + 150% Nutrients level	70.58	29.42	79.23	20.77	
Signal grass + 100% Nutrients level	71.75	28.25	78.92	21.06	
Signal grass + 125% Nutrients level	74.19	25.81	76.06	23.94	
Signal grass + 150% Nutrients level	68.32	31.68	73.01	26.99	

CS-13-AST-4: Residual effect of P applied to wheat on the succeeding summer fodders in sorghumwheat-summer fodders cropping system [(Table Reference: CS-13-AST-4 (a) to (d)]

Location: Ludhiana

The experiment was initiated during Kharif 2013 at PAU, Ludhiana with a view to identify suitable summer fodder crop in sorghum-wheat-summer fodder cropping system and to study the residual effect of P applied to wheat on succeeding summer fodder crops. The treatments consisted of three summer fodders (cowpea, maize and bajra) and five levels of P applied to summer fodders (control, 25, 50, 75 and 100 % of recommended P) laid out in FRBD with three replications. During Rabi 2014-15, general crop of wheat was raised with recommended dose of fertilizers. The grain yield of wheat ranged between 44.3 to 46.8 q/ha. After harvesting of wheat crop, three summer fodder crops viz. maize, bajra and cowpea were sown with application of phosphorus at 0, 25, 50, 75 and 100% of recommended dose of phosphorus. Among the summer fodders maize gave significantly higher green fodder (339.6 q/ha) and dry matter yield (86.6 q/ha) over baira (322.8 and 72.2 q/ha, respectively) and cowpea (287.2 and 45.2 g/ha, respectively). The response to phosphorus application was variable among different summer fodder crops. The green fodder yield of maize increased significantly up to 50% of recommended dose of fertilizer whereas in case of bajra the response was significant up to 25% of recommended dose of fertilizer. There was no response of application of phosphorus for green fodder yield of cowpea. The dry matter yield of maize and bajra increased significantly up to 25% of recommended dose of phosphorus but dry matter yield of cowpea did not have any influence of applied phosphorus. The crude protein content of cowpea fodder was significantly higher over maize and bajra and there was significant increase in crude protein content with P application up to 100% recommended dose of fertilizer in all the summer fodders. The crude protein yield was significantly higher in case of maize fodder over baira and cowpea which may be attributed to its higher dry matter yield.

After harvesting of summer fodders, sorghum fodder was sown. The green fodder yield of sorghum was significantly higher in wheat-cowpea-sorghum cropping system (528.9 q/ha) over wheat-maize-sorghum (429.7 q/ha) and wheat-bajra-sorghum (363.4 q/ha) cropping systems. The dry matter yield of sorghum followed the same trend as green fodder yield. The green fodder and dry matter yield of sorghum increased significantly up to application of 50% recommended dose of phosphorus to the summer fodders. Similar trend was followed in case of other growth parameters, crude protein content and yield.

The economic analysis of the experiment revealed that gross returns, net returns and benefit cost ratio were significantly higher in case of wheat-cowpea-sorghum cropping system over wheat-maize-sorghum and wheat-bajra-sorghum.

Treatments	Wheat	Wheat	Summer fodder		Sorghum	
			Yield ((q/ha)		
	Grain	Straw	Green	Dry	Green	Dry
			fodder	matter	fodder	matter
Cropping system						
Wheat-maize-sorghum	45.8	42.6	339.6	86.6	429.7	78.2
Wheat-bajra-sorghum	45.5	44.2	322.8	72.2	363.4	66.1
Wheat-cowpea-sorghum	45.8	45.9	287.2	45.2	528.9	100.6
CD (5%)	NS	NS	28.79	6.49	21.94	4.78
P-applied to summer fodder	· (% of Recor	nmended P)				
0	44.8	42.1	254.3	52.1	333.8	62.7
25	46.0	42.1	305.4	66.4	428.8	78.9
50	45.8	44.4	332.8	70.9	464.2	86.2
75	45.7	46.0	342.1	74.5	482.2	90.0
100	46.2	46.6	348.0	76.2	494.4	90.2
CD (5%)	NS	NS	37.17	8.38	28.33	6.18

Table CS-13-AST-4 (a): Fodder and grain yields in Wheat-Summer fodder-Sorghum cropping system

Table CS-13-AST-4 (b): Growth parameters of different crops in Wheat-Summer fodder-Sorghum Cropping system

Treatments	Р	lant height (c	m)	Tillers or	plants per m	row length		
	Wheat	Summer	Sorghum	Wheat	Summer	Sorghum		
		fodder			fodder			
Cropping system								
Wheat-maize-sorghum	101.6	159.3	197.9	65.5	12.4	26.9		
Wheat-bajra-sorghum	101.3	170.3	191.6	64.1	55.8	23.2		
Wheat-cowpea-sorghum	101.8	149.9	206.9	65.6	16.4	30.7		
CD (5%)	NS	6.33	4.77	NS	2.27	2.35		
P-applied to summer fodde	r (% of Reco	mmended P)						
0	101.6	140.0	182.5	65.1	24.6	21.6		
25	100.6	156.6	195.4	65.3	27.6	26.3		
50	102.5	165.2	201.9	65.4	29.2	28.2		
75	101.6	168.0	205.5	65.4	29.7	29.0		
100	101.4	169.4	208.6	64.1	30.1	29.4		
CD (5%)	NS	8.18	6.16	NS	2.93	3.03		

Table CS-13-AST-4 (c): Quality parameters in Wheat-Summer fodder-Sorghum cropping system

Treatments	Summe	r fodder	Sor	ghum
	CP (%)	CP yield (q/ha)	CP (%)	CP yield (q/ha)
Cropping system				
Wheat-maize-sorghum	10.09	8.82	7.58	6.04
Wheat-bajra-sorghum	7.68	5.60	7.68	5.17
Wheat-cowpea-	15.69	7.11	8.18	8.29
sorghum				
CD (5%)	0.07	0.70	0.25	0.41
P-applied to summer fo	dder (% of Recomme	ended P)		
0	10.23	5.03	6.45	4.11
25	10.83	6.72	7.20	5.72
50	11.32	7.52	7.45	6.48
75	11.63	8.16	8.62	7.76
100	11.75	8.47	9.35	8.44
CD (5%)	0.09	0.91	0.33	0.53

Table CS-13-AST-4 (d): Economics of Wheat-Summer fodder-Sorghum cropping system per hectare

Treatments	Sorghum equivalent yield (q)	Gross returns (Rs)	Net Returns (Rs)	B:C Ratio
Cropping system				•
Wheat-maize-sorghum	2166.9	130012.0	61053.0	1.89
Wheat-bajra-sorghum	1970.7	118241.3	56694.3	1.92
Wheat-cowpea-	2185.2	131109.5	71325.0	2.19
sorghum				
CD (5%)	53.33	3199.2		0.05
P-applied to summer for	odder (% of Recomme	ended P)		
0	1895.6	113735.4	50617.6	1.81
25	2079.9	124795.1	61521.0	1.98
50	2155.1	129308.7	65878.3	2.04
75	2187.7	131260.6	67674.0	2.07
100	2219.5	133171.7	69428.8	2.09
CD (5%)	68.84	4130.2	4130.1	0.07

AICRP on Forage Crops & Utilization

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K-12-AST-4: Cropping system studies in fodder maize with legume intercropping (Location: Srinagar)

The experiment was planned to evaluate the forage production potential of maize and legume intercropping in terms of total dry matter production and maize forage quality. The experiment was laid out in RBD with three replications and nine treatments. The treatments consisted of sole maize (30 cm spacing), sole cowpea (30 cm spacing), sole soybean (30 cm spacing), maize + cowpea (1:1), maize + cowpea (2:1), maize + soybean (1:1), maize + soybean (2:1), maize + cowpea mixed cropping and maize + soybean mixed cropping. The experiment was started in *kharif*- 2012. The experiment completed two year report and the data of the 3rd year could not be collected due to devastating floods in the valley of Kashmir. Hence the trial will be repeated in *kharif*- 2016.

K-12-AST-5: Effect of varying seed rate of forage legumes on productivity of fodder maize

Location: Srinagar

The experiment was started in *kharif* -2012 to study the effect of varying seed rate of forage legumes on productivity of fodder maize. The experiment was laid out in RBD with three replications and nine treatments. The nine treatments consisted of sole maize (30cm spacing), sole cowpea (30cm spacing), sole soybean (30cm spacing), maize + cowpea @ 20 kg/ha, maize + cowpea @ 40 kg/ha, maize + cowpea @ 60 kg/ha and maize + soybean @ 80 kg/ha. The data of the 3rd year could not be collected due to devastating floods in the valley of Kashmir. Hence the trial will be repeated in *kharif*-2016.

Annual Report-Kharif-2015

K-14-AST-13: Effect of levels of nitrogen on productivity of perennial grasses with and without tree shade [(Table Reference: K-14-AST-13 (a)]

Locations: Jorhat

A field experiment was started during kharif 2012-14 at Jorhat to study the productivity of perennial grasses as influenced by tree shade and nitrogen levels. Two perennial grasses viz. Setaria Cv. PSS-1 and Congo-signal grass Cv. DRSB-7 was tested under tree shade and open condition in main plots with graded levels of nitrogen (125 % RDNF, RDNF and 75% RDNF). Application of 40kg N, 60kg P, 30kg K +30kg N as top dress after each cut was used as RDNF (recommended dose of nitrogenous fertilizer). The trial was conducted in Split Plot Design with three replications. Every year three cuts were taken. The crop was established in 2011 and conducted for three years. The soils of the experimental area were sandy loam in texture with pH 5.6, medium in available N & K and low in P. The results of pooled analysis indicated that the mean GFY under open condition was 1247 q as compared to 567 q/ha obtained under tree shade. Both Congo-signal and Setaria grass produced mean green forage yield of 905 and 909q/ha, respectively. As far as the dry matter yield was concerned the similar trend was observed to that of GFY. The DMY obtained under open condition was 208 q/ha and under shade was 114 q/ha. The dry matter yield of Congosignal grass was higher (169q/ha) than Setaria (152q/ha) though the GFY was higher in Setaria. Increasing level of nitrogenous fertilizer resulted in increase in both GFY and DMY. The highest GFY and DMY were recorded with the application of 125% RDNF (1027q and 196 q/ha respectively). Total crude protein yield of 13.97 q/ha was obtained under open condition which was 42% higher over shade condition. Congo-signal grass produced higher CP yield (11.86 q/ha) than Setaria (10.25 q/ha). The highest net return (Rs. 102579/ha) was recorded under open condition which was 51% higher than shade condition. Both the grasses fetched similar net return/ha. However, with the increased levels of nitrogen the profitability increased from Rs 70867/ha in 75% RDNF to Rs 95522/ha in 125% RDNF application.

Treatment		Yield (q/ha)		Plant height	Tiller	NMR
I reatment	GFY	DMY	CPY	(cm)	/tussock	(Rs/ha)
A. Growing conditions						
Under tree shade	567.94	114.10	8.19	153.72	41.57	50189
Open condition	1247.44	208.21	13.97	149.35	78.76	102579
SEm±	36.39	7.29	0.42	1.40	6.00	2777
C.D. at 5%	117.96	23.78	1.40	NS	18.4	8723
B. Grasses						
Seteria anceps	909.75	152.56	10.25	151.06	50.43	76289
Brachiaria brizantha	905.62	169.50	11.86	150.39	69.95	76479
SEm±	36.39	7.29	0.42	1.40	6.00	2777
C.D. at 5%	NS	NS	NS	NS	NS	NS
C. Nitrogen levels						
25% < RDNF	773.65	151.59	10.06	146.28	79.32	70687
RDNF	922.26	174.56	12.04	150.03	59.78	85177
25% > RDNF	1027.19	196.69	13.58	154.08	63.38	95522
SEm±	43.11	8.68	0.49	3.65	8.65	3362
C.D. at 5%	139.84	28.14	1.61	10.95	26.75	10550
D. Interaction						
S X P						
SEm±	56.31	11.35	0.61	4.95	11.55	4632
C.D. at 5%	178.44	36.15	3.79	15.25	NS	14105
SXN						
SEm±	74.67	15.03	0.85	6.20	15.45	5824
C.D. at 5%	251.36	50.61	2.89	20.75	NS	19603
CV %	13.42	16.82	15.93	8.95	15.40	20.09

 Table K-14-AST-13 (a): Effect of levels of nitrogen on productivity of perennial grasses with and without tree shade (2012-14)

K-15-AST-8C: Compatibility of *Stylosanthes hamata* with *Sewan (Lasiurus sindicus)* and *Dhaman Grass (Cenchrus setigerus)* in arid conditions [(Table Reference: K-15-AST-8C (a)]

(Locations: Bikaner)

The experiment was conducted at Bikaner. Jalore center did not execute the trial. Sowing of the trial was done in Kharif, 2015 at Bikaner, Fatehpur and Bhilwara. However, due to non receipt of sufficient rains, grasses could not establish properly at Fatehpur and Bhilwara centers while at Bikaner life saving irrigation saved the trial from failure. At Bikaner, experimental field soil was poor in fertility status (pH ó 7.9, Organic. Carbon-0.12%, Available. N-98 kg/ha, $P_2O_5 - 15$ kg/ha and $K_2O - 230$ kg/ha), sandy loam in texture and saline in reaction. Sowing was done with commencement of monsoon rains on 2^{nd} July, 2015.

The treatments included eight combinations of grass +Stylo namely, T_1 . Sewan grass, T_2 . Dhaman grass, T_3 *Stylosanthes hamata*, T_4 -3:1 combination of $T_1 + T_3$, T_5 - 3:1 combination of $T_2 + T_3$, T_6 - 2:2 combination of $T_1 + T_3$, T_7 - 2:2 combination of $T_2 + T_3$ and T_8 - 1:1:1 combination of $T_1 + T_2 + T_3$ intercropping row arrangement. The treatments were replicated thrice in RBD. Gap filling was done 20 days after sowing with next rain. A total of 388.8 mm rainfall was received in 19 rainy days during the crop season. After harvesting the fodder, one irrigation was given as no rainfall was received from second fortnight of August. Observations on growth, grass yield parameter was recorded and statistically analyzed. (Table no.)

The results indicated that among different grass+ legume treatments, sowing the sole Sewan grass (T_1) recorded the highest plant height; number of tillers/clump, shoot weight; root weight and dry matter yield which were significantly higher over rest of the treatments, except $T_2 \& T_6$ in plant height and T_2 in shoot weight which was found at par. The L: S ratio was maximum in sole Dhaman (T_2) , shoot:root ratio was the highest in sole *Stylosanthes hamata* and green fodder yield was recorded maximum in Sewan, Dhaman & *Stylosanthes* (1:1:1) intercropping row arrangement treatment (T_8) and were statistical superior over all other treatments.

Treatment	Plant	Tillers/	L:S ratio	Shoot	Root	Shoot:	Yield	(q/ha)
	height	clump		weight	weight	Root	Green	Dry
	(cm)	(no.)		(g/plant)	(g/plant)	ratio	fodder	matter
T ₁	47.50	51.50	2.29	30.08	23.31	1.29	36.30	15.56
T ₂	46.67	30.00	3.37	30.88	19.68	1.58	35.10	12.65
T ₃	33.83	27.83	0.76	3.75	1.44	2.62	22.85	9.49
T ₄	46.00	47.17	2.05	25.07	16.16	1.56	25.49	10.48
T ₅	44.50	28.50	2.66	26.33	15.67	1.70	32.83	11.14
T ₆	46.33	42.17	1.84	19.20	13.17	1.46	33.80	12.67
T ₇	42.67	28.83	1.64	16.67	12.47	1.35	34.19	13.36
T ₈	43.67	39.83	1.71	21.27	15.05	1.42	40.53	14.62
SEm <u>+</u>	0.92	1.06	0.09	1.70	0.89	0.12	1.06	0.34
CD at 5%	2.79	3.22	0.28	5.17	2.70	0.37	3.20	1.02

Table K-15-AST-8C (a): Effect of *Stylosanthes hamata* +Sewan and Dhaman grass mixture on growth and yield.

 T_1 = Sewan, T_2 = Dhaman, T_3 = Stylosanthes hamata, $T_4(3:1) = T_1 + T_3$, $T_5(3:1) = T_2 + T_3$

 $T_6(2:2) = T_1 + T_3$, $T_7(2:2) = T_2 + T_3$, $T_8(1:1:1) = T_1 + T_2 + T_3$ intercropping row arrangement.

K-15 AST-2: Screening of genotypes of fodder bajra under sodic soil

[(Table Reference: K-15-AST-2 (a)]

(Location: Faizabad)

The field experiment was conducted at Faizabad centre to screen the fodder pearl millet entries for their performance under sodic condition. The treatment comprised of total 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 6 9.1, E.C.- 0.98 dsm⁻¹, Organic. Carbon-0.27%, Available. N-115.6 kg/ha, P_2O_5 6 19.2 kg/ha and K_2O -147.7 kg/ha), sandy loam in texture and saline in reaction. The results indicated that among all the entries, NDFB-939 was superior in all parameters plant height, leaf stem ratio, green, dry and crude protein yields as well as crude protein content. The entry also recorded maximum per day productivity. This was closely followed by NDFB-936.

			Yield	(q/ha)		Per day pro	oductivity	Plant	L/S
S.N.	Genotype					(q/ha/day)		height	ratio
		GFY	DMY	СРУ	CP %	GFY	DMY	(cm)	
1	NDFB-936	395.5	112.1	9.1	8.1	5.56	1.58	189.4	0.69
2	NDFB-904	305.7	93.3	7.1	7.6	4.31	1.31	166.1	0.63
3	NDFB-939	410.3	129.9	11.3	8.7	5.78	1.80	198.7	0.73
4	NDFB-914	340.6	99.1	7.1	7.2	4.80	1.40	172.5	0.62
5	NDFB-926	360.5	100.6	7.8	7.8	5.08	1.42	174.3	0.70
6	NDFB-12	370.4	109.6	8.2	7.5	5.22	1.54	178.6	0.65
7	NDFB-2 (check)	381.8	115.7	9.7	8.4	5.38	1.63	188.4	0.71
8	NDFB-3(check)	375.2	108.1	8.6	8.0	5.28	1.52	185.2	0.69
Mean		367.4	108.5	8.6	7.9	5.18	1.53	181.6	0.68
SEm	E	18.5	5.8	0.4	0.3	-	-	10.6	0.04
CD at	5%	55.9	17.7	1.2	0.8	-	-	NS	0.10
CV%		8.7	9.3	8.3	6.1	-	-	10.1	9.50

Table K-15-AST -2(a): Screening of genotypes of fodder bajra under sodic soil

K-15-AST-3 L Studies on integrated nutrient management in fodder Rice bean [(Table Reference: K-15-AST-3 (a)]

(Location: Imphal)

The experiment was initiated in kharif-2015 for three years on location specific mode with a view to study the effect of combined application of organic manure (poultry manure, PM) and inorganic fertilizers on forage yield and economics of fodder rice bean [*Vigna umbellate* (Thumb) Ohwi and Ohashi] at Imphal. The treatments consisted of 100% RDF for phosphorus-**RDFP** (T₁), 75% **RDFP**+1 t Poultry Manure-**PM** (T₂), 75% RDFP+2 t PM (T₃), 50% RDFP+1 t PM (T₄), 50% RDFP+2 t PM (T₅), 25% RDFP+1 t PM (T₆), 25% RDFP+2 t PM (T₇), were laid out in randomized block design and replicated three times. The rice bean was sown in 35 cm spaced lines using 35 kg seed/ha. The data revealed that application of 50% RDFP+2 t PM /ha recorded highest green fodder yield (370.03 q/ha), dry matter yield (83.27 q/ha), crude protein content (13.73%) and crude protein yield (11.46 q/ha). It also fetched highest net monetary returns (Rs 49436.35/ha/yr) and benefit cost ratio (2.01) over rest of the treatments and lowest being with 25% RDFP + 1 t PM (Rs 24266.98/ha/yr and 1.02), respectively.

Table K-15-AST-3 (a): Effect of Integrated nutrient management in fodder Rice bean

		Yield (q/l	ha)	Crude	Plant	Leaf	Net	Benefit
Treatment	Green	Dry	Crude	protein	height	stem	return	cost
	fodder	matter	protein	(%)	(cm)	ratio	(Rs./ha)	ratio
T ₁	259.43	51.95	6.51	12.50	153.44	0.93	27895.7	1.16
T ₂	280.63	66.05	8.44	12.77	146.11	1.01	31747.0	1.30
T ₃	350.22	70.70	7.36	10.43	137.00	0.73	45264.4	1.83
T ₄	273.40	61.22	6.78	11.07	130.11	0.82	30609.4	1.27
T ₅	370.03	83.27	11.46	13.73	152.44	0.69	49436.4	2.01
T ₆	240.63	45.27	5.90	13.00	129.11	0.83	24267.0	1.02
T ₇	356.06	68.74	7.82	11.37	136.22	0.75	46852.7	1.92
SEm <u>+</u>	12.49	6.48	0.90	0.18	7.61	0.07	2498.0	0.10
C.D.	38.49	19.97	2.77	0.54	23.44	0.22	7697.1	0.32
(p=0.05)								

(T₁)-100% RDF for phosphorus-RDFP, (T₂)-75% RDFP+1 t Poultry Manure-PM, (T₃)-75% RDFP+2 t PM, (T₄)-50% RDFP+1 t PM, T₅-50% RDFP+2 t PM, (T₆)-25% RDFP+1 tPM, (T₇)-25% RDFP+2 t PM

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

Location: Rahuri

The B x N hybrid trial was planted on 30-07-2015. This season was the establishment year. The data will be reported from *Kharif* -2016.

C. AVT BASED TRIALS

K-14-AST-1 AVTPM-2: Effect of nitrogen levels on promising entries of pearl millet (AVTPM-2)

[Table Reference: K-14-AST-1 (a) to (c)]

Locations: NWZ- Ludhiana, Hisar, Bikaner, SZ-Coimbatore, Hyderabad, Mandya

A field trial AVTPM-2 was conducted to find out the response of promising entries of pearl millet to supplementation of graded doses of nitrogen. The study was undertaken at six locations; three in North West Zone and three in South Zone with 4 entries (3 national checks and one entry DFMH-30) and 4 levels of nitrogen (0, 30, 60 and 90 Kg N/ha).

In the NWZ, entry DFMH-30 recorded highest GFY (540.6 q/ha), which was 6.22 % higher than the best national check Giant Bajra. But in terms of DMY, Giant Bajra yielded maximum (99.5q/ha) followed by entry DFMH-30 (90.3q/ha). In south zone, no entry under evaluation could surpass the national check Giant bajra at Hyderabad and Coimbatore locations and also on mean basis in both GFY and DMY. On overall mean basis across the zones, Giant Bajra yielded maximum GFY and DMY (432.2 & 85.7 q/ha) followed by entry DFMH-30 (421.5 & 77.3 q/ha).

Critical observation of data indicated that in terms of crude protein content and crude protein yields, Giant Bajra proved superior followed by DFMH-30 among all the entries. 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 48.7, 21.1 and 5.6 per cent over 0, 30 and 60 kg N/ha and respective increase with respect to dry matter yield was 54.0, 24.9 and 7.1 per cent. The interaction effect of entries and nitrogen levels indicated that yield of all the entries increased consistently with increasing levels of nitrogen. However, the response of nitrogen application on the yields of entries was more pronounced at Bikaner, Mandya and Coimbatore with each increment in nitrogen level. The economic optima worked out on the basis of mean of all entries on a location indicated that, at Bikaner it was 65.7 kg/ ha, whereas at Hisar it was 126.9 kg/ha (Fig.1).



Fig.1: Response equation and economic optima of entries at different locations

			(Green fod	der yield (q/	ha)					D)ry matte	er yield (q/	'ha)		
A Entrica		NV	VZ			SZ				NW	Z			SZ	Z	
A. Entries	Ludh-	His-	Bika-	Mean	Hydera-	Coimb-	Man-	Mean	Ludh-	His-	Bika-	Mean	Hyder	Coimba	Man-	Mean
	iana	ar	ner		bad	atore	dya		iana	ar	ner		-abad	tore	dya	
Raj Bajra Chari-2	396.3	293.6	493.9	394.6	265.3	271.9	145.6	227.6	62.5	70.0	78.8	70.4	74.3	40.3	33.04	49.2
AVKB-19	399.9	350.6	603.8	451.4	293.9	307.6	192.7	264.7	62.0	86.3	94.0	80.8	84.8	45.7	44.82	58.4
DFMH-30	386.0	546.3	689.5	540.6	386.8	304.2	216.4	302.5	54.0	121.4	95.6	90.3	98.5	45.2	48.83	64.2
Giant Bajra	353.5	599.8	573.3	508.9	416.5	448.6	201.4	355.5	54.2	135.2	109.1	99.5	103.4	65.1	47.44	72.0
SEm ±	7.9	10.3	10.7		9.8	18.3	5.3		1.0	3.4	2.1		4.2	2.8	1.68	
CD (P=0.05)	22.9	29.8	30.8		28.4	44.9	15.2		3.0	9.8	5.9		12.0	6.9	4.82	
B. N levels (kg/ha)																
0	266.5	358.9	432.1	352.5	289.7	314.2	122.6	242.2	40.7	77.5	79.3	65.8	68.3	45.9	24.8	46.3
30	353.0	429.7	587.0	456.6	324.0	320.8	174.6	273.1	50.0	101.0	92.4	81.1	85.3	47.6	39.0	57.3
60	420.8	483.8	697.1	533.9	358.5	340.3	211.9	303.6	66.1	115.1	105.0	95.4	98.1	50.4	49.7	66.1
90	495.3	517.9	644.3	552.5	390.3	356.9	247.1	331.4	76.0	119.4	100.7	98.7	109.49	52.4	60.7	74.2
SEm+	7.9	10.3	10.7		9.8	11.4	5.3		1.0	3.4	2.1		4.2	1.7	1.68	
CD (P=0.05)	22.9	29.8	30.8		28.4	23.6	15.2		3.0	9.8	5.9		12.0	3.5	4.82	
Interaction																
SEm ±	15.8	20.6	21.35		19.7	27.0	10.6		2.1	6.7	4.10		8.3	4.1	3.34	
CD (P=0.05)	45.7	NS	61.65		NS	NS	30.5		6.0	NS	11.85		NS	NS	9.64	

Table K-14-AST-1(a): Effect of entries and nitrogen levels on GFY (q/ha) & DMY (q/ha) of pearl millet (AVTPM-2)

Entries / N lovels		Green fo	dder yield	(q/ha)		Dry matter yield (q/ha)						
Entries/ IN levels	0	30	60	90	Mean	0	30	60	90	Mean		
Raj Bajra Chari-2	398.3	458.0	591.0	528.3	493.9	69.7	73.3	87.3	84.7	78.8		
AVKB-19	377.0	556.0	775.7	706.3	603.8	67.0	98.3	111.0	99.7	94.0		
DFMH-30	520.7	736.7	780.0	720.7	689.5	80.0	94.0	107.0	101.3	95.6		
Giant Bajra	432.3	597.3	641.7	622.0	573.3	100.7	104.0	114.7	117.0	109.1		
Mean	432.1	587.0	697.1	644.3		79.3	92.4	105.0	100.7			
SEm+	21.35					4.10						
CD (P=0.05)	61.65					11.85						
CV (%)												

Table K-14-AST-1(a-1): Interaction effect of entries and N levels on GFY and DMY of pearl millet at Bikaner

Table K-14-AST-1(a-2): Interaction effect of entries and N levels on GFY and DMY of pearl millet at Mandya

Entries / N levels		Green fo	dder yield ((q/ha)			Dry matte	er yield (q/	'ha)	
Entries/ IN levels	0	30	60	90	Mean	0	30	60	90	Mean
Raj Bajra Chari-2	104.8	142.7	159.7	175.3	145.6	20.67	30.77	37.83	42.90	33.04
AVKB-19	122.2	185.4	216.5	246.7	192.7	25.13	42.13	51.33	60.67	44.82
DFMH-30	146.7	199.1	247.8	271.9	216.4	29.17	44.50	55.43	66.23	48.83
Giant Bajra	116.7	171.1	223.4	294.6	201.5	24.10	38.40	54.20	73.07	47.44
Mean	122.60	174.58	211.85	247.13		24.77	38.95	49.70	60.72	
SEm <u>+</u>		10.6				SEm <u>+</u>		3.34		
CD (P=0.05)		30.5				CD (P=0.05)		9.64		

Table K-14-AST-1(a-3): Interaction effect of entries and N levels on CPY of pearl millet at Coimbatore

Entries/ N lovels		Crude pro	otein yield (q/ha)		
Entries/ IN levels	0	30	60	90	Mean
Raj Bajra Chari-2	3.69	4.67	4.74	5.74	4.71
AVKB-19	3.83	4.08	4.85	5.38	4.54
DFMH-30	4.95	5.44	6.39	6.84	5.91
Giant Bajra	9.12	9.39	10.02	10.44	9.74
Mean	5.40	5.90	6.50	7.10	6.22
SEm+	0.30				
CD (P=0.05)	0.74				

				C	PY (q/ha)							CP (%)				
Treatment		N	WZ			SZ				NV	ΝZ			SZ		
Ireatment	Ludh-	His-	Bika-	Mean	Hydera-	Coimb-	Man-	Mean	Ludh-	His-	Bika-	Mean	Hydera-	Coimb-	Man-	Mean
	iana	ar	ner		bad	atore	dya		iana	ar	ner		bad	atore	dya	
A. Entries/ N levels																
Raj Bajra Chari-2	3.8	6.7	6.05	5.52	5.2	4.7	10.8	6.90	6.0	9.5	7.58	7.69	6.8	11.6	8.5	8.97
AVKB-19	3.2	8.8	6.75	6.25	5.0	4.5	11.9	7.13	5.0	10.2	7.08	7.43	5.8	9.9	8.1	7.93
DFMH-30	3.2	12.3	7.30	7.60	7.2	5.9	14.1	9.07	5.9	10.1	7.54	7.85	7.2	13.0	7.8	9.33
Giant Bajra	3.5	13.1	9.37	8.66	6.8	9.7	18.8	11.77	6.2	9.7	8.53	8.14	6.4	15.0	7.7	9.70
SEm ±	0.1		0.26		0.3	0.3	0.7		0.02	0.09	0.22		0.2	0.1	0.2	
CD (P=0.05)	0.2		0.74		1.0	0.7	1.9		0.07	0.27	0.63		0.5	0.1	0.5	
CV (%)	6.4								1.5							
B. N levels (kg/ha)																
0	2.0	7.1	5.04	4.71	3.7	5.4	5.3	4.80	4.8	9.2	6.30	6.77	5.4	11.4	7.1	7.97
30	2.8	9.7	6.98	6.49	5.4	5.9	10.5	7.27	5.6	9.6	7.51	7.57	6.3	12.1	7.9	8.77
60	4.0	12.3	8.88	8.39	6.8	6.5	15.7	9.67	6.1	10.7	8.47	8.42	7.0	12.7	8.4	9.37
90	4.9	12.0	8.56	8.49	8.3	7.1	24.7	13.37	6.5	10.1	8.46	8.35	7.6	13.4	8.7	9.90
SEm <u>+</u>	0.1		0.26		0.3	0.2	0.7		0.02	0.09	0.22		0.2	0.1	0.2	
CD (P=0.05)	0.2		0.74		1.0	0.5	1.9		0.07	0.27	0.22		0.5	0.2	0.5	
C. Interaction																
SEm ±	0.1				0.7	0.5			0.05	0.18			0.3	0.2		
CD (P=0.05)	0.4				NS	NS			0.14	0.54			NS	0.4	NS	
					15.5								9.1			

Table K-14-AST-1 (c): Effect of entries and nitrogen levels on quality of pearl millet (AVTPM-2)

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				Plant he	eight (cm)]	Leaf stem rat	io	
A Entries / N Lovels		NV	VZ			SZ			NWZ		S	Z	
A. Entries/ N levels	Ludh-	His-	Bika-	Mean	Hyder-	Coimb-	Man-	Mean	Bika-	Hyder-	Coimb-	Man-	Mean
	iana	ar	ner		abad	atore	dya		ner	abad	atore	dya	
Raj Bajra Chari-2	191.6	258.4	193.3	214.4	202.33	212.3	133.15	182.6	0.57	0.204	0.17	0.24	0.20
AVKB-19	201.1	276.6	199.7	225.8	189.68	218.6	135.53	181.3	0.59	0.174	0.15	0.25	0.19
DFMH-30	177.9	240.4	183.3	200.5	215.04	219.6	131.28	188.6	0.96	0.234	0.20	0.26	0.23
Giant Bajra	128.4	252.6	180.5	187.2	215.35	227.9	134.01	192.4	0.88	0.240	0.26	0.29	0.26
SEm ±	4.16	2.22	3.44		1.7	5.6	4.17		0.04	0.01	0.02	0.01	
CD (P=0.05)	12.07	6.45	9.94		4.9	NS	NS		NS	0.03	0.04	0.03	
B. N levels (kg/ha)													
0	142.2	244.8	165.3	184.1	189.20	208.6	112.53	170.1	0.76	0.179	0.18	0.23	0.20
30	159.4	257.5	194.1	203.7	203.03	213.7	129.96	182.2	0.71	0.200	0.19	0.25	0.21
60	191.8	262.1	198.8	217.6	212.40	223.9	139.90	192.1	0.80	0.226	0.20	0.27	0.23
90	205.5	263.6	198.7	222.6	217.7	232.7	151.58	200.7	0.75	0.248	0.21	0.28	0.25
SEm <u>+</u>	4.16	2.22	3.44		1.7	2.8	4.17		0.04	0.01	0.03	0.01	
CD (P=0.05)	12.07	6.45	9.94		4.9	5.8	12.03		NS	0.03	NS	0.03	
C. Interaction													
SEm ±	8.32	4.44			3.4	7.4				0.02	0.03		
CD (P=0.05)	24.14	NS			NS	NS	NS			NS	NS		
		19.13			2.9					18.5			

Table K-14-AST-1 (c): Effect of entries and nitrogen levels on growth parameters of pearl millet (AVTPM-2)

Table K-14-AST-1 (c): Effect of entries and nitrogen levels on Tillers/m² and economics of pearl millet (AVTPM-2)

Treatment	Net Return (Rs/ha)	B:C ratio	Tillers/m ²
A. Entries/ N levels	Bikaner	Bikaner	Hisar
Raj Bajra Chari-2	46270	1.65	21.2
AVKB-19	58950	1.82	23.3
DFMH-30	68840	1.97	28.4
Giant Bajra	54500	1.71	30.8
SEm ±	1601	0.05	0.62
CD (P=0.05)	4624	0.15	1.81
B. N levels (kg/ha)			
0	38175	1.42	20.6
30	56765	1.80	25.9
60	69975	2.01	28.4
90	63645	1.92	28.8
SEm <u>+</u>	1601	0.05	0.62
CD (P=0.05)	4624	0.15	1.81
C. Interaction			
SEm ±			1.25
CD (P=0.05)			NS
CV (%)			8.34

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K-14-AST-2 AVTC-2: Effect of phosphorus levels on promising entries of cowpea (AVTC-2) [Table Reference: K-14-AST-2 (a) to (c)]

Locations: NEZ-Faizabad, Kalyani Jorhat, Bhubaneswar and Ranchi

A field trial was conducted to study the effect of phosphorus levels on the performance of AVTC-2 entries of cowpea in North East Zone. The study was undertaken at five locations with 4 entries (including 3 national checks) and 3 levels of phosphorus (30, 60 and 90 Kg P_2O_5/ha). The results indicated that the entry TNFC-0926 (274.2q green and 52.2q dry matter/ha) out yielded the national as well as zonal checks. It recorded 11.3 and 10.65 % higher GFY and DFY respectively, over best check Bundel Lobia-1 (NC). The entry also recorded highest CP Yields followed by Bundel Lobia-1 (NC). The growth parameters, herbage yield and crude protein yield increased consistently with increasing level of phosphorus up to 90 Kg P_2O_5/ha . With the application of to 90 Kg P_2O_5/ha the green forage yield increased by 14.8, and 2.9 per cent over 30 and 60 kg P_2O_5/ha and respective increase with respect to dry matter yield was 13.7 and 2.3 per cent. The interaction effect of entries and nitrogen levels indicated that yield of all the entries increased consistently with increasing levels of phosphorus at Ranchi and Kalyani.

			GFY	ľ (q/ha)					DM	Y (q/ha)		
Treatment	Faiza-	Kal-	Jor-	Bhuban-	Ran-	Mean	Faiza-	Kal-	Jor-	Bhuban-	Ran-	Mean
	bad	yani	hat	eswar	chi		bad	yani	hat	eswar	chi	
A. Entries												
Bundel	160.0	190.0	341.4	279.5	260.8	246.3	25.2	26.7	71.7	57.4	55.2	47.2
Lobia-1 (NC)												
UPC-622	154.5	166.3	396.6	248.2	205.3	234.2	23.7	26.4	83.3	50.0	48.1	46.3
(NEZ)												
TNFC-0926	175.5	212.0	445.0	292.2	246.1	274.2	27.2	29.9	93.5	58.6	51.8	52.2
UPC-5286	169.9	214.5	253.4	200.5	274.9	222.6	25.8	30.4	53.2	40.1	55.8	41.1
(NC)												
SEm ±	5.2	4.41	175.1	4.2	2.7		0.8	0.65	29.6	1.2	0.7	
CD (P=0.05)	15.1	13.27	NS	12.3	7.9		2.2	1.92	NS	3.6	2.1	
B. P levels (kg/	ha)								1		1	
30	150.9	169.2	333.1	235.1	234.6	224.6	22.8	23.9	70.0	47.3	51.5	43.1
60	168.1	201.1	368.8	270.5	244.2	250.5	26.4	29.5	77.5	54.6	51.7	47.9
90	175.9	216.7	375.4	259.7	261.4	257.8	27.1	31.7	78.8	52.6	55.0	49.0
SEm <u>+</u>	4.4	6.25	51.8	3.6	2.3		0.7	0.82	10.9	1.1	0.6	
CD (P=0.05)	13.1	18.65	NS	10.7	6.8		1.9	2.43	NS	3.1	1.8	
C. Interaction	V x P											
SEm ±	8.9	5.12	27.8	7.3	4.6		1.3	1.31	8.0	2.1	1.2	
CD (P=0.05)	NS	15.47	117.9	21.3	13.6		NS	3.84	25.0	6.2	3.6	
CV (%)	9.37	9.68	5.9	4.9			8.9	10.23	17.9	7.1		

Table-K-14-AST-2 (a): Effect of entries and phosphorus levels on GFY and DMY of forage cowpea (AVTC-2) in North East Zone

Entries / Dlovels		Green fodde	r yield (q/ha)		D	ry matter y	ield (q/ha)	
Entries/ 1 levels	30	60	90	Mean	30	60	90	Mean
Bundel Lobia-1 (NC)	244.2	250.1	288.1	260.8	52.8	53.1	59.9	55.3
UPC-622 (NEZ)	196.1	199.5	220.2	205.3	46.6	46.7	51.2	48.2
TNFC-0926	231.7	253.0	253.5	246.1	52.2	50.1	52.9	51.7
UPC-5286 (NC)	266.5	274.1	284.1	274.9	54.5	55.9	55.9	55.4
Mean	234.6	244.2	261.5		51.5	51.5	55.0	
	V	Р	V X P			V	Р	V X P
SEm <u>+</u>	2.7	2.3	4.6		SEm <u>+</u>	0.7	0.6	1.2
CD (P=0.05)	7.9	6.8	13.6		CD (P=0.05)	2.1	1.8	3.6
CV (%)					CV (%)			

Table K-14-AST-2(a-1): Interaction effects of entries and phosphorus levels on GFY & DMY (q/ha) of forage cowpea at Ranchi

Table K-14-AST-2(a-2): Interaction effects of entries and phosphorus levels on GFY & DMY (q/ha) of forage cowpea at Kalyani

Entries / D levels			Dry matter yield (q/ha)					
Entries/ r levels	30	60	90	Mean	30	60	90	Mean
Bundel Lobia-1 (NC)	151.6	195.2	223.3	190.0	20.8	27.8	31.5	26.7
UPC-622 (NEZ)	143.3	170.5	185.3	166.4	22.5	27.6	29.1	26.4
TNFC-0926	185.6	222.2	228.3	212.0	25.5	30.9	33.4	29.9
UPC-5286 (NC)	196.6	216.8	230.2	214.5	26.7	31.8	32.8	30.4
Mean	169.3	201.2	216.8		23.9	29.5	31.7	
	V	Р	V X P			V	Р	V X P
SEm <u>+</u>	5.1	5.7			SEm <u>+</u>	1.3	1.1	
CD (P=0.05)	15.5	16.9			CD (P=0.05)	3.8	3.4	
CV (%)					CV (%)			

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	CPY (q/ha)					CP (%)					
A. Entries	Faizabad	Kalyani	Jorhat	Bhuban	Ranchi	Mean	Faizabad	Jorhat	Bhuban	Ranchi	Mean
				eswar					eswar		
Bundel Lobia-1 (NC)	4.10	3.15	8.60	9.00	8.10	6.60	16.60	11.90	15.70	14.70	14.70
UPC-622 (NEZ)	3.80	3.49	10.10	8.10	6.90	6.50	16.00	12.20	16.30	14.40	14.70
TNFC-0926	4.30	3.74	11.40	9.10	7.40	7.20	16.10	12.20	15.60	14.40	14.60
UPC-5286 (NC)	4.00	4.06	6.40	6.80	8.30	5.90	15.70	12.00	16.80	14.90	14.90
SEm ±	0.10	0.13	2.60	0.20	0.10		0.40	3.50	0.10	0.10	
CD (P=0.05)	0.30	0.37	NS	0.60	0.30		NS	NS	0.20	0.20	
B. P levels (kg/ha)											
30	3.60	3.40	8.50	7.50	7.50	6.10	15.80	12.10	15.90	14.50	14.60
60	4.20	3.43	9.40	8.70	7.50	6.60	16.20	12.10	16.10	14.60	14.80
90	4.40	3.99	9.50	8.60	8.10	6.90	16.30	12.10	16.30	14.80	14.90
SEm <u>+</u>	0.10	0.11	1.30	0.20	0.10		0.30	1.70	0.10	0.10	
CD (P=0.05)	0.30	0.27	NS	0.50	0.30		NS	NS	0.20	0.20	
C. Interaction											
SEm ±	0.20	0.12	2.00	0.30	0.20		0.60	8.00	0.10	0.10	
CD (P=0.05)	NS	0.34	3.90	1.00	NS		NS	NS	0.40	NS	
CV (%)	8.10	9.72	17.90	7.20			6.70	17.90	1.50		

Table K-14-AST-2(b): Effect of entries and phosphorus levels on quality and CPY of forage cowpea (AVTC-2)

Table K-14-AST-2(c): Effect of entries and phosphorus levels on growth parameters and quality parameters of forage cowpea (AVTC-2)

		Plant height (cm)				Leaf Stem Ratio					Plant population/m ²			
A. Entries	Faizabad	Kalyani	Jorhat	Bhuban	Ranchi	Mean	Faizabad	Kalyani	Bhuban-	Ranchi	Mean	Faizabad	Ranchi	Mean
				eswar					eswar					
Bundel Lobia-1 (NC)	177.6	96.8	191.1	114.5	125.5	141.1	0.37	1.14	0.92	0.50	0.73	11.6	11.7	11.7
UPC-622 (NEZ)	176.7	96.7	162.3	109.8	90.3	127.2	0.36	0.91	0.80	0.56	0.66	11.5	10.8	11.2
TNFC-0926	178.2	94.2	166.0	118.8	116.5	134.7	0.40	1.17	0.98	0.46	0.75	11.6	10.6	11.1
UPC-5286 (NC)	177.3	99.9	172.1	102.3	121.8	134.7	0.37	1.01	0.77	0.57	0.68	11.5	10.9	11.2
SEm ±	6.3	1.05	647.6	0.9	2.2		0.01		0.02	0.01		0.17	0.3	
CD (P=0.05)	NS	3.02	NS	2.7	6.4		NS		0.06	0.02		NS	NS	
CV (%)			13.0	2.5					7.62					
B. P levels (kg/ha)														
30	176.4	84.3	164.3	109.7	111.7	113.1	0.37	1.10	0.78	0.54	0.70	11.6	11.0	11.3
60	177.8	101.2	173.3	112.9	112.5	116.0	0.38	1.04	0.94	0.55	0.73	11.5	10.6	11.1
90	177.9	105.5	181.2	111.5	116.3	118.2	0.38	1.02	0.89	0.47	0.69	11.6	11.3	11.5
SEm+	5.5	2.52	100.0	0.8	1.9		0.01		0.02	0.01		0.15	0.3	
CD (P=0.05)	NS	7.51	NS	2.4	NS		NS		0.06	0.02		NS	NS	
C. Interaction														
SEm ±	11.0	1.23	173.3	1.6	3.74		0.02		0.04	0.01		0.3	0.55	
CD (P=0.05)	NS	3.72	NS	4.7	NS		NS		0.11	0.05		NS	NS	
CV (%)	10.7	5.82					9.8					4.6		

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K-14-AST-3 (NT): Study of intercropping system of pigeon pea with different annual fodder crops

[Table Reference: K-14-AST-3 (NT) (a)]

Location: Raipur

The experiment was initiated during 2014 to identify the suitable intercropping system higher yields of pigeonpea as well as fodder and profit maximization. The treatment consisted of seven pigeonpea based intercropping system namely; Pigeonpea +Sorghum (2:1), Pigeonpea +Maize (2:1), Pigeonpea + Pearl Millet (2:1), Pigeonpea + Soybean (2:1), Pigeonpea + Rice bean (2:1), Pigeonpea + Cowpea (2:1), Pigeonpea + Clusterbean (2:1). The experiment was laid out in RBD & replicated three times. The first years results indicated that, in terms of GFY, Pigeonpea +Sorghum (2:1), Pigeonpea +Maize (2:1), Pigeonpea + Pearl Millet (2:1) intercropping system remained at par with each other but significantly superior to other systems. But in case of DFY, Pigeonpea +Maize (2:1) system recorded d significantly higher yields to other systems. In terms of CPY and net returns, Pigeonpea + Soybean (2:1) proved superior.

Table K-14-AST-3 (NT) (a): performance of intercropping system of pigeon pea with different annual fodder crops

	Plant	Leaf			Net	B:C			
Treatment	height (cm)	Stem Ratio	Green Fodder	Dry matter	Crude protein	Pigeon pea grain	Pigeon pea Stover	returns Rs./ha	ratio
Pigeonpea +Sorghum (2:1)	207.11	0.48	172.33	39.15	3.15	15.40	52.78	60617	2.42
Pigeonpea +Maize (2:1)	212.86	0.46	199.53	54.53	5.17	12.67	40.74	48310	1.93
Pigeonpea + Pearl Millet (2:1)	201.79	0.61	174.12	38.02	3.34	14.88	50.56	58106	2.32
Pigeonpea + Soybean (2:1)	77.28	0.73	162.45	30.84	5.54	17.94	59.72	72806	2.91
Pigeonpea + Rice bean (2:1)	110.89	0.87	138.75	21.72	3.66	16.75	54.83	65704	2.63
Pigeonpea + Cowpea (2:1)	82.68	0.84	153.60	27.58	4.16	18.35	66.17	74430	2.98
Pigeonpea + Clusterbean (2:1)	85.23	0.16	32.63	4.22	0.64	20.13	70.30	77298	3.09
CD at 5%	11.05	0.079	30.27	7.15	0.82	4.94	16.15		

FORAGE CROP PROTECTION

CHAPTER-3

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

Locations: Hyderabad, Dharwad, Palampur, Rahuri & Ludhiana

Four cultivated Kharif forage crops *viz.* Sorghum, Bajra, Maize and cowpea were screened under field conditions to observe the occurrence and incidences of major diseases, insect-pests. The center wise details are given below:

Palampur: During *kharif* 2015 wilt/root rot (55%), Leaf spot (40%) and blights (12%) of cowpea, blight of maize (20%), zonate leaf spot of sorghum (50% and *Helminthosporium* blight of Bajra (15%) & sorghum (20%) and were observed the main diseases (Table PPT1- Palampur)

Date of	Cowpea						
observation	Wilt/ root rot (Fusarium, Rhizoctonia)	Leaf spot, Anthracnose and blight (Ascochyta, Colletotrichum and Phyllostricta)	Phytophthora Blight	CMV	Pod borer	Aphids	
03.06.15	15	-	-	-	-	-	
07.07.15	25	-	-	-	-	-	
14.07.15	45	5	-	-	-	-	
21.07.15	55	10	5	-	-	-	
28.07.15	-	25	7	5	-	-	
04.08.15	-	30	15	7	-	-	
11.08.15	-	35	-	10	3	2	
18.08.15	-	40	-	12	7	5	
25.08.15	-	-	-	-	10	20	

 Table: PPT 1- Palampur: Severity /incidence (%) recorded on different dates at Palampur

Table: PPT 1- Palampur: Severity /incidence	(%) recorded on different dates at Palampur
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Date of	Maize			Sorgh	num	Bajra
observation	Blight (Helminthosprium maydis and H. tercecium)	Banded leaf & sheath blight (<i>Rhizoctonia</i>)	Maize stem borer	leaf blight (Helminthospori um)	Zonate leaf spot (Gloeocercosp ora sorghi)	leaf blight (Helmintho sporium)
03.06.15	-	-	-	-	-	-
07.07.15	-	-	-	-	-	-
14.07.15	-	-	-	-	-	-
21.07.15	-	-	-	-	-	3
28.07.15	3	-	-	5	3	5
04.08.15	5	-	-	10	10	10
11.08.15	10	2	1	15	20	15
18.08.15	15	5	3	15	40	20
25.08.15	20	5	3	15	50	20

Rahuri: During *Kharif*, 2015, very meager incidence/infestation of insect-pests and diseases were noticed throughout the crop period on kharif forage crops at MPKV, Rahuri, and Maharashtra. The incidence of stem borer was negligible on maize (< 5%). In cowpea, low level of infestation of aphids per plant (range-1.67 to 4.00/plant) was noticed. Similarly, jassids population was also observed at low level (range-2.0 to 3.00/leaf). The population of coccinellids was ranged 0.0 to 0.33 /plant on cowpea during the infestation of aphids. The symptom of yellow mosaic virus was found low throughout the crop period. In pearl millet insect-pests and diseases were not observed throughout the crop period (Table PPT1- Rahuri)

	Ма	aize	Bajra	Cowpea				
Date	Stem borer % DH	% Leaf spot	% Stem fly damage	Aphids/ plant	Jassids / plant	Defoliators/ m ²	YMV score	Coccinellid Predators
9/8/2015	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
16/8/2015	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
23/8/2015	0.00	0.00	0.00	1.67	2.00	0.00	2.00	0.00
30/8/2015	1.00	0.00	0.00	4.00	3.00	0.00	2.00	0.33
7/9/2015	2.50	0.00	0.00	0.00	3.00	0.00	2.00	0.00
14/09/15	3.00	0.00	0.00	0.00	3.00	0.00	2.00	0.00
21/09/15	3.00	0.00	0.00	0.00	3.66	0.00	2.00	0.00

Table: PPT-1- Rahuri: Seasonal occurrence of insect pests and diseases at Rahuri

Hyderabad: At Hyderabad, Incidence of aphid infestation was monitored on forage cowpea variety APFC -10-1. Incidence of aphids started from 29th STD week and highest frequency was observed during 31st STD week (98 aphids per 10 plants). It decreased gradually afterwards, decreasing to 14 aphids per 10 plants in 33rd week. Afterwards incidence was negligible. At Hyderabad, negligible incidence of stem borer was observed on Maize var. African Tall (Table PPT 1-Hyderabad).

SMW		Cowpea: APFC 10-1	Maize: African Tall
	Period	No. aphids/10 plants	Stem borer infestation (%)
29	16-22 July	6	-
30	23-29 July	22	-
31	30-5 August	98	1.01
32	6-12 August	72	1.22
33	13-19 August	14	1.44
34	20-26 August	-	-

PPT 1 – Hyderabad: Monitoring of insect pests in Cowpea, Maize at Hyderabad

Dharwad: Seasonal incidence of insect pest indicated that aphid *Aphis craccivora* population started in 30th week and was highest (465/plant) during 33rd Indian Standard week i.e. during 3rd week of August. It started declining and during 36th week no incidence was observed. Hairy caterpillar *Spilosoma obliqua* ranged from 0.4 to 8.2 during 3rd week of July to first week of August, reaching peak at 30th week and declining afterwards. Cowpea yellow mosaic was highest to the tune of 25% during second week of August and declined gradually. NO incidence was recorded during and after 35th week (Table PPT 1- Dharwad).

Table PPT 1 Dharwad. Monitorin	g of important insect pests and dis	seases in Kharif cowpea at Dharwad

Indian Standard 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
28	09 Jul – 15 Jul	0	0	0
29	16 Jul – 22 Jul	0	4.2	4.2
30	23 Jul – 29 Jul	12	8.2	12.6
31	30 Jul – 05 Aug	222	5.2	22.8
32	06 Aug – 12 Aug	386	1.2	25
33	13 Aug – 19 Aug	465	0.4	10.4
34	20 Aug – 26 Aug	214	0	3.2
35	27 Aug – 02 Sep	42	0	0
36	03 Sep – 09 Sep	0	0	0

Ludhiana: Incidences of major diseases on Kharif crops are given below (Table PPT -1- Ludhiana).

Pearl millet

Leaf blast of Pearl millet: leaf spots (blast) of pearl millet on variety FBC 16 started appearing in second fortnight of August 2015. Disease progressed slowly during the crop season till last week of September and further progressed at a steady pace till third week of October with favorable temperature range of 26.7 -30.1°c and RH of 66-79 percent. Due to absence of showers and lowering of the temperatures, the disease development became static and progressed slowly till third week of October with maximum disease severity of 29.1 percent.

Downy mildew of Pearl millet: The incidence of Downy mildew was less on the recommended cultivars and varied from traces to 2.0 percent. On the susceptible check, 7042, the incidence was 68.0 per cent.

Sorghum

Cercospora leaf spot of Sorghum: Cercospora leaf spot of sorghum appeared on SL44 variety in the first fortnight of August, 2015 in the crop sown during first week of June, 2015. Disease progressed slowly till first week of September and then progressed at alarming rate up to first week of October, 2015 with 54.9 percent disease severity. During this period, 65.6 to 87 mm rainfall and moderate temperatures of 29.9°C with mean RH of 64-79 percent witnessed in last week of August and September favoured the disease development. The disease further progressed at a steady pace till last week of October with percent severity of 58.6. With the maturity of crop (non-availability of green areas) and decrease in temperatures and RH, the disease development slowed down.

Anthracnose of Sorghum: Anthracnose of sorghum on SL44 variety was observed in the last week of August, 2015. Disease progressed slowly till first week of September and further progressed at rapid rate upto first week of October, 2015. Maximum disease severity of anthracnose (45.2 %) was recorded during second week of October, 2015. During this period, 65.6 mm of rainfall with moderate temperatures and mean RH of 26.8 to 30.1°C and 66-76 percent respectively favoured the disease development. With the maturity of crop (non-availability of green areas) and decrease in temperatures and RH, the disease development slowed down.

Zonate leaf spot on Sorghum: The occurrence of zonate leaf spot on SL 44 variety of sorghum was very less i.e. 8.6 per cent and more over it appeared late in the season.

<u>Maize</u>

Leaf blight of Maize: Disease appeared in the third week of August, 2015 on J 1006 variety and progressed slowly upto first week of September with 87 mm rainfall during second fortnight of August and no rainfall upto last week of September. Thereafter disease showed rapid increase upto first week of October with percent severity of 42.6 (mean RH ranging from 70-79% and mean temperature between 26.8 to 30.1°C. Thereafter, as the crop reached physiological maturity and the disease development slowed down and disease progressed at a steady pace with maximum disease severity of 42.6 percent.

Table: PPT-1- Ludhiana: Seasonal occurrence of the insect pe	bests and diseases at Ludhiana
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	CROP/ VARIETY						
	Bajra / FBC 16	SORGHUM / SL 44		Maize / J 1006			
Date of observations (DOO)	Blast	Cercospora leaf spots	Anthracnose	Leaf blight			
14/8/15	-	4.0 (DOA)	-	-			
21/8/15	5.3 (DOA)*	9.5	4.9 (DOA)	2.5 (DOA)			
28/8/15	7.2	14.6	10.6	8.6			
4/9/15	11.5	19.2	16.8	14.2			
11/9/15	14.6	25.0	24.5	21.9			
18/9/15	18.9	32.5	30.9	28.5			
25/9/15	21.8	41.8	38.4	35.1			
2/10/15	24.0	50.5	42.5	39.4			
9/10/15	27.4	54.9	45.2	42.6			
16/10/15	29.1	58.6	-	-			

*DOA: DATE OF APPEARANCE

PPT-2: Evaluation of kharif breeding materials for their reaction to insect-pests and diseases

Locations: Hyderabad, Palampur, Rahuri, Ludhiana, Dharwad

Maize

IVT Maize: At Rahuri, all the entries of IVT maize were found less susceptible to stem borer as these entries showed less than 3 mean leaf injury score. At Ludhiana, entries ADVI 5788, JHM 15-1 and check J 1006 were found to be moderately susceptible, whereas other entries were moderately resistant. At Palampur, entry AFM-4 was found to be susceptible to leaf blight; entries MFM-5, ADVI 5788, JHM -2, African Tall were found to be moderately susceptible, other entries were moderately resistant (Table IVT Maize- Rahuri).

Entries	Rahuri		Ludhiana		Palampur		
	Mean leaf injury		Maydis leaf blight		Leaf blight		
	score/	Disease reaction	Intensity	Disease	Severity	Disease	Disease
	plant		(%)	reaction	(%)	Rating	Reaction
MFM-8	1.50	Least susceptible	28.86	MR	5	3	MR
AFM-4	1.60	Least susceptible	32.19	MR	30	7	S
MFM-5	1.20	Least susceptible	24.42	MR	10	5	MS
ADVI 5788	1.00	Least susceptible	23.31	MS	15	5	MS
JHM-15-1	1.40	Least susceptible	36.63	MS	5	3	MR
JHM-2	1.33	Least susceptible	31.08	MR	10	5	MS
J-1006 (NC)	1.47	Least susceptible	26.64	MS	5	3	MR
African Tall (NC)	1.60	Least susceptible	22.20	MR	25	5	MS

Table IVT Maize – Rahuri: Leaf injury score of maize stem borer in IVT Maize at Rahuri

Maize: - **AVT-1-** At Ludhiana, all the entries were found to be moderately susceptible for maydis leaf blight. At Palampur, African Tall, MFM-4, AFM-4 showed moderately resistant reaction whereas other entries were moderately susceptible. (Table: AVT-1 Maize)

	Ludhiana		Palampur			
	Maydis	eaf blight		Leaf blight		
Entries	Intensity (%)	Disease reaction	Severity (%)	Disease Rating	Disease Reaction	
PAC-746	37.72	MS	10	5	MS	
MFM-6	27.73	MS	15	5	MS	
AFM-4	28.85	MS	5	3	MR	
MFM-4	27.38	MS	4	3	MR	
MPC-1	35.52	MS	25	5	MS	
African Tall (NC)	25.51	MS	5	3	MR	
J-1006 (NC)	32.18	MS	12	5	MS	

Table AVT-1 Maize: Leaf blight of maize in IVT Maize at Ludhiana and Palampur

Pearl millet

IVT: At Rahuri, Maximum rust incidence was observed on TSFB-13-12, which was susceptible, all other entries were found resistant.

Table: Score values of rust intensity on different entries of pearl millet in IVT Pearl millet at Rahuri

	Rahuri		Ludhiana				
Entries	Rust (Puccinea purpurea)		Downy mildew		leaf spot		
	Mean score	Disease	Percent	Disease	Percent	Disease	
	values/ plant	reaction	incidence	reaction	intensity	reaction	
RBB-6	2.33	Immune	0.0	DF	2.96	R	
TSFB 14-10	3.00	Resistant	0.0	DF	2.96	R	
RBB-7	3.33	Resistant	0.0	DF	3.70	R	
AFB-36	3.00	Resistant	0.0	DF	2.59	R	
TSFB-10-5	3.00	Resistant	0.0	DF	1.48	R	
TSFB-13-12	8.87	Susceptible	0.0	DF	1.48	R	
Giant Bajra	3.00	Resistant	0.0	DF	5.55	R	
Raj Bajra Chari -2	3.00	Resistant	0.0	DF	3.33	R	
AFB-3 (ZC NWZ)			0.0	DF	1.85	R	
BAIF Bajra 1 (ZC CZ)	3.00	Resistant					

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Score categorization for Rust at Rahuri

Mean score value	detail	Reaction
1	No lesions	
2	1-5% leaf area covered with lesions	Immune
3	6-10 % leaf area covered with lesions	Resistant
4	11-20% leaf area covered with lesions	Moderately Resistant
5	21-30% leaf area covered with lesions	Moderately Resistant
6	31-40% leaf area covered with lesions	Moderately Resistant
7	41- 50 % leaf area covered with lesions	Moderately susceptible
8	51-75% leaf area covered with lesions	Susceptible
9	> 75% leaf area covered with lesions	Highly susceptible

Pearl millet – AVT-2 – Ludhiana- At Ludhiana, all the entries were resistant to Pyricularia leaf spot with minimum incidence observed in the test entry DFMH -30. There was no incidence of downy mildew and ergot.

Table. Disease incluence in Feat miner AV 1-2 that at Euclidia							
Entries	Pyricularia leaf spot intensity (%)	Disease reaction	Downy mildew incidence (%)	Ergot severity (%)			
DFMH-30	0.35	R	0.0	0.0			
Raj Bajra Chari-2	2.57	R	0.0	0.0			
AVKB-19	5.53	R	0.0	0.0			
Giant Baira	8.50	R	0.0	0.0			

Table: Disease incidence in Pearl millet AVT-2 trial at Ludhiana

Pearl millet - AVT-2 (Seed) – Ludhiana: In seed trial also, the minimum incidence was observed in entry DFMH-30.

Entries	Downy mildew incidence (%)	Disease reaction	Pyricularia leaf spot intensity (%)	Disease reaction
DFMH-30	0.0	DF	17.2	MR
Raj Bajra Chari-2	0.0	DF	18.5	MR
AVKB-19	0.0	DF	24.6	MR
Giant Bajra	0.0	DF	22.4	MR

Table: Disease incidence in Pearl millet AVT-2 seed trial at Ludhiana

Cowpea

IVTC Palampur: At Palampur all the entries showed susceptible to highly susceptible reaction for leaf disease, root rot/ wilt/ collar rot.

Table: Disease reaction in IVT cowpea at Palampur

Entries	Root rot/ wilt/ collar rot complex			L	eaf diseases	5
	Incidence (%)	Disease Rating	Disease Reaction	Severity (%)	Disease Rating	Disease Reaction
TSFC-12-15	65	9	HS	35	7	S
MFC-09-3	45	7	S	40	7	S
MFC-09-13	55	9	HS	30	7	S
UPC-1501	70	9	HS	35	7	S
MFC -09-4	50	7	S	45	7	S
Vellyani-1	60	9	HS	50	9	S
UPC-5286(NC)	55	9	HS	30	7	S
Bundel Lobia -1 (NC)	80	9	HS	40	7	S
UPC-622 (ZC HZ)	50	7	HS	45	7	S

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IVT Cowpea – Hyderabad

At Hyderabad, (DOS: 2- 7-15), all the cowpea entries recorded 28.1 to 35.3 number of aphids per sq.cm leaf. The infestation in all the entries are above the ETL(15/twig) hence categorised as susceptible. Aphids were controlled by spraying of Dimethoate @ 2ml/l. Yellow mosaic virus infestation ranged between 0.33 to 2.33. The entries UPC-5286(NC), UPC-1501, Vellyani-1 are resistant while others are moderately resistant.

Entries	No. aphids/ sq cm	YMV infested plants (1-5 scale)
TSFC-12-15	32.4	1.67
MFC-09-3	35.3	1.0
MFC-09-13	28.1	1.0
UPC-1501	33.6	0.33
MFC -09-4	35.2	2.33
Vellyani-1	32.3	0.67
UPC-5286(NC)	28.2	0.67
Bundel Lobia -1 (NC)	33.1	1.0
MFC-8-14 (ZC SZ)	30.9	1.33

	C 11 CC 1				
Lable: Reaction of	t ditterent cow	hea entries adains	t annids and ve	llow mosaic virus	at Hyderabad
		ou ontrioo ugunio	aprilao ana yo		at i yaoi abaa

Cowpea – IVTC – Ludhiana: At Ludhiana, all the entries show near similar response to root rot/damping off and mosaic incidence.

Entries	Percent root rot/ Damping-off incidence	Disease reaction	Percent mosaic incidence	Disease reaction
TSFC-12-15	0.0	DF	2.84	R
MFC-09-3	0.0	DF	2.84	R
MFC-09-13	0.0	DF	3.79	R
UPC-1501	0.0	DF	3.79	R
MFC -09-4	0.0	DF	2.84	R
Vellyani-1	0.0	DF	2.60	R
UPC-5286 (NC)	0.0	DF	2.60	R
Bundel Lobia -1 (NC)	0.0	DF	2.60	R
Bundel Lobia-2 (ZC NWZ)	0.0	DF	2.84	R

Table: Disease reaction in IVT Cowpea at Ludhiana

IVT Cowpea – Rahuri

Sowing date: 08/07/2015 Observations: 17/8/15 & 7/9/2015

- Aphids: All the entries showed significant differences in survival population of aphids/plant. However, UPC 9202 (zonal check) showed 2.89 aphids/plant, which was significantly lower than the other entries except MFC -09-4 (3.11), Vellyani -1 (3.78), TSFC-12-15 (4.22) and MFC-09-13 (4.55). These entries were found at par with each other. The highest population of aphid was recorded in UPC 5286 (27.33 aphids/plant).
- Jassids : Among the 9 entries, entry Bundel Lobia -1 (NC) recorded significantly lesser (1.89 jassids/leaf) number of nymphs of jassids/leaf . However, it was at par with MFC -09-4 (2.00), Vellyani-1 (2.45), UPC 9202 (ZC CZ) (2.56), MFC-09-3 (3.00) and MFC-09-13 (3.11). The highest population of jassid was recorded in UPC-1501 (4.56 jassids/leaf).
- Yellow Mosaic Virus: All the entries were found resistant to yellow mosaic virus except UPC-1501 it was susceptible to YMV. Resistant entries showed less than 2 score whereas, UPC-1501 was found susceptible to YMV as it recorded 4.0 score rating of YMV.

Inferences:

- UPC-5286(NC) Highly susceptible to aphids (35.33 aphids/plant).
- UPC-1501- Susceptible to aphids jassids and yellow mosaic virus
| Entrico | Av. no. of aphids/ | | YMV | | |
|----------------------|--------------------|------------------------|--------------|-------------|--|
| Entries | plant | No. of jassids/ leaves | Score rating | Inference | |
| TSFC-12-15 | 4.22 (2.28) | 3.22 (2.05) | 1.00 | Immune | |
| MFC-09-3 | 6.00 (2.64) | 3.00 (2.00) | 1.33 | Immune | |
| MFC-09-13 | 4.55 (2.34) | 3.11 (2.01) | 2.00 | Resistant | |
| UPC-1501 | 8.22 (3.02) | 4.56 (2.36) | 4.00 | Susceptible | |
| MFC -09-4 | 3.11 (2.03) | 2.00 (1.73) | 1.67 | Immune | |
| Vellyani-1 | 3.78 (2.17) | 2.45 (1.83) | 1.33 | Immune | |
| UPC-5286(NC) | 27.33 (5.32) | 3.11 (2.03) | 1.67 | Immune | |
| Bundel Lobia -1 (NC) | 6.11 (2.66) | 1.89 (1.70) | 2.00 | Resistant | |
| UPC -9202 (ZC CZ) | 2.89 (1.97) | 2.56 (1.88) | 2.00 | Resistant | |
| SE± | 0.16 | 0.11 | | | |
| CD at 5% | 0.46 | 0.32 | | | |

Table: Reaction of different cowpea entries against sucking pests and yellow mosaic virus at Rahuri

Bold figures in parenthesis indicates transformed values of square root n+1

Napier bajra hybrid

VTBN – Ludhiana- No incidence of root rot and Pyricularia leaf spot was observed in any entry at Ludhiana. The entries are in coded form and will be decoded after completion of trial.

Entries	Per cent root rot incidence *	Pyricularia leaf spot intensity (%)
VTBN 1	0.00	0.00
VTBN 2	0.00	0.00
VTBN 3	0.00	0.00
VTBN 4	0.00	0.00
VTBN 5	0.00	0.00
VTBN 6	0.00	0.00
VTBN 7	0.00	0.00
VTBN 8	0.00	0.00
VTBN 9	0.00	0.00
VTBN 10	0.00	0.00
VTBN 11	0.00	0.00

Table: Disease reaction in VTBN at Ludhiana

*Mean of four replications

Evaluation of cowpea breeding materials for insect-pest at Dharwad: Out of 8 parents, one (UPC-622) exhibited susceptible reaction to hairy caterpillar at 90 days after sowing, while remaining showed moderately resistant reaction. Among crosses, four expressed susceptible reaction to hairy caterpillar, while remaining showed moderately resistant reaction (Table, 2). All the parents exhibited resistant reaction to cowpea yellow mosaic virus at 90 days after sowing. Among twenty eight crosses, five expressed resistant reaction, while other twenty three exhibited moderately resistant reaction to cowpea yellow mosaic virus at 90 days after sowing (Table Cowpea Dharwad)

		Coord	Reaction to hairy caterpillar Spilosoma oblique				
Genotypes	Growth habit	color		(per c	ent infestation)		
		00101	30	30 DAS		DAS	
PARENTS							
SWAD	Semi-erect	Buff	4	R	15	MR	
MFC-09-12	Semi-erect	Buff	0	HR	24	MR	
UPC-8705	Semi-erect	Buff	0	HR	19	MR	
UPC-9202	Semi-erect	Cream	10	R	20	MR	
BL-2	Semi-erect	Speckled	2	R	23	MR	
UPC-622	Semi-erect	Creamy	9	R	26	S	
EC-4216	Semi-erect	Creamy	0	HR	22	MR	
UPC-5286	Semi-erect	Creamy	2	R	15	MR	
SWAD x MFC-09-12	Semi-erect	Creamy	4	R	27	S	
SWAD x UPC-8705	Semi-erect	Creamy	4	R	17	MR	
SWAD x UPC-9202	Semi-erect	Creamy	0	HR	11	MR	
SWAD x BL-2	Semi-erect	Creamy	4	R	19	MR	
SWAD x UPC-622	Semi-erect	Creamy	3	R	16	MR	
SWAD x EC-4216	Semi-erect	Creamy	0	HR	15	MR	
SWAD x UPC-5286	Semi-erect	Creamy	4	R	15	MR	
MFC-09-12 x UPC-8705	Semi-erect	Creamy	5	R	16	MR	
MFC-09-12 x UPC-9202	Semi-erect	Creamy	3	R	16	MR	
MFC-09-12 x BL-2	Semi-erect	Creamy	4	R	12	MR	
MFC-09-12 x UPC-622	Semi-erect	Creamy	4	R	23	MR	
MFC-09-12 x EC-4216	Semi-erect	Buff	5	R	19	MR	
MFC-09-12 x UPC-5286	Semi-erect	Creamy	2	R	20	MR	
UPC-8705 xUPC-9202	Semi-erect	Buff	2	R	18	MR	
UPC-8705 x BL-2	Semi-erect	Creamy	2	R	28	S	
UPC-8705 x UPC-622	Semi-erect	Creamy	2	R	21	MR	
UPC-8705 x EC-4216	Semi-erect	Creamy	8	R	16	MR	
UPC-8705 x UPC-5286	Semi-erect	Buff	4	R	13	MR	
UPC-9202 x BL-2	Semi-erect	Buff	4	R	18	MR	
UPC-9202 x UPC-622	Semi-erect	Creamy	5	R	20	MR	
UPC-9202 x EC-4216	Semi-erect	Buff	4	R	14	MR	
UPC-9202 x UPC-5286	Semi-erect	Buff	2	R	25	MR	
BL-2 x UPC-622	Semi-erect	Speckled	2	R	17	MR	
BL-2 x EC-4216	Semi-erect	Speckled	3	R	15	MR	
BL-2 x UPC-5286	Semi-erect	Speckled	3	R	13	MR	
UPC-622 x EC-4216	Semi-erect	Buff	4	R	17	MR	
UPC-622 x UPC-5286	Semi-erect	Creamy	3	R	14	MR	
EC-4216 x UPC-5286	Semi-erect	Creamy	5	R	16	MR	

Table Cowpea Dharwad: Evaluation of cowpea Kharif breeding material against hairy caterpillar	Spilosoma
oblique at Dharwad	

1=Highly resistant (HR)- No incidence; 2= Resistant (R)- up to 10% incidence; 3= Moderately resistant (MR)- 11 -25 % incidence; 4= Susceptible (S)- 26-50% incidence; 5- Highly susceptible (HS)- >50% incidence

l able: Evaluation of cowpea	Kharif breeding material	against cowpea ye	Boootion	virus at D	harwad	accio	
Genotynes	Growth habit	Seed color	virus	virus (per cent infestation)			
Genotypes	Orowin habit	Seed color	30 D		90		
PARENTS			00 5			5/10	
SWAD	Semi-erect	Buff	2	R	8.6	R	
MFC-09-12	Semi-erect	Buff	0	HR	4.6	R	
UPC-8705	Semi-erect	Buff	0	HR	7.6	R	
UPC-9202	Semi-erect	Cream	4	R	9.4	R	
BL-2	Semi-erect	Speckled	2	R	9.6	R	
UPC-622	Semi-erect	Creamy	0	HR	9.2	R	
EC-4216	Semi-erect	Creamy	0	HR	6.6	R	
UPC-5286	Semi-erect	Creamy	0	HR	10	R	
SWAD x MFC-09-12	Semi-erect	Creamy	2	R	11	MR	
SWAD x UPC-8705	Semi-erect	Creamy	1	R	13	MR	
SWAD x UPC-9202	Semi-erect	Creamy	1	R	12	MR	
SWAD x BL-2	Semi-erect	Creamy	1	R	7.6	R	
SWAD x UPC-622	Semi-erect	Creamy	0	HR	7	R	
SWAD x EC-4216	Semi-erect	Creamy	2.8	R	7	R	
SWAD x upc-5286	Semi-erect	Creamy	0	HR	15	MR	
MFC-09-12 x UPC-8705	Semi-erect	Creamy	1	R	10.2	R	
MFC-09-12 x UPC-9202	Semi-erect	Creamy	2	R	16	MR	
MFC-09-12 x BL-2	Semi-erect	Creamy	0	HR	11.6	MR	
MFC-09-12 x UPC-622	Semi-erect	Creamy	1	R	14.6	MR	
MFC-09-12 x EC-4216	Semi-erect	Buff	1	R	14	MR	
MFC-09-12 x UPC-5286	Semi-erect	Creamy	0	HR	16	MR	
UPC-8705 xUPC-9202	Semi-erect	Buff	3	R	14	MR	
UPC-8705 x BL-2	Semi-erect	Creamy	1	R	12.8	MR	
UPC-8705 x UPC-622	Semi-erect	Creamy	0	HR	19.6	MR	
UPC-8705 x EC-4216	Semi-erect	Creamy	2	R	16	MR	
UPC-8705 x UPC-5286	Semi-erect	Buff	1	R	15	MR	
UPC-9202 x BL-2	Semi-erect	Buff	0	HR	12.6	MR	
UPC-9202 x UPC-622	Semi-erect	Creamy	1	R	13	MR	
UPC-9202 x EC-4216	Semi-erect	Buff	2.4	R	13	MR	
UPC-9202 x UPC-5286	Semi-erect	Buff	2	R	8.8	R	
BL-2 x UPC-622	Semi-erect	Speckled	1	R	16	MR	
BL-2 x EC-4216	Semi-erect	Speckled	1	R	14	MR	
BL-2 x UPC-5286	Semi-erect	Speckled	2	R	14	MR	
UPC-622 x EC-4216	Semi-erect	Buff	2	R	11	MR	
UPC-622 x UPC-5286	Semi-erect	Creamy	2	R	11.8	MR	
EC-4216 x UPC-5286	Semi-erect	Creamy	3	R	17	MR	

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PPT 15: Integrated management of root rot and foliar diseases of forage cowpea.

Locations: Palampur, Ludhiana

The experiment was conducted to evaluate the losses due to root rot and foliar diseases of cowpea by three treatment sets and their combinations. Date of sowing, seed treatment by bio-control agents and foliar spray of fungicides were applied in different combinations to work out the effective integrated management of various diseases in forage cowpea.

Design: Split plot **Replication:** 3 **Plot size:** 2 x 2 m² **Variety:** Local Susceptible Variety

Treatments:

Main plot: 3 (Date of Sowing)

T_A = 1st Date of sowing i.e. 15 days before Normal Days of Sowing

- $T_B = 2^{nd}$ Date of sowing i.e. Normal Days of Sowing
- T_C = 3rd Date of sowing i.e. 15 days after Normal Days of Sowing

Sub plot: 4 (Treatments)

- T₁ No treatment
- T₂- Seed treatment with *Trichoderma viride* + *Paecilomyces lilacinus* @ 5 g/kg seed each followed by foliar sprays of propiconazole @ 1ml/l at 15 days interval.
- T₃- Seed treatment with tebuconazole 2DS @ 1g/kg seed + NSKP(50 g/kg seed) followed by foliar spray of propiconazole @ 1ml/l at 15 days interval.
- T₄- Seed treatment with metalaxyl 8% + Mancozeb 64% @ 2.5g/kg seed + NSKP(50 g/kg seed) followed by foliar spray of propiconazole @ 1ml/l at 15 days interval.

Target Diseases:

- i. Root rot/wilt (Fusarium/ Rhizoctonia/ Phytophthora)
- ii. Anthracnose (Colletotrichum)
- iii. Leaf blight (Cercospora/ Phomopsis etc.)
- iv. Nematodes

Observations:

- 1. Incidence and severity of diseases will be recorded.
- 2. GFY and DMY.
- 3. Correlation of weather variable with disease (s) development.
- 4. Nematode population before sowing and at harvest.

Ludhiana: Cowpea mosaic incidence (%): At Ludhiana, with respect to incidence of mosaic, disease was quiet less in plots where seed was treated with tebuconazole 2DS @ 1g/kg seed + NSKP(50 g/kg seed) followed by foliar spray of propiconazole @ 1ml/I at 15 days interval followed by seed treatment with metalaxyl 8% + Mancozeb 64% @ 2.5g/kg seed + NSKP(50 g/kg seed) followed by foliar spray of propiconazole @ 1ml/I at 15 days interval and Seed treatment with *Trichoderma viride* + *Paecilomyces lilacinus* @ 5 g/kg seed each followed by foliar sprays of propiconazole @ 1ml/I at 15 days interval respectively as compared to check. First date of sowing (02/07/2015) showed higher disease incidence as compared to other two dates of sowing (15/07/2015 & 30/07/2015).

At Ludhiana, the green fodder yield was maximum in plots where seed was treated with tebuconazole 2DS @ 1g/kg seed + NSKP(50 g/kg seed) followed by foliar spray of propiconazole @ 1ml/I at 15 days interval followed by seed treatment with metalaxyl 8% + Mancozeb 64% @ 2.5g/kg seed + NSKP(50 g/kg seed) followed by foliar spray of propiconazole @ 1ml/I at 15 days interval and Seed treatment with *Trichoderma viride* + *Paecilomyces lilacinus* @ 5 g/kg seed each followed by foliar sprays of propiconazole @ 1ml/I at 15 days interval respectively as compared to untreated plot. Besides high incidence of mosaic, the green fodder yield was maximum on first date of sowing (02/07/2015) followed by crop sown on 15/07/2015 & 30/07/2015 respectively.

Palampur: In untreated crop, root rots incidence increase with the delay in sowing of the crop. Minimum incidence (10.1%) was observed in early sown crop & maximum (40.0%) in late sown crop. However, the disease severity of Anthracnose was maximum (32.2%) on 19th June sown crop & minimum (15.1%) in crop sown on 4th July. In case of leaf blight the severity was maximum (27.2%) in the normal sowing date (19 June) & minimum (14.2%) in late sown crop. The nematode population also increases with the delay in sowing. (Table PPT 15- Palampur).

For the management of diseases & nematode seed treatment with fungicides (tebuconozole 2DS or metalaxyl + mancozeb) and NSKP followed by foliar spray with propiconazole were found effective. Both the treatments i.e. seed treatment with tebuconozole + NSKP followed by sprays of propiconazole (T₃) and seed treatment with metalaxyl + mancozeb + NSKP followed by sprays of propiconazole (T₄) were found very effective & gave maximum control of root rot, anthracnose, leaf blights and nematode in all the three dates of sowing with maximizing the GFY Data in table PPT 15a revealed that the appearance of the root rot and leaf blight was delayed with the delay in sowing. The incidence of root rot was maximum (37.3%) where as disease severity of anthracnose (15.1%) and leaf blight (14.9%) was minimum in the late sown crop. The GFY yield was maximum in normal sown crop being followed by early and late sown crop.

PPT-15 – Ludhiana: Integrated management of root rot and foliar diseases of forage cowpea at Ludhiana

Main plot	Sub plot	Per cent mosaic	Green Fodder Yield	Dry matter yield
treatments	treatments	incidence	(q/ha)	(q/ha)
	T ₁	15.93	729.17	123.96
DOG 4 (02/07/2015)	T ₂	11.85	750.00	127.50
DOS 1 (02/07/2015)	T ₃	9.63	787.50	133.88
	T 4	8.52	862.50	146.63
	T 1	10.37	462.50	78.63
DOC 2 (45/07/2045)	T ₂	8.89	495.83	84.29
003 2 (13/07/2013)	T ₃	8.52	550.00	93.50
	T4	7.41	600.00	102.00
	T 1	8.89	354.17	60.21
DOS 2 (20/07/2015)	T ₂	7.04	412.50	70.13
003 3 (30/07/2013)	T ₃	5.56	429.17	72.96
	T4	5.19	479.17	81.46
CD (p=0.05)				
	DOS	1.95	24.83	4.22
	Treatments	2.26	28.15	4.87
	DOS x Treatments	NS	NS	NS

Note: There was no incidence of root rot in cowpea.

Treatr	nent		ę	Severity/ ind	cidence of	Diseases	and nema	todes			Yield (q/ha))
Main	Sub	Root	rot	Anthracnose		Leaf blig	ht	Nematodes	s /g of soil	GFY		DFY
(DOS)		Incidence	%	Severity	%	Severity	%	Before	After	Yield	%	
		(%)	Control	(%)	Control	(%)	Control	sowing	harvest		Increase	
04.06.14	T ₁	10.1	-	21.5	-	20.1	-	147	311.7	53.3	-	14.6
	T ₂	7.0	30.7	8.9	58.6	5.4	73.1	147	208.3	59.4	11.4	15.3
	T ₃	3.4	66.3	7.6	64.7	5.1	74.6	147	212.0	64.6	21.2	16.5
	T ₄	3.3	67.3	10.1	53.0	5.2	74.1	147	202.0	64.9	21.8	16.9
19.06.14	T ₁	21.7	-	32.2	-	27.2	-	165	348	48.5	-	14.9
	T ₂	17.9	17.5	10.4	67.7	6.3	76.8	165	222.7	62.4	28.7	16.6
	T ₃	9.3	57.1	8.6	73.3	6.1	77.6	165	224.3	69.6	43.5	16.9
	T ₄	9.6	55.8	10.5	67.4	6.3	76.8	165	228.3	70.3	44.9	16.8
04.07.14	T ₁	40.0	-	15.1	-	14.9	-	185	398.0	40.8	-	14.2
	T ₂	37.3	6.8	5.5	63.6	5.4	63.8	185	244.3	51.6	26.5	15.2
	T ₃	18.3	54.2	3.9	74.2	4.8	67.8	185	246.7	54.5	33.6	16.0
	T ₄	19.0	52.5	4.1	72.8	5.1	65.8	185	246.7	56.6	38.7	16.1
CD (P=0.0)5)											
A (date of	Sowing)	1.33	-	0.67	-	0.91	-	NS	9.08	1.09	-	0.27
B (Treatm	ents)	1.54	-	0.77	-	1.05	-	NS	10.48	1.27	-	0.31
AxB		2.67	-	1.34	-	1.83	-	NS	18.10	2.19	-	0.55

PPT-15 – Palampur: Integrated management of root rot and foliar diseases of forage cowpea at Palampur

AICRP on Forage Crops & Utilization

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PPT-16: Efficacy of different biopesticides against aphids on forage sorghum Location: Rahuri

During the Kharif, 2015, infestation of aphids was not observed on sorghum throughout the crop period hence the spray treatments were not been given to the crop.

PPT 17: Biological management of defoliators on cowpea. Locations: Dharwad and Rahuri

The trial was conducted at Dharwad and Rahuri center to evaluate the efficacy of biopesticides in management of defoliators on cowpea.

Treatment details

Replication: 4Design: RBDPlot size: 3 x 4 cm2Locations: Dharwad, RahuriTreatments:

- T₁: Beauveria basiana @ 5 g (cfu 10⁶)/lt
- T₂: Nomurae relyi @ 5 g (cfu 10⁶)/lt
- T₃: NSE 5%
- T₄: Pseudomonas fluorescence @ 5 g (cfu 10⁶)/lt
- T₅: Untreated control

Observations:

- Survival population of defoliators 5 and 7 days after treatment
- Count of natural enemies at 5 & 7 days after spray treatment
- Green forage and dry matter yield (q/ha)

Dharwad: All the biological control agents except *Pseudomonas* fluorescence @5 g(cfu 10⁶)/lt proved superior over untreated check in managing defoliator. Among the biological agents tested against defoliator *Spilosoma obliqua*, three treatments *viz., Beauveria basiana* @ 5 g (cfu 10⁶) /lt (T₁), NSE 5% (T₃) and *Nomurae relyi* @ 5 g (cfu 10⁶)/lt (T₂) were at par with each other and they were superior over *Pseudomonas* fluorescence @5 g (cfu 10⁶)/lt (T₄). Similar trend was reflected in obtaining green forage yield dry matter yield (Table PPT17-Dharwad)

Tr. No.	No.of defoliators before spray	5DAT*	7DAT	No. of predators before spray	5DAT	7DAT	GFY (q/ha)	DMY (q/ha)
T 1	6.8	2.2	0.4	8.2	8.0	8.2	180.4	47.4
T ₂	7.2	2.0	0.2	8.4	7.8	7.6	174.6	45.6
T ₃	7.0	1.8	0.4	9.2	8.2	8.4	176.2	46.1
T 4	6.8	6.4	4.2	9.0	8.0	8.2	162.0	40.4
T₅	7.0	7.2	6.6	8.8	8.4	8.0	130.4	34.6
CV	-	3.32	4.10	-	-	-	9.4	7.2
CD at 5%	NS**	0.52	0.64	NS	NS	NS	10.52	6.2
SEM±	-	1.10	1.42	-	-	-	3.40	2.5
	A T A A							

Table PPT 17- Dharwad: Evaluation of biological agents against defoliator Spilosoma obliqua in forage cowpea

*DAT=Days after Treatment

NS**= Non Significant

At MPKV, Rahuri, during the kharif-15, Sowing of Variety Sweta was done on 17/07/2015 as per technical programme. However, infestation of defoliators was not observed on cowpea throughout the crop period hence the spray treatments were not been given to the crop. Therefore, the data of the trial is not included.

PPT 18: Validation of management of foliar diseases of forage sorghum

Locations: Palampur, Ludhiana

Design: Pair plot **Plot size:** 500 m² **Variety:** Local Susceptible Variety Spray the crop at 30 and 45 DAS **Treatments:**

- T₁ = Seed treatment with carbendazim @ 2 g/kg seed + Two foliar sprays of propiconazole @ 0.1%
- T₂ = Untreated Control

The experiment was conducted to validate the management technology for the diseases of sorghum particularly Zonate spot. The highly effective treatment *i.e.* seed treatment with carbendazim @ 2 g/kg seed + Two foliar sprays of propiconazole @ 0.1per cent was evaluated at large plot

Palampur: At Palampur, it was observed that the treatment provided 83.9 per cent control of zonate leaf spot (13.2 % disease severity) over check (81.8 % disease severity) with 22.5 per cent increase in green fodder yield (299q/ha) as compared to control (244q/ha). (Table PPT18- Palampur)

Treatment	Zonate leaf s	Green Fodder yield		
	Disease severity (%) Disease control (%)		(q/ha)	(%) increase
T 1	13.2 (21.3)	83.9	299.0	22.5
T ₂	81.8 (64.8)	-	244.0	
CD (P=0.05)	4.18	-	22.07	-

Table PPT 18-Palampur: Validation of management of foliar diseases of forage sorghum at Palampur

*Figures in bold and parentheses are arc sine transformed values

Ludhiana: Seed treatment with carbendazim @ 2g/kg seed + two foliar sprays of propiconazole @ 0.1% reduced the disease with total leaf spot severity of 55.13 per cent as compared to check (97.88 percent). This treatment also showed increased green fodder and dry matter yield as compared to the check.

Treatments	Per cent grey leaf spot severity	Per cent zonate leaf spot severity	Mean leaf spot severity (%)	Green Fodder Yield (q/ha)	Dry Matter Yield (q/ha)
T 1	44.03	11.1	55.13	579.17	132.19
T ₂	68.65	29.23	97.88	320.94	112.50

Table PPT 18-Ludhiana: Validation of management of foliar diseases of forage sorghum at Ludhiana

PPT 19. Efficacy of different bio pesticides against aphids on forage cowpea Location: Hyderabad

DOS: 4.7.2015 **Plot size:** 3x4m **Variety:** APFC 10-1 **Design:** RBD **Replications:** 3 At Hyderabad, six bioagents and two neem formulations were tested against aphids on cowpea. Experiment comprised of 9 treatments replicated thrice in RBD. Vijaya (APFC 10-1) variety released from PJTSAU was grown in plots of 3x4m size on 4.7.2015. Spraying was done on 5.8.2015. Neem seed extract 5% proved to be the best with 79.38% reduction over control in cowpea aphid population. It was followed by *B.bassiana* @ 10⁸ cfu/g (7.5g/l). Number of aphids per sq.cm leaf at 5 days after neem seed extract spray was 4.6. Number of coccinellids was not affected due to biopesticide spray. Significantly higher green fodder yield (108.3q/ha) was obtained in Neem sprayed plot as against control plot (70.83 q/ha) (Table ppt 19-Hyd). This is the first season of experiment and the trial will be repeated kharif 2016.

Table- I	PPT-19 Hy	d: Efficacy	of different bio	pesticides ag	gainst aphid	ls on forage co	wpea var. APFC 10-1
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S. N.	Treatment details		No. Aphids/ sq.cm			No. cocci	GFY	
		Pre treatmen t	5 days after spray	Per cent reduction over control	7 days after spray	Pre treatment	5 days after spray	(Q/ha)
T ₁	L. lecani @ 10 ⁸ cfu/g(5g/l)	44.2	8.67	69.40	1.2	1.53	6.07	113.92
T ₂	L. lecani @ 10 ⁸ cfu/g(7.5g/l)	35.6	5.27	76.91	0.7	2.33	9.53	104.17
T ₃	B. bassiana @ 10 ⁸ cfu/g(5g/l)	39.8	9.13	64.21	2.8	1.53	6.87	90.25
T ₄	B.bassiana@ 10 ⁸ cfu/g(7.5g/l)	38.4	5.60	77.25	0.0	2.00	11.0	73.58
T ₅	M.anisopliae@10 ⁸ cfu/g(5g/l)	31.6	7.67	62.14	2.7	1.80	7.80	84.75
T ₆	M.anisopliae@108cfu/g(7.5g/l)	31.6	5.60	72.35	0.0	2.07	7.13	84.75
T ₇	NSE @ 5%	34.8	4.60	79.38	0.0	1.53	6.20	108.33
T ₈	Azadirachtin @ 0.03%	40.0	11.20	56.32	2.0	1.33	3.60	105.58
T۹	Untreated control	35.0	22.40		4.0	1.87	5.07	70.83

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CHAPTER-4 BREEDER SEED PRODUCTION

Breeder Seed Production in Forage Crops (*Kharif-*2015) [Indent year *kharif* 2016] (Table Reference: Tables BSP 1 & BSP 2)

In *Kharif*-2015, the indent for Breeder Seed Production (Indent year Kharif 2016) was received from DAC, GOI for 7 varieties of three forage crops *viz.*, Maize, Pearl millet and Cowpea. The total indent for breeder seed production was 77.84q. The indent was allocated to seven SAUs/ICAR/NGO institutes. Among the quantity allocated for different forage crops, the maximum was for Maize (75.79 q) followed by Cowpea (1.95 q), and minimum was for Pearl millet (0.10 q).

The final Breeder Seed Production Report (BSP-IV) received from different seed producing centres revealed that in all the crops and varieties, the overall breeder seed production was higher in comparison to allocated quantity. Coming to the crop wise scenario, as compared to allocation in Maize, the production was 82.85 q (7.06 q surplus) and in Pearl millet production was 4.40q (4.30 q surplus). In cowpea, the production was 3.25 q (1.30 q surplus). The overall breeder seed production was 90.50 q against the allocation of 77.84 q, which was 12.66 q surplus or 16.26 per cent higher than the quantity allocated.

	[
S. N.	Producing centre/ State	Variety	Сгор	DAC indent	Actual Allocation	Actual Production	Production Surplus (+)/ Deficit (-)
Mal	harashtra						
1.	BAIF, Urulikanchan	African Tall	Maize	34.19	16.00	18.00	(+) 2.00
2.	MPKV, Rahuri	African Tall	Maize		18.19	22.00	(+) 3.81
3.	BAIF, Urulikanchan	BAIF Bajra 1	Pearl millet	0.05	0.05	4.25	(+) 4.20
Pun	jab						
4.	PAU, Ludhiana	J-1006	Maize	31.80	31.80	35.00	(+) 3.20
Raj	asthan						
5.	RRS, IGFRI,	Avika Bajra Chari-19	Pearl	0.05	0.05	0.15	(+) 0.10
	Avikanagar		Millet				
6.	MPUAT, Udaipur	Pratap Makka Chari-6	Maize	9.80	9.80	7.85	(-) 1.95
Utta	arakhand						
7.	GBPUAT,	UPC-8705	Cowpe	1.30	1.30	1.50	(+) 0.20
	Pantnagar		a				
Utta	ar Pradesh				-		
8.	IGFRI, Jhansi	EC-4216	Cowpe	0.65	0.65	1.75	(+) 1.10
			а				
Tota	al			77.84	77.84	90.50	(+) 12.66

 Table BSP 1: Centre wise Breeder Seed Production (q) during Kharif-2015

 [Indent Kharif 2016]

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						[Indent	Kharif 201	6]
Сгор	S No.	Variety	Produced by	Year of Notification	DAC indent	Allocation As per BSP-1	Actual Production	Production Surplus (+)/ Deficit (-)
Forage Maize	1	African Tall	MPKV, Rahuri & BAIF, Urulikanchan	1983	34.19	34.19	40.0	(+) 5.81
	2	J-1006	PAU, Ludhiana	1992	31.80	31.80	35.0	(+) 3.20
	3	Pratap Makka Chari-6	MPUAT, Udaipur	2009	9.80	9.80	7.85	(-) 1.95
		Total			75.79	75.79	82.85	(+) 7.06
Forage Pearl	4	Avika Bajra Chari-19	IGFRI RRS Avikanagar	2009	0.05	0.05	0.15	(+) 0.10
Millet	5	BAIF Bajra 1	BAIF, Urulikanchan	2010	0.05	0.05	4.25	(+) 4.20
		Total			0.10	0.10	4.40	(+) 4.30
Forage	6	EC-4216		1978	0.65	0.65	1.75	(+) 1.10
Cowpea	7	UPC-8705		1996	1.30	1.30	1.50	(+) 1.20
		Total			1.95	1.95	3.25	(+) 1.30
		Grand Total			77.84	77.84	90.50	(+) 12.66

Table BSP 2: Variety-wise Breeder Seed Production (q) during Kharif-2015

Table BSP 3: Left over (non-lifted) of previous year breeder seed

Center	Crop	Variety	Year of production	Left over quantity (q)
CSK HPKV, Palampur	Maize	African Tall	2015	3.95*
PAU, Ludhiana	Maize	J 1006		14.4**

• Produced by Department of Seed Science and Technology, CSK HPKV, Palampur as per indent received from the Department of Agriculture (H.P)

** Less lifting by DADH (3.5 q against indent of 17.00 q); NDDB (4.0 q against indent of 4.90 q)

I able BSP 4: Additional seed produced –truthfully labeled seed of forage cr	itional seed produced –truthfully labeled seed of forage crops
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Center	Сгор	Variety	Nature of	Year of	quantity (q)
	_	-	seed	production	
TNAU,	Fodder maize	African Tall	TFL	2016-17	7.5
Coimbatore	Multicut fodder sorghum	CO (FS) 29	TFL	2016-17	1.5
	Multicut Fodder sorghum	CO 31	TFL	2016-17	1.4
	Desmanthus	-	TFL	2016-17	1.5
	Subabul	-	TFL	2016-17	0.22
CSK HPKV,	Setaria grass	PSS-1	TFL	2015	1.3 (seed)
Palampur		S-18			
	Setaria grass	PSS-1	TFL	2015	6 Lakh (Root slips)
		S-18			
	NxB Hybrid	NB-37	TFL	2015	2 Lakh (Root slips)
PAU,	Maize	J 1006	F	2015	226.50
Ludhiana			TL		2474.50
	Pearl millet	FBC 16	F	2015	1.80
			TL		61.00
		PCB 164	F	2015	
			TL		5.80
	Cowpea	CL 367	F	2015	
			TL		12.15
	Guinea grass	PGG 518	F	2015	
			TL		1.00
	Pearl millet	FBC 14	Breeder	2015	1.50***

***DAC indent was for 0.2 q and 1.50 q was produced (surplus 1.30 Q)

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All India Coordinated Research Project on Forage Crops

FTDs ALLOTED TO AICRP (FC & U) CENTRES FOR KHARIF- 2015

Centre	Crop-wise FTDs to be conducted during Kharif-2015											
	BN	Rice	Maize	Maize +	Setaria	Bajra	Cowpea	Guinea	Guar	Fodder /	Rice bean	Total no.
	hyb	bean		cowpea				grass		Sorghum	/ Cowpea	of FTDs
Jorhat	15		20		20							
Bhubaneswar	10						10					20
Kalyani	15	15	20				-					50
Ranchi	10	5	10				5	10				40
Faizabad												
Jabalpur	5	5	5					-				15
Anand	20					10		5				35
BAIF Urul.	10			10		10	5					35
Bikaner						15	5		5			25
Ludhiana	60		60			55						175
Coimbatore	15		10					5				30
Hyderabad	25		25			25	25					100
Mandya	10		10			10	10	10				50
Rahuri	20		5			5						30
Palampur	20				20							40
Srinagar			20	5								25
Imphal												
Raipur												
Hisar						10						10
Vellayani	20						5					25
Karikal	5		5									10
Pantnagar			30	30						30	10	100
Raichur	10		5			5	5	10				35
Dapoli	20	10										30
Total	290	35	225	45	40	145	70	40	5	30	10	935

TRIBAL SUB-PLAN ACTIVITIES

JNKVV, Jabalpur

Forty farmers in kanhisang village district Dindori Madhya Pradesh were provided with improved seeds and package of practices for enhancing fodder production. The improved varieties include African Tall in Maize, JRBJ05-2 in rice bean, IGFRI-7 in Hybrid Napier, JB5 in Berseem and Jawahar oat 1 &2 in Oat. This helped in increasing the productivity of milk health of animals and the tribals as well. In Kisan sangosthi, literatures related on forage production technology were distributed.

GBPUAT, Pantnagar

Total 1586 farmers including 584 direct beneficiaries and 1002 farmers as indirect beneficiaries were benefitted by different field activities organized under TSP program. Maize (African Tall), sorghum, berseem, oat, cowpea and ricebean seed were distributed among selected farmers along with NPK, urea weedicides, insecticides and fungicides. 24 farmers' training programs were organized in selected tribal villages i.e. Kanpura, Balkhera and Kaithulia, Pehsaini, Balkhera, Saronja and Gaganpur Block Sitarganj (U S Nagar) and Rajpura-2, Nandpur and Khempur (Gadarpur Block), U S Nagar Uttarakhand, 20 field days were organized where farmers were trained about production technology. 20 farmers from two villages i.e. Kanpura and Kaithulia were selected for soil testing. 02 Farmers' Fair-Cum Exhibition was organized for benefit of tribal farming communities.

BAIF, Urulikanchan

2 villages Chondvade and Belakund were identified and meetings were conducted for identification of technology and farmers. Fifty HDPE silage bags were procured for 50 beneficiaries for ensilaging and quality enhancement 50 farmers were supplied with Hybrid Napier BNH-10 cuttings (500 stumps/ farmer) to promote new varieties of perennial grass for round the year green fodder availability. 50 farmers were benefitted by providing diesel pump set and PVC pipes (10 units) to generate water lifting mechanism for irrigation. As per the need of farmers and site situation 2 diesel pump, 4 monoblock & 5 submersible electric pumps, 1020 m PVC pipes were purchased and supplied among 50 farmers in groups to support water resources development. 50 farmers benefitted from two villages by supply of chaff cutter (2 units), which created common facilities for chaffing of jawar straw and other crop residues. 50 farmers benefited by training. Farmers Training module developed. 50 farmers (10 Groups) were distributed bucks (10 bucks) to improve local goats with Osmanabadi breed in two villages.

SKUAST-K, Srinagar

TSP interventions were implemented at Upper reaches of Bandipora, Budgam,Ganderbal and Kupwara districts of Kashmir region and Drass and Kargil of Ladkh region. Agricultural, Livestock and fodder related interventions were demonstrated to uplift the socio-economic condition of tribal farmers under adopted villages. The Fodder maize (African tall) has been introduced in Drass and Kargil as a source of fodder first time. Thirty (30) tribal families of Kaksar (12), Lobar (10) and Garkon(08) villages of district Kargil were selected. The crop was excellent and farmers were very enthusiastic to extend fodder maize (African tall) cultivation in maximum area of District Kargil. Oats var. SKO-90 and SKO-96 were introduced to 50 tribal farmers of Budgam (15), Ganderbal (15) and Kupwara (20) districts of Kashmir and 20kg oat seed per beneficiary along with inorganic fertilizers (Urea, DAP & MOP) were provided. The crops are in field and in good condition. One Tribal village namely Mattayan located near Drass of Kargil district consisting of sixty seven (67) families was adopted for forage technology. The crop Oats will be grown as summer crop in this area. The beneficiaries will be provided with oatss seed, Vermicompost and Farm kits/agri-tools. Awareness programme on "Cultivation of summer Oats" to the tribal farmers of Mattayn village of Drass-Kargil were conducted during September-2015. One day training programme on "Production technology on fodder crops" was organised in the month of July-2015 at MLRI-Manasbal for fifty tribal families.

Assam Agricultural University, Jorhat

Organised four training programs on Scientific Farming System along with Animal health camp cum field day. Distributed improved varieties of Perennial Grasses like Setaria, Hybrid Napier, Para and Congo signal grass Annual Fodder - Oat and Maize. Distributed vegetable seed like pumpkin, Okra and Tomato to increase income of the farmers by utilizing rice fellows. Distributed Sprayer to each family. Distributed "Bonraja" Breed of Poultry which is a dual type i.e. both for meat and egg. Besides small farm tools, weeder and grass cutter for harvesting forage crops etc has been distributed. Permanent Fodder plots in 6 villages covering 2 districts were created.

CSKHPKV Palampur

Twenty families in Jhikhli Bheth in Kangra district surveyed for benchmark data. Establishment and success of planted material observed. 20 families selected in Baijnath block surveyed for benchmark data and material of winter species supplied. Agrochemicais and planting material of improved forage species viz., setaria grass, NBH, Tall Fescue grass and white cloverhave been distributed/planted among farmers in the selected areas.

Vellayani, Kerala

The programme was implemented in Trivandrum district, Kerala and the beneficiaries belongs to mundela, cherukode and Karuvilanchi tribal areas. 65 farm families were benefitted. Kid goats and fodder planting material was distributed to farmers. The fodder technologies were appreciated by farmers.

MPKV, Rahuri

40 tribal families from village Dhulipada, Post Dhanrat, Tal. Navapur, district Nandurbar, Maharastra are identified for implementation of TSP-2015-16. Maize variety African Tall seed, BxN hybrid sets, Laxmi sickle, Khurpi, University diary and six forage variety folders in regional language. Also training on fodder production will be organized to the beneficiary farmers.

CAU, IMPHAL

Ninety families from 3 different villages of Churachandpur District, Manipur and 90 nos. of families from 3 different villages of Ukhrul District, Manipur were benefited. Programme on "Fodder production round the year", on 30th June and 1st of July 2015 was conducted in district Churachandpur, Manipur. TSP programme on "Improvement of Animal Products through Green Fodder" were conducted on 11th January and 20th February, 2016 in district Ukhrul, Manipur. Fertilizers, Fodder rice bean seed, Fodder maize seed, Napier hybrid cuttings, plant protection chemicals, Fertilizers, Knapsack sprayer were provided.

PJTSAU, Hyderabad.

10 Tribal families were identified in Girgaon, Tamsi (mandal), Adilabad district as beneficiaries under TSP programme. distributed inputs viz., fertilizer, seed etc. (Maize, APBN-1, Fodder Cowpea, Hedge leucerne)

BAU, Ranchi

Training was conducted for 50 farmers on quality green fodder production at Udrangi and Bhouro Panchayat of Lohardaga. 15 FTDs were conducted on Oat, Lathyrus and Berseem.

Name of Centre	Monitoring Team	Date of Monitoring
OUAT, Bhubaneswar	Drs. K K Sharma and S Bora Neog	18 Sep, 2015
BCKV, Kalyani	Drs. Ashisan Tuti and Birendra Kumar	23 Nov, 2015
BAU, Ranchi	Dr. A. K. Roy	8 Oct, 2015
NDUAT, Faizabad	Dr. A K Mehta	28 Sep, 2015
JNKVV, Jabalpur	Drs. Mayuri Sahu and S R Kantwa	28 Sep, 2015
AAU, Anand	Drs. A H Sonane and A B Tambe	21 Sep, 2015
BAIF, Urulikanchan	Drs. H P Parmar and P M Patel	14-15 Sep, 2015
MPKV, Rahuri	Drs. Yogesh Jindal and U N Joshi	19 Sep, 2015
RAU, Bikaner	Mr. P S Takawale and Dr. B T Sinare	16 Sep, 2015
PAU, Ludhiana	Drs. S S Shekhawat and S M Kumawat	26 Sep, 2015
CCS, HAU, Hisar	Drs. U S Tiwana and Rahul Kapoor	23 Sep,2015
GBPUA&T, Pantnagar	Drs. Naveen Kumar and V K Sood	22 Sep, 2015
TNAU, Coimbatore	Drs. T. Shashikala and R Susheela	1 Oct, 2015
ANGRAU, Hyderabad	Drs. M R Krishnappa and BG Shekara	1 Oct, 2015
UAS, B (ZRS, Mandya)	Drs. C Babu and Rajiv Agrawal	28-29 Sep, 2015
CSK HPKV, Palampur	Drs. U S Tiwana and Rahul Kapoor	8-9 Sep, 2015
KAU, Vellayani	Drs. C Babu and Rajiv Agrawal	25-30 Sep, 2015
IGKV, Raipur	Drs. G B Das and Amit Jha	23 Sep, 2015
SKUAS&T, Srinagar	Drs. M S Pal and Yogesh Jindal	28-29 Sep, 2015

Monitoring Details of Kharif -2015 AICRP (FC &U) Trials

APPENDICES

Forage In-house Breeding Activities-Kharif, 2015

AICRP (FCU), PJTSAU, HYDERABAD

Germplasm Holding

Сгор	No. of Collections	Source
Fodder Cowpea	40	1. NBPGR, Regional Station, Hyderabad
		2. RARS, ANGRAU, Tirupathi
Fodder Maize	45	Maize Research centre, PJTSAU, Hyderabad.
Fodder Bajra	26	ICRISAT, Hyderabad
Napier Lines	16	TNAU, Coimbatore.

Fodder Cowpea

- Entry APFC 10-1 was identified for release by State varietal Release committee on 9th October 2015. Seed multiplication is in progress.
- Evaluation of six uniform bulks in station AVT, Kharif 2014 revealed that the entries TSFC 11-6 (CO4 X UPC 625) and TSFC 11-8 (UPC5286 X CS8) were promising with 12% and 8% higher GFY and DFY over the best check variety (BL-1). Two entries will be proposed for testing in coordinated breeding trial, IVTC, Kharif 2016.
- During Kharif 2015, twenty three germplasm lines obtained from NBPGR, Regional Station, Hyderabad were evaluated.

Fodder Maize

- Promising Maize population (TSFM -15-5) developed from G1 group (African tall) of polycross population was evaluated in station Preliminary yield trial (PVT) during *Kharif 2015* It showed 8% increase in GFY and 15% increase in DFY over African Tall.
- TSFM 15-2, a Promising Maize population was developed through mass selection from a source population of IC 83220 and evaluated in station trial during 2015. The entry was 20 days early in flowering and has shown 5.5 % increase in GFY over African tall.
- 19 germplasm lines obtained from NBPGR New Delhi were evaluated
- Second cycle of in breeding was attempted in source population of African Tall.

Multicut Bajra: The F6 generation of following cross combinations of Multic*ut* bajra genotypes were evaluated for stability during *Kharif* 2015 and these five populations will be evaluated in station yield trials during kharif 2016.

- MRB 8 X ICMV 05 555
- Giant Bajra X MRB-8
- Giant Bajra X Jakarana
- ICMV 05 555 X Giant Bajra
- Rijco Bajra X Giant Bajra

Bajra Napier

• Eight identified promising BN hybrids with high tillering, long plant height, long, broad & soft leaves, glabrous at the nodes were established to evaluate in replicated station yield trial during Kharif 2015.

AICRP on Forage Crops & Utilization

A-1

Annual Report Kharif-2015

AICRP (FCU), TNAU, COIMBATORE

I. New initiatives:

a) Development of a reference set of sorghum for cyanogenic potential (HCNp): A total of 141 sorghum (*Sorghum bicolor* L. Moench) germplasm accessions collected from ARS, Kovilpatti was evaluated with the objective of formulating a reference set for cyanogenic potential (HCNp) and to identify elite genotypes encompassing low HCN content, high fodder yield and quality. A high throughput protocol *i.e.*, Feigl-Anger paper method was exercised for screening the sorghum accessions for HCNp resulting in the formation of a reference set containing 24 accessions.

Trend analysis was performed at various stages of reference set to assess the dilution pattern of dhurrin besides assessing their potential for fodder yield and quality. All the accessions recorded safe level of HCN content on 35th day, implying the use of these accessions as fodder earlier than the recommended 50th day. Four accessions *viz.*, TKFS 11107, TNS 623, TKFS 1051 and TKSV 1046 which obtained very low HCN content on 50th day were identified as near acyanogenic and were considered as highly safe for the cattle to feed. These accessions may be incorporated in hybridization programme in developing low HCNp varieties.

b) Evaluation of Sugarcane intergeneric hybrids involving *Tripsacum* for fodder value: A new initiative on evaluation of sugarcane intergeneric hybrids was embarked with an objective of identifying sugarcane varieties with better fodder quality. The multi-rationability of sugarcane and the varietal differences in production of water shoots or late tillers also can be suitably exploited for making available sufficient quantity of quality green fodder at the required period. Incorporation of new variability for desired traits can be brought in to sugarcane, which is a high polyploid, through interspecific or intergeneric hybridization and introgression breeding. The intergeneric hybrids involving other genera such as *Erianthus, Miscanthus, Sorghum, Tripsacum* and *Zea* are already available. Many of these perennial hybrids are female fertile by which they can be further used in developing new plant types with good fodder attributes.

Six hybrids viz., CYM 07-767 [(CoC 671 x *Tripsacum*) x Co 775], CYM 07-770 [(CoC 671 x *Tripsacum*) x Co 775], CYM 07-791 [(CoC 671 x *Tripsacum*) x Co 775], CYM 07-827 [(CoC 671 x *Tripsacum*) x Co 775], CYM 07-832 [(CoC 671 x *Tripsacum*) x Co 775] and CYM 11-406 [(CoC 671 x *Tripsacum*) x Co 775] x Co 775] collected from Dr. Premachandran, Head, Crop Improvement Division, Sugarcane Breeding Institute, Coimbatore were planted for sett increase.

II. Fodder Cowpea culture TNFC 0924 identified for release as CO 9 during 2016: A promising entry TNFC 0924 developed from the cross combination of CO 5 x Bundel Lobia 2 was evaluated against CO (FC) 8 in Forage Research Farm, Coimbatore (2010 to 2012), AICRP trials (2012 and 2013), MLT (2014) and OFTs (2013 and 2014). The culture TNFC 0924 registered 18.42 per cent higher mean GFY of 22.82 t/ha against the check CO (FC) 8 (19.27 t/ha). The seed yield was also higher (745 kg/ha) as compared to CO (FC) 8 (610 kg/ha) being bold size of seeds. It ranked first at National level AICRP trials during *kharif* 2012 and 2013 for GFY, DMY and CPY. It recorded higher crude protein percentage (21.56), CPY (0.83 t/ha) as compared to CO (FC) 8 (19.54% and 0.59 t/ha). Similarly, higher dry matter content in TNFC 0924 (16.86%) contributed to higher dry matter yield (3.85 t/ha). Reduced fibre portions like crude fibre (19.9 %), ADF (28.0) and NDF (34.0) confers increased palatability, digestibility and intake rate. Relatively higher level of Nitrogen, Potassium and Magnesium in TNFC 0924 signifies the nutritive value of the fodder as compared to CO (FC) 8.

TNFC 0924 is also moderately resistant to YMV and resistant to major pests, it was identified for release during 2016 as Cowpea CO 9.

Special features

- Higher green fodder and dry matter yield (23 and 3.85 t/ha)
- More number of branches with broader leaves
- Higher protein content (21.56 %)
- Reduced fibre portions confer increased digestibility, palatability and intake rate
- Resistant to yellow mosaic virus and root rot
- Shorter in duration; Suited for intercropping with sorghum and maize

AICRP on Forage Crops & Utilization

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AICRP (FCU), CSKHPKV, PALAMPUR

Germplasm holding

Сгор	No. of collections
Setaria (Setaria anceps)	40
Paspalum (Paspalum wetstenii)	2
Maize (Zea mays)	20

Promising germplasm of Setaria

Parameters	Entries
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
Leaves/plant	S-6,S-11 and S-25
Leaf-stem ratio	S-9,S-18, S-20 and S-39
Tillers/plant	S-21

Setaria grass

- Genotypes S-6, S-25, S-17, S-92, S-21, S-27, PSS-1, S-16 and S-11 exhibiting maximum diversity are being multiplied for use in polycross breeding programme for further development of synthetic varieties for increased fodder yield in Setaria grass.
- Evaluation of thirty one collections against 3 checks revealed superiority of selections S-6 and S-17 for fodder yield and other traits.
- Five new clonal selections were also made in the existing populations.

Maize

• Nineteen land races/populations of maize were maintained. All the nineteen land races were statistically at par with African tall for fodder yield.However, land races PMG-3, PMG-9, PMG-18. PMG40, PMG49.PMG62,PMG95 and PMG 97 were found superior for seed yield as compared to African Tall

Bajra Napier hybrid programme

• Evaluation of sixteen hybrids revealed superiority of two hybrids, namely, NDFB1 7 x FD 479, NDFB 4 x FD 482 for fodder yields.

AICRP (FCU), ASSAM AGRICULTURAL UNIVERSITY, JORHAT

Germplasm Collection: During Kharif 2015, 26 germplasm were collected from Arunachal Pradesh, Manipur, Mizoram, Tripura and Assam.

Crop	Total collections	Place
Ricebean	4	Manipur
Maize	20	Arunachal, Mizoram, Tripura, and Manipur
Lathyrus	2	Assam
Total	26	

Evaluation of Ricebean germplasm: 71 ricebean germplasm including checks were evaluated for their earliness, productivity and disease resistance. Promising entries were selected.

National hybridization programme on Ricebean : The performances of selected F_{668} were evaluated during *kharif* 2015. New crosses were also attempted taking with the 10 parents.

Evaluation of maize germplasm: Newly collected maize germplasm were tested along with the check African Tall.

Hybridization programme on forage cowpea: Five local cowpea germplasm were crossed with 12 cowpea entries received from GB Pant University of Technology Pantnagar in *Kharif* 2014. The successful crossed materials were evaluated in *Kharif* 2015.

AICRP (FCU), MPKV, RAHURI

Maize population improvement programme

Season	Activity		
Rabi 2011-12	Initial Crossing Programme		
	Female parent: African Tall		
	Male Parents : Pratap Makka Chari-6, GWL-15, BAIF-245, 3-2-5 (F5), 1-66-1(F5)		
Kharif 2012	Equal number of above crossed was included in C1 bulk and the same was sown in		
	isolation for random mating.; Stratified bulk harvesting		
Kharif 2014	Sowing of bulk seed produced during Kharif-2012 in large plot		
	IPS and development of full sibs ; Harvest full sibs individually.		
Summer 2015	Sowing of bulk seed of full sibs in isolation for random mating; Harvest in bulk (C_2).		
Kharif 2015	Sowing of C ₂ bulk ; IPS and development of full sibs ; Harvest full sibs individually.		
Summer 2016	Sowing of full sibs in isolation for random mating; Harvest in bulk (C_3) .		
Pearl millet pop	oulation improvement programme		

Kharif, 2012	Sowing of C ₁ bulk seed ; Random Matting ; Harvest in bulk
Kharif, 2014	Sowing of bulk seed (in isolation); IPS and Selfing; Harvest individually
Kharif, 2015	Sowing of IPS ; Random Matting in isolation ; Harvest in bulk
Summer, 2016	Sowing of bulk seed (in isolation); IPS and Selfing; Harvest individually

Development of bajra napier hybrids: Total 15 bajra x Napier crosses were made during Rabi-2014-15. The F1seed of these crosses were sown during Kharif-2015 for identification of heterotic clones. About 100 heterotic clones will be selected and will be planted in augmented block design with check Phule Jaywant during Summer-2016 for further evaluation

Germplasm holding

Name of grass	Nos.
Napier (Pennisetum purpereum)	43
Guinea grass (Panicum maximum)	11
Stylo (Stylosanthes spp.)	43 (34- S. sebrana, 5 - S. scabra, 2-S. hamata, 1- S. viscosa, 1- S. seca)
Marvel (Dichanthium spp.)	48
Madras Anjan (enchrus spp.)	43
Dongari (Chrysopogon fulvus)	11
Rhodes grass (Choris gayana)	7
Gokarn/Butterfly pea (Clitoria ternatea)	24
Dinanath (Pennisetum pedicelatum)	3
Total	239

AICRP (FCU), BAU, RANCHI

New Collecti	on	
Crop	Number	Source
Cowpea	3	Farmers Field
Maize	2	Farmers Field

Germplasm maintained

Germpiasn	Ger in plusin munitumed			
Crops	numbers			
Cowpea	10			
Maize	8			
Ricebean	6			

• In cowpea, 3 new crosses were attempted during Kharif 2014.

- In Bajra Napier Hybrid 20 were evaluated.
- Seed multiplication of 2 entries in cowpea, 2 in Rice bean and 1 in Maize
- Single plant selections were made using different fodder traits.
- 8 entries were tested along with the checks UPC-622 and UPC-5286

AICRP (FCU), PAU, LUDHIANA

New germplasm acquired: A total 200 germplasm lines of pearl millet were acquired from ICRISAT, Hyderabad during last year and evaluated in Kharif 2015.

New crosses attempted

- **Pearl millet:** A total of 150 new crosses (forage and grain specific) were developed using hand pollination method.
- **Cowpea:** A total of thirty two new crosses were synthesized by crossing lines selected on the basis of erectness, virus resistance, late flowering and high GFY

Breeding material maintained/handled/generated Pearl millet

- Maintenance and development of male sterile lines: 75
- Inbred lines (B&R) maintained: 385
- Seventy six 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 including germplasm accessions (256), F₁ Crosses (32), F₂(18), F₃(8) was maintained.

Trial	Entries	Promising entries
Station trial in Maize (Spring)	21 + 1 (c)	PMH 3
Station trial in Maize (Kharif)	17 +1 (c)	J 1006
Station trial in fodder bajra-1-Summer (Multicut)	14 + 2 (c)	PHB 2707, 3144, 3149, 3360, PHBF 2
Station trial in fodder bajra-2-Summer (Multicut)	7 + 1 (c)	PHBF 4
MLT in Napier Bajra Hybrid (NBH)	8 +2 (c)	PBN 346, PBN 351, Baif Bajra x FD 460
Station trial in NBH	59+1(c)	PBN 346, PBN 351
Station trial in Cowpea (fodder)	8+1 (c)	FC 31, CL 391
Station trial in Cowpea (seed)	15+1 (c)	CL 400, CL 396, FC 12

Local trials conducted during *Kharif* 2015

Pearl Millet: Forty one hybrids including check were evaluated in a multicut system trial. The hybrids viz; PHB 2707, 3144, 3149, 3053, and PHBF 4 exhibited superiority over the best check PHBF 1 and FBC 16.

Napier bajra hybrid: Two trials of NBH were continued this year too and sixty three Napier bajra hybrids were evaluated in two trials out of which one was multilocation trial consisting of seven entries and other was local trial consisting of fifty six entries sown in augmented design. Five hybrids viz; PBN 351, PBN 346, PBN 342, ICMV05222 × FD485 and Baif bajra × FD460 were found to be superior to the check PBN 233.

Cowpea: Sixteen genotypes were tested in a multilocation trial conducted at Ludhiana and the entries FC 12, CL 400 and CL 396 out-performed on the basis of seed yield and its components.

In another fodder trial nine genotypes were tested in a local trial conducted at Ludhiana and the entries FC 31 and CL 391 out-performed the check CL 367 for GFY and DMY.

Maize: Two local trials were conducted one each in *Spring* and *Kharif* season. Forty entries including check J 1006 were evaluated. During *Spring* PMH 3 performed better than the check J 1006, whereas, in *Kharif* season none of the entry could surpass the check J 1006.

AICRP on Forage Crops & Utilization

Germplasm available

S. No.	Сгор	Number of accessions
1.	Napier grass	31
2.	Guinea grass	20
3.	Cowpea	234
4.	Cluster bean	102
	Total	387

Entries in AICRP (FC) trials and their status:

Name of Trial	Name of entry	Remarks	
VTNB-Perennial (2013)	PBN342, PBN 346	Trial will continue up to Kharif 2016	
VTNB-Perennial (2015)	PBN 351	Trial will continue up to <i>Kharif</i> 2018	

:

Varieties released at Central or State level (in last 5 years)

Crop	Variety	Year of release	(state/ central)
Guar	HG 365	2014	State
Oats	OL 10	2014	State
Sorghum	PSC 4	2015	State
Pearl millet	PHB 2884	2015	State
Bajra Napier Hybrid	PBN 346	2016	State

AICRP (FCU), SKUAS&T, SRINAGAR

Germplasm enrichment:

Maize

Collection of local maize biodiversity has been undertaken to identify the germplasm base available for use in the future breeding programmes. The total collections made are 55 from the districts of Srinagar, Kupwara, Shopian, Pulwama, Ganderbal, Budgam and Anantnag spanning an altitude of 1560-2100m amsl.

The promising local lines will be crossed to generate population bulks for exploiting dual maize types for food/ fodder as exclusive maize for fodder is not in vogue in Kashmir and all the maize is used for dual purpose of food and fodder. African Tall variety along with Pratap Chari 6 and 8 will be used as testers for crossing with local types to get forage traits from these types and other agronomic traits from local ones by using the contrasting traits available in these germplasm resources. The inclusion of Pratap Chari-6 and 8 is envisaged to improve the genetic base of the breeding materials and also the derivatives from these crosses may be utilized to develop hybrids for forage use as a long term strategy.

Alfalfa

During *Kharif*- 2015, twenty five (25) germplasm of alfalfa were collected from Ladkh region (Kargil & Leh Districts) in the month of August-2015 and the evaluation will be conducted during Kharif-2016 as station programme.

AICRP (FCU), UAS, ZRS MANDYA

Germplasm collected

- Cowpea: 70 genotypes collected from AICRP Arid Legumes, GKVK, Bengaluru, IGFRI, Jhansi and Farmers Field.
- Cluster bean: 2 (IGFRI)
- Anjan Grass: 2 (IGFRI)
- Guinea grass: 4 (IGFRI-2 & KAU, Vellayani-2)
- NB Hybrid : 3 (IGFRI-2 & KAU, Vellayani-1)
- Horse gram: 35 (AICRP on Arid Legumes, GKVK, Bengaluru)

Maintenance Breeding of forage crop varieties - Nucleus seed produced

- ➤ Cowpea MFC-08-14 30 Kg
- ➤ Cowpea MFC-09-1 20 Kg

Breeding lines multiplied

F₃ generation & evaluation of forage Cowpea

- **Date of Sowing :** 24-07-2015
- \succ **F**₃- lines: 38 F₃ lines were multiplied.
- Selection ó 30 plants were selected.

Advancing of F3 generations

MFC-09-09 X EC-170578-1-1(1)	23	MFC-09-6 X IC-1071(1)
MFC-09-09 X EC-170578-1-1(2)	24	MFC-09-6 X IC-1071(2)
MFC-09-09 X EC-170578-1-1(3)	25	MFC-09-6 X IC-1071(3)
MFC-09-09 X EC-170578-1-1(4)	26	MFC-09-6 X IC-1071(5)
MFC-09-09 X EC-170578-1-1(5)	27	MFC-09-6 X IC-1071(6)
MFC-09-10 X EC-170578-1-1(1)	28	MFC-09-9 X IC-1071(1)
MFC-09-10 X EC-170578-1-1(2)	29	MFC-09-9 X IC-1071(2)
MFC-09-6 X EC-170578-1-1(1)	30	MFC-09-9 X NBC-2(4)
MFC-09-6 X EC-170578-1-1(2)	31	MFC-09-10 X NBC-2(1)
MFC-09-6 X EC-170578-1-1(3)	32	MFC-09-10 X NBC-2(2)
MFC-09-6 X EC-170578-1-1(4)	33	EC-458505 X NBC-2(1)
MFC-09-6 X EC-170578-1-1(6)	34	EC-458505 X NBC-2(2)
MFC-09-10 X IC-171(1)	35	EC-458505 X NBC-2(3)
MFC-09-10 X IC-171(3)	36	EC-458505 X NBC-2(4)
MFC-09-10 X IC-171(4)	37	EC-458505 X NBC-2(5)
MFC-09-10 X IC-171(5)	38	MFC-09-6 X EC-170578-1-1(5)
MFC-09-10 X IC-171(6)	39	C-33
MFC-09-10 X IC-171(7)	40	V-578(C)
MFC-09-13 X IC-1071(2)	41	NBC-7
MFC-09-13 X IC-1071(3)	42	NBC-19
MFC-09-13 X IC-1071(4)	43	NBC-2
MFC-09-13 X IC-1071(7)	44	MFC-09-13 X IC-1071(8)
	MFC-09-09 X EC-170578-1-1(1) MFC-09-09 X EC-170578-1-1(2) MFC-09-09 X EC-170578-1-1(3) MFC-09-09 X EC-170578-1-1(3) MFC-09-09 X EC-170578-1-1(4) MFC-09-09 X EC-170578-1-1(5) MFC-09-10 X EC-170578-1-1(1) MFC-09-10 X EC-170578-1-1(2) MFC-09-6 X EC-170578-1-1(2) MFC-09-6 X EC-170578-1-1(2) MFC-09-6 X EC-170578-1-1(2) MFC-09-6 X EC-170578-1-1(3) MFC-09-6 X EC-170578-1-1(4) MFC-09-6 X EC-170578-1-1(3) MFC-09-6 X EC-170578-1-1(4) MFC-09-10 X IC-171(5) MFC-09-10 X IC-171(4) MFC-09-10 X IC-171(5) MFC-09-10 X IC-171(7) MFC-09-13 X IC-1071(2) MFC-09-13 X IC-1071(4) MFC-09-13 X IC-1071(7)	MFC-09-09 X EC-170578-1-1(1) 23 MFC-09-09 X EC-170578-1-1(2) 24 MFC-09-09 X EC-170578-1-1(3) 25 MFC-09-09 X EC-170578-1-1(3) 25 MFC-09-09 X EC-170578-1-1(4) 26 MFC-09-09 X EC-170578-1-1(5) 27 MFC-09-10 X EC-170578-1-1(1) 28 MFC-09-10 X EC-170578-1-1(2) 29 MFC-09-6 X EC-170578-1-1(1) 30 MFC-09-6 X EC-170578-1-1(2) 31 MFC-09-6 X EC-170578-1-1(2) 31 MFC-09-6 X EC-170578-1-1(3) 32 MFC-09-6 X EC-170578-1-1(3) 32 MFC-09-6 X EC-170578-1-1(4) 33 MFC-09-10 X IC-1710578-1-1(4) 33 MFC-09-10 X IC-171(1) 35 MFC-09-10 X IC-171(3) 36 MFC-09-10 X IC-171(4) 37 MFC-09-10 X IC-171(5) 38 MFC-09-10 X IC-171(7) 40 MFC-09-13 X IC-1071(2) 41 MFC-09-13 X IC-1071(3) 42 MFC-09-13 X IC-1071(4) 43 MFC-09-13 X IC-1071(7) 44

Station Trial: Station varietal trial of forage Cowpea with 12 genotypes.

Entries in AICRP:

a) IVT Cowpea: 3 (MFC-09-3, MFC-09-6 & MFC-09-13)

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Forage Maize

Advancing forage maize populations

- 1) Cross 1: No. of Population- 95
- 2) Cross 2: No. of Population- 21
- 3) Cross 3: No. of Population- 11
- 4) Cross 4: No. of Population- 8
- 5) Cross 5: No. of Population-15
- 6) Cross 6: No. of Population- 5
- 7) Cross 7: No. of Population-1

BC₃ Population : No. of Population - 2

Entries nominated to IVT Forage Maize: MFM-6, MFM-8 Entries advanced to AVT Forage Maize: MFM-2 & MFM-4

Germplasm identified for unique traits

High forage biomass: Channarayapattana Local, Goa Local, C-157 & KBC-5

AICRP (FCU), JNKVV, JABALPUR

Сгор	existing accession	new collection	total accession	source
Soybean	45	7	52	NRC Indore & Sehore
Rice bean	34	5	39	NBPGR.,New Delhi

Generation of materials/entries/crosses made during – Kharif 2015

			7
Crop	Cross made	Cross advanced	Selection made
Soybean	5	$4F_1$	-
		3F ₂	19
		5F ₃	11
		$4F_4$	06
		6F5	03

Single plant progenies and promising genotypes were also evaluated for fodder traits.

Rice bean

- 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)
- New crossing programme was initiated using diverse genotypes of rice bean.
- Single plant selections were made using different fodder traits.

AICRP (FCU), BAIF, URULIKANCHAN

Maize

• **Population Development Programme:** A station trial was conducted with four crosses namely BAIF 299 x BAIF 295, BAIF 296 x African Tall, BAIF 297 x African Tall and BAIF 302 x African Tall along with six parents to study the performance for forage yield and quality traits. Performance of BAIF 297 x A.T. cross was superior over the rest of crosses and parents for GFY, DMY and CPY. The F₁ progeny of the BAIF 297 x A.T. cross was grown for population improvement programme.

Pearl millet

- **Germplasm collection:** Ten accessions of forage pearl millet (BAIF INC Bajra-17 & BAIF INC Bajra-26) were collected from farmerøs field in Bikaner block of Rajasthan.
- Germplasm evaluation & pure line development: Progeny of 25 accessions of Pearl millet was grown for evaluation and purification. The individual plant selections of similar characters were done from each accession as well as few plants of elite character were also identified and selfed for progeny study.

B x N hybrid

- Evaluation of B x N hybrids: Three crosses namely BAIF Bajra-1 x BRN 01, BAIF Bajra-1 x FD 444 and Bajra landrace-3 x BRN 01 were attempted during *kharif* 2011. Crossed seed of these crosses was sown for evaluation during *rabi* 2011-12. After six cuttings, based on the phenotypic characters, the promising individual clumps from each cross were identified. Thus total clumps selected were 15. A station trial was established in randomized block design for evaluation of the progeny of the clumps in comparison with BNH-10 for yield and quality parameters. Ten cuts were obtained and three hybrids namely BNH-14, BNH-11, BNH-12 and BNH-22 showed better performance with respect to GFY over the check. These hybrids were contributed in new coordinated trial for Kharif 2015.
- Two new crosses namely BAIF Bajra 14 x BRN 01 and BAIF Bajra 14 x FD 467 was attempted during September 2014. The crossed seed of these two crosses was sown for further evaluation.

AICRP (FCU), IGKV, RAIPUR

Breeding material collection, generation and handled - crosses attempted

Oat

- Crossing Block
- Date of sowing 24-11-2015
- Parents Used: JHO-822, OS-6, RO-19

Lathyrus

- Crossing Block
- Date of sowing 30-11-2015
- Parents Used: Mahateora, Pusa-24, Ratan, BK-5, Nirmal, BK-20-5

Collection of landraces in Cowpea: 83 Germplasm accessions with passport data (Trait specific germplasm characterization and identification for forage type)

Lathyrus (germplasm evaluation and identification for forage type) = 139 Germplasm accessions

- Low ODAP Group
- Late Flowering Group
- Broad Leaf Group

AICRP (FCU), GBPUAT, PANTNAGAR

Cowpea germplasm evaluation: A total of 390 cowpea germplasm lines including indigenous and exotic and improved genetic stocks have been planted in 1-5 m long rows spaced 1.0 m apart for evaluation and maintenance of the germplasm.

Breeding materials/ cowpea progenies evaluation: Total of one hundred and sixty cowpea breeding lines including 36 F_5 , 67 F_6 , 06 F_7 and 52 F_8/F_9 progenies were planted on July 29, 2015. Each progeny was planted in 1-5 m long two rows spaced 50 cm apart from the next progeny line. There progenies were evaluated for different characters/character combinations as per the breeding objectives. Heavy continuous rains just after the planting led to the extensive damage/ mortality of the germinating seedlings of the progeny lines. However, the seed from some of the following lines belonging to different generations from different crosses could be harvested.

<u>F5</u> Progenies	F ₇ Progenies
(TVu 3531-1-1-5 x Co-5)	(CX 39-1 x UPC 5286)
(EC 394 -1 x V 92-2)	(MS-9020-10-15 x UPC 9202)
(C-88 x Co-5)	(MS-9020-10-13 x UPC 9202)
(Co FC-8 x C-88)	(UPC 617 x UPC 4200)
<u>F</u>₆ Progenies	<u>F₈/F₉ Progenies</u>
(IT82E x UPC 8705)	(IT81D-380-5 x UPC 9200)
(IT82E 60 x UPO 9202)	(Singapore x UPC 606)
(CL-370 x UPC 607)	(EC 6280-1 x UPC 952)
(V5716/V34-1//UPC 4200)	(MS 9020-1-1 x UPC 952)
(UPC 2201/IT82D-875//UPC 287)	(TVu 6/PLL149-3//PLL149-2/TVu 6)
[(TVu 6/ PLL149-2//TVu6) x UPC 618]	(IT85F 958 // P542/No.1418)
[(UPC 5286/UPC 916)-20-7//UPC 618]	(UPC 9202 x IT86D-719)
(UPC 5286/VP961//UPC5286)	(UPC 9301 // H244/CX 30)
(UPC 5286/H27-4//UPC 9202)	(No. 443-2-2 x IT82D-716)
[(V 3017-2/V6342-6-3)// V 622]	(UPC 8703 x H 244)
(V 5716/V 879//V 618)	(UPC 2201 x IT81D-875)
(IT82E-6/UPC 8705-9)	
(UPC 220// IT82D-875//UPC 287)	
[(TVu 6/ PL-149-2//TVu6) x UPC 618]	
(V 5716/V 879// V618)	

Multiplication/maintenance of advanced generation improved lines: Multiplication/ increase of twenty plots of twenty improved lines/released varieties were under taken during the season for the use of their seed material in the Station/ National Coordinated Trials.

SI No.	Improved lines/Varieties	SI No.	Improved lines/Varieties
1.	UPC 801	2.	UPC 802
3.	UPC 803	4.	UPC 804
5.	UPC 805	6.	Pr-1
7.	UPC 953	8.	UPC 4200
9.	UPC 5286	10.	UPC 8705
11.	UPC 287	12.	UPC 607
13.	UPC 9202	14.	UPC 621
15.	UPC 618	16.	UPC 625
17.	UPC 622	18.	UPC 631
19.	UPC 628		

Breeder Seed Production

Variety	DAC Indent (qtl.)	Quantity Produced (qtl.)	Indenter
UPC 8705	1.30	1.50	NDDB (1.30)

AICRP (FCU), KAU, VELLAYANI, KERALA

Evaluation of Guinea grass cultures First year

Plant height: Plant height was significantly influenced by the cultures in second and fifth cuts. In the second harvest, GG culture (T_3) recorded higher plant height (117.05 cm) followed by the culture GG-08-04 (T1). In the fifth harvest, GG-08-04 (T₁) recorded a higher plant height of 174 cm.

Number of tillers: Number of tillers was significantly influenced by the cultures in fourth and fifth cuts. In the fourth harvest, GG culture (T_3) recorded highest number of tillers (37) which was on par with GG-08-04 (T_1), GG-08-01 (T_2) and Harithasree (T_4). In the fifth cut also GG- culture (T_3) recorded higher number of tillers (36) which was on par with GG-08-04 (T_1) and Harithasree (T_4).

Green fodder yield: The green fodder yield was significantly influenced by the cultures in all cuts. Significantly higher green fodder yield was recorded by the culture GG-08-04 (T1).

Second year (I cut):

In the II year, all the parameters were significantly influenced by the cultures in the first cut. The culture T1 recorded higher plant height and green fodder yield. T2 recorded higher number of tillers followed by T3 and T4.

Evaluation of BN hybrid cultures

First year

Plant height: Plant height was significantly influenced by cultures in first and fourth cuts. Significantly higher plant height (167.07 cm and 215.33 cm) was recorded by NB-08-11 (T_1) in first and fourth cut respectively and it was on par with NB-09-08 (T_2) in the first cut.

Number of tillers: Cultures had significant influence on number of tillers in all harvests.

Green fodder yield: GFY was significantly influenced by the cultures in all harvests Significantly higher GFY was recorded by the culture NB-08-11 (T_1) in all the cuts and was on par with the cultures NB-08-02 (T_3) and NDFB-17x FD-479 (T_6) except in the last cut.

Second year:

Number of tillers and green fodder yield were significantly influenced by all the cultures. The culture T1 (NB-08-11) recorded significantly higher number of tillers and green fodder yield in the first cut.

Evaluation of F1 generation of cowpea crosses for yield and late flowering in cowpea: The evaluation of 11 cowpea crosses is in progress.

Induced mutation for delayed flowering and high tillering in guinea grass (*Panicum maximum* Jacq.): 39 accessions were evaluated

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AICRP (FCU), SKRAU, BIKANER

S. No.	Range grass/ fodder crop	No. of accessions	
1	Lasiurus sindicus	330	
2	Cenchrus ciliaris	40	
3	Cenchrus setigerus	80	
4	Cymbopogon jwarancusa	40	
5	Pearl millet	30	

GERMPLASM MAINTENANCE, EVALUATION AND COLLECTION: Germplasm evaluation and maintenance was done for the following germplasm

Pasture grasses

- Some promising entries of the three range grasses were evaluated in RBD. Entries were 10 for *Lasiurus sindicus*, six for *Cenchrus ciliaris* and 12 for *Cenchrus setigerus*. 10 promising entries of *Cenchrus ciliaris* were evaluated in large plots of 100 m² size. At this time, four entries of *Cenchrus ciliaris* are being tested at national level in coordinated trials which have been contributed from Bikaner centre. Year of testing was second for two *Cenchrus ciliaris* entries and the first for other two entries. Two entries of *Cenchrus setigerus* contributed from Bikaner centre were tested in the first year in coordinated trial.
- One variety of *Lasiurus sindicus* grass RLSB-11-50 developed at Bikaner centre was identified for release at central level in the National Group Meeting of the project held at P. J. Telangana State Agricultural University, Hyderabad during April 17-18, 2015.

Pearl millet:

- Two pearl millet entries contributed by Bikaner centre were tested in coordinated trials in IVT national level during Kharif-2015.
- 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. Materials in hybridization nursery were evaluated for selection of superior plants.

Varieties released

Crop/ variety	Variety	Year of		
		Release	Identified for release	
Pearl millet	Raj Bajra-1	2015		
Lucerne	Krishna		2014	
Cenchrus ciliaris	Bikaneri Dhaman	2015		
Lasiurus sindicus	Jaisalmeri Sewan		2015	

AICRP (FCU), CCSHAU, 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
- > Evaluation of promising Pearl millet genotypes for fodder yield and quality

Fodder Cowpea:

- Evaluation of germplasm: Sixty three germplasm lines of fodder cowpea were evaluated.
- Evaluation of varietal trials for fodder yield and its components: One station trial *viz.*, LST on fodder cowpea was conducted. In this trial, 8 genotypes were tested against two checks *viz.*, CS 88 and BL 1.
- Special breeding programme in fodder cowpea

Fresh crosses attempted

SN	Name of the cross	No. of seeds obtained in each cross
1.	HFC 11-3 x CS 88	7
2.	HFC 11-2 x CS 88	13
3.	CS 88 x Bundel Lobia ó 1	9
4.	HFC 13-1 x CS 88	15
5.	CS 88 x TVv 92-2	12
6.	Bundel Lobia ó1 x TVv 92-2	16
7.	Bundel Lobia ó1 x HFC 11-2	14

Fodder Pearl millet:

• Maintenance of germplasm: Thirty germplasm lines were maintained. Promising genotypes of forage pearl millet

Characters	Range	Promising Genotypes
Plant height (cm)	168-275	HFP-14-5 (275.2) HFP-14-12 (270) & HFP 14-18 (268)
Tillers/plant	3.2-7.0	HFP 14-13 (7.0), BBS (6.3) & HFP 14-17 (6.2)
Leaf: stem ratio	0.32-0.62	HFP 14-23 (0.62) HFP 14-8 (0.52) & HFP 14-24 (0.52)
Days to 50% flowering (days)	60.0-75.0	HFP 14-15 (75.0) HFP 14-21 (73.0) & HFP 14-20 (72.0)
Green fodder yield (g)/plant	320-1102	HFP 14-21 (862) HFP 14-22 (860) & HFP 14-11 (850)
Dry matter yield (g)/plant	86-224	HFP 14-4 (224.0) HFP 14-22 (215.0) & HFP 14-11 (210)

• Evaluation of varietal trials for fodder yield and its components

One station trial *viz.*, **Large Scale Trial (LST)** on fodder pearl millet was conducted. Seven genotypes were tested against two checks *viz.*, RBC-2 and HC 20.

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AICRP (FCU), AAU, ANAND

New Collection: New germplasm lines of Sorghum (17): 4 from Bharuch, 1 from Surat and 12 from NDDB, Anand, Maize (29): from MMRS, Godhara, Clitoria (23) from Anand district were collected Germplasm maintained

 \triangleright

Sr.No.	Сгор	No. of Lines
1.	Sorghum	598
2.	Maize	150
3.	Pearl millet	64
4.	Cowpea	34
5.	Sorghum Sterile line & its maintainer	8
6.	Pearl millet Sterile line & its maintainer	4
7.	Clitoria	23

(A) Forage Sorghum:

New Crosses: 8 \rightarrow

,			
1.	CoFS-29 x C-10-2	5.	SSG-59-3 x AFS-57
2.	SSG-59-3 x C-10-2	6.	CoFS-29 x AFS-57
3.	SSG-59-3 x AFS-52	7.	SSG-59-3 x AFS-58
4.	CoFS-29 x AFS-52	8.	CoFS-29 x AFS-58

 $F_1:19$ \rightarrow

F₂: 16 Sown and 33 IPS selected from it \rightarrow

F₃: 18 Sown and 22ISPS selected from it \rightarrow

 $F_4: 20$ Sown and 24 IPS selected from it \rightarrow

F₅: 8 Sown and 7 Bulk were made \rightarrow

F₆: 15 : From 15 Progenies PYT was formed \rightarrow

(B) Maize:

Population Improvement \rightarrow

Sr.No	Population			New Name
1.	African tall Anand			AFM-1
2.	African tall Rahuri			AFM-2
3.	African tall X five mix (Five mix :	BAIF	-245, Pratap Makka	AFM-3
	Chari-6, GWL-15, 3-2-5 F ₅ , 1-66-	1 F ₅)		
4.	J-1006 Rahuri			AFM-4
5.	J-1006 Anand			AFM-5
6.	J-1006 X (Above five mix)			AFM-6
7.	African tall Urulikanchan			AFM-7
8.	J-1006 Urulikanchan		AFM-8	
\rightarrow N	ew Crosses: 26			
1.	African Tall x GYC-9842	14.	African Tall x GWC-0	324
2.	African Tall x GYC-0653	15.	African Tall x GWC-0	400

2.	African Tall x GYC-0653	15.	African Tall x GWC-0400
3.	African Tall x HQPM-1	16.	African Tall x Godhra Local (Vijora)
4.	African Tall x GWH-0902	17.	GYC-9842 x GYH-0653
5.	African Tall x GYH-0655	18.	GYH-0653 x HQPM-1
6.	African Tall x GWL-27	19.	GWH-0902 x GYH-0655
7.	African Tall x I-07-66-1-1	20.	GYH-0655 x GWL-27
8.	African Tall x GWQPM -68- 3	21.	GWL-27 x I-07-66-1-1
9.	African Tall x GWC-0320	22.	I-07-66-1-1 x GWQPM -68-3
10.	African Tall x GWC-0803	23.	GWC-0803 x GWC-0603
11.	African Tall x GWC-0609	24.	GWC-0609 x GWC-0608
12.	African Tall x GWC-0608	25.	GWC-0608 x GWC-0511
13.	African Tall x GWC-0511	26.	GWC-0511 x GWC-0324

 \rightarrow F₂: 10 Sown and 15 IPS selected from it

F₄: 15 Sown and 17 IPS selected from it \rightarrow

F₆: 45 Sown and 45 IPS selected from it \rightarrow

F₆: 8 Sown and 8 Bulk were made \rightarrow

(C) Forage Pearl millet:

\rightarrow	New Crosses: 8
1.	Giant Bajra x AFB-32
2.	Giant Bajra x AFB-33
3.	Giant Bajra x AFB-34
4.	Giant Bajra x AFB-35
5.	Giant Bajra x AFB-36
6.	Giant Bajra x AFB-37
7.	Giant Bajra x AFB-38
8.	Giant Bajra x AFB-39

- \rightarrow F₁:16
- \rightarrow F₂: 34 Sown and 23 IPS were selected from it
- \rightarrow F₃: 17 Sown and 18 IPS were selected from it
- \rightarrow F₄: 14 Sown and 15 IPS were selected from it
- \rightarrow F₅: 4 Sown and 4 Bulk were made

AICRP (FCU), BCKV, KALYANI

Germplasm maintained

Name of the crop	Total number of lines
Rice bean	250
Coix	3

Breeder seed production:

- Rice bean (Bidhan Rice bean 1)-22 kg
- Rice bean (Bidhan Rice bean 2)-16 kg
- Coix (Bidhan Coix 1)

Multiplication and management of BN hybrid:

- CO 3 and CO 4
- Nucleus seed production:
 - Rice bean (Bidhan Rice bean 1)-3.2 kg
 - Rice bean (Bidhan Rice bean 2)-2.5 kg
 - Coix (Bidhan Coix 1)-0.70 kg

Multiplication of rice bean, coix and BN hybrid were done during *kharif*, 2015 for distribution to the resource poor farmers.

- Rice bean (Bidhan Rice bean 1) ó 25 kg
- Rice bean (Bidhan Rice bean 2) ó 64 kg
- Coix (Bidhan Coix 1) ó 15 kg
- BN hybrid (CO-3) : 3500 cuttings (Approx.) [Nos.]
- BN hybrid (CO-4) : 4500 cuttings (Approx.) [Nos.]

A-15

Other Activities Kharif-2015

AICRP (FCU), TNAU, COIMBATORE

Publications

- Babu, C., K. Iyanar A and Kalamani. 2015. Predicting the yield potential of Guinea grass (*Panicum maximum Jacq.*) genotypes across India through G x E analysis. *XXIII International Grassland Congress-2015*, New Delhi.
- Karthikeyan B. J., C. Babu, A. John Joel and S. Ganesh Ram. 2015. Development of a reference set of sorghum (*Sorghum* spp.) for cyanogenic potential (HCN-p) and evaluating their fodder yield traits. *XXIII International Grassland Congress-2015*, New Delhi.

Babu, C., K. Iyanar and A. Kalamani 2015. High green fodder yielding new forage crop varieties. *Uzhavarin Valarum Velanmai*. Malar-7, Ithal-4, pp. 19 - 21.

Student(s) guided

- M.Sc. (Agri.) in PBG ó 1
- Ph.D. in PBG ó 1

FTDs conducted: 25

Training conducted for farmers/ NGO/ Govt. officials: 2

TV/ Radio talk delivered: 2

Forage crops seed production details (2015-16)

S.	Forage crops	Total quantity (kg)				
No.		Breeder	Foundation	TFL	Total	
		seed	seed	seed		
1.	Multicut fodder sorghum CO (FS) 29	350.0	-	791.75	1141.75	
2.	Multicut fodder sorghum CO 31	-	-	11.25	11.25	
3.	Fodder maize- African tall	-	1965.0	2044.0	4009.0	
4.	Fodder cowpea CO (FC) 8	-	-	136.0	136.0	
5.	Hedge Lucerne	-	-	568.75	568.75	
6.	Subabul	-	-	3.2	3.2	
7.	Agathi	-	-	73.5	73.5	
	Grand Total	350.0	1965.0	3628.45	5943.45	

Quantity of planting material produced and supplied (2015-16)

S. No.	Сгор	Planting material (Nos.)
1.	BN hybrid CO (BN) 5	14,53,669
2.	BN hybrid CO (CN) 4	33,000
3.	Guinea grass CO (GG) 3	34,088

Externally funded projects:

Title of the Scheme	Sponsors	Duration	Outlay
Development of pearl millet forage hybrids and	CGIAR- Dry	2015-16	50,000 USD
pearl millet ó napier (PN) hybrids for high	land Cereals ó		
biomass and quality suited for different agro	Competitive		
climatic zones of India.	Grants 2015		

Important persons visit

- Dr. S. K. Gupta, Sr. Scientist (Pearl millet Breeding), ICRISAT, Patancheru, Hyderabad
- Dr. S. Chandra, Director, ISAP (Indian Society of Agribusiness Professional), New Delhi

AICRP (FCU), PJTSAU, HYDERABAD

SN	Сгор	Variety at state level	Variety at central level
1	Fodder cowpea	Vijaya	
2	Fodder bajra	Moti bajra (Multi cut)	
3.	Fodder bajra		APFB 09-1(single cut) for NEZ

Varieties released at state and central level

Research papers

- Shanti, M., R. BalajiNaik, K. B. Suneeta Devi, J. Rajsekhara Reddy and Ch.Chiranjeevi 2015. Effect of Biogas poultry manure on soil fertility in cereal-legume based cropping system. *International Journal of Bio-resource and Stress Management* 6(1): 81-86
- Susheela, R., M. Shanti, T. Shashikala, V. Chandrika and M. Anuradha 2015 Fodder yield and quality of fodder pearlmillet genotypes as influenced by different levels of nitrogen. *Annals of plant and soil Research* 17(special issue) 228-230
- Raghavendra, B. M., R. Susheela, V. Praveen Rao. A. Madhavi. 2015. Efficacy of different weed management practices on growth &Yield of direct wet seeded rice sown through drum seeder. *The Bioscan10*(1):97-101
- Raghavendra, B. M., R. Susheela, A. Madhavi, V. Praveen Rao, T. M. Sudhakara. 2014 Influence of high efficacy herbicides on yield and economics of direct wet seeded rice sown through drum seeder. *Progressive Research* 9(conf spl):598-600

FTDs conducted during Kharif 2015 – **100 comprising of 25 each of** Cowpea (MFC-8), NB hybrid (APBN-1), Maize (African Tall), Bajra (BAIF Bajra)

Tribal Sub Plan

Number of individuals/	Activities	Any other information
families benefited		
10 Tribal families were	Distributed inputs viz., fertilizer, seed	Fodder resources
identified in Girgaon, Tamsi	etc. (Maize, APBN-1, Fodder Cowpea,	increased and quality
(mandal), Adilabad Dist. as	Hedge lucerne.	fodder fed to the sheep.
beneficiaries		

Conferences attended

- Asia pacific weed science conference at PJTSAU, Hyderabad during October 2015
- International Grassland Congress held at New Delhi from 20-24th November, 2015

Meetings attended

- Second meeting of ISSS Council at Div. of Soil Science and Agril. Chemistry, New Delhi. 11-12 June, 2015- Dr Shanti
- 8th National Seed Congress held at HICC, Novotel Hotel 27th to 29th Oct Dr Shashikala
- ZREAC meeting of Southern Telangana Zone at Rajendranagar 10.9.15 All scientists
- ZREAC meeting of Northern Telangana Zone at Nizamabad 15.9.15 Dr Shashikala

Radio & TV programmes

- 14.8.15- Dr Shanti radio talk on rabovu kalaniki pasugrasala erpatu emi chesukovali,
- 1.8.15- Dr Shashikala programme on Perennial fodders in Express TV
- 19.9.15- Dr Shashikala-V6 TV-Forage crops varieties and their cultivation
- 13.10.15- Dr Shashikala- MAHA TV phone-in-live programme on rabi saaguku anuvaina pasugrasaalu

Teaching activities

- Dr Susheela PG course Agro 501
- Dr Shanti PG Course EST-507 titled Waste Water Management

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AICRP (FCU), PAU, LUDHIANA

Publications

Kapoor Rahul, R K Bajaj, R S Sohu, Devinder Pal Singh and Ruchika Bhardwaj (2015) OL 10: A new high yielding variety of fodder oat (*Avena sativa* L.). *Agric Res J* 52 (2):214-15.

Kapoor, Rahul (2015) Studies on variability and character association in forage pearl millet (*pennisetum americanum* (l.) R. Br.) hybrids. J Global Agri. Ecol. 4(1): 7-11. ISSN 2454-4205

- Kaur J, Bhatti DS, Goyal M (2015) Influence of copper application on forage yield and quality of oats fodder in copper deficient soils *Indian J. Anim. Nutr.* 32 (3): 290-294
- Goyal, M, Tiwana U S and Bhullar M S (2015) Nutritional evaluation of sugar beet (*Beta vulgaris* L.) genotypes as fodder. *Indian J Anim Nutr* 32: 237-41

Students guided:

- M. Sc.: 5
- Ph.D.: 1

FTDs conducted: 112

- Maize (J 1006) =13
- Napier Bajra Hybrid (PBN 233) = 68
- Pearl millet (FBC 16) = 31

TV/Radio talks:

- TV (2)
- Radio (2)

HRD for AICRP staff:

 21 day summer school entitled õNovel approaches and technologies for Processing and value addition of agricultural produceö at ICAR-CIPHET, Ludhiana from 4-24 August, 2015. (Dr. Meenakshi Goyal)

Details of seed/Planting material sold to farmers:

Crop	Variety	B/S (q)	F/S (q)	C/S (q)	TL (q)	Total (q)
Cowpea	CL 367	2.87			6.45	9.32
Guinea grass	PGG 518	0.24			0.76	1.00
Maize	J 1006	50.70	158.36	99.28	1422.23	1730.57
Bajra	FBC 16		5.0		47.44	52.44

External funded Projects: (2)

Sr.	Status	Name	of	the	Funding	Amount	Name of PI
No.		Project/Sch	eme		Agency	(in Lacs)	
1.	Ongoing	Developing	guidelines	for	PPV and	14.92	Dr. Rahul Kapoor
		conduct of	DUS test	for	FRA		
		oat, cowpe	ea and gu	iinea			
		grass. CSS-	74 (PC 611	5)			
2.	Ongoing	Alien gene	s introgres	ssion	UGC	9.31	Dr. Rahul Kapoor
		in oat by	developing	oat			
		maize addit	ion lines				

AICRP on Forage Crops & Utilization

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B-3

AICRP (FCU), UAS (ZRS), MANDYA

Publications: 2

- Shekara, BG, Krishnappa MR, Nagesh Chikkarugi and Manasa N (2014) õEconomics of Cultivation of Fodder Sorghum in Saline Alkali Soils. *Research Journal of Agricultural Sciences*, 5(6): 1209-1211.
- Shekara, B. G., H. C. Lohithaswa., Nagesh Chikkarugi, Krishnappa, M. R. and Manasa, N (2015) Production potential of Forage Crops in Rice Fallows under varied Nitrogen Levels. *Research Journal of Agricultural Sciences*, 6(3): 517-520.

Extended Abstracts: 4

- Shekara B G, Krishnappa M R, Lohithaswa H C, Chikkarugi N M, Manasa N, Performance of dual purpose pearl millet genotypes as influenced by cutting management and nitrogen levels, XXIII International Grassland Congress ó IGC-2015, 20th -24th, November, 2015.
- Krishnappa M R, Shekara B G, Lohithaswa H C, Chikkarugi N M, Manasa N, Performance of Guinea grass variety JHGG-08-1 Southern region of Karnataka, XXIII International Grassland congress ó IGC-2015, 20^{th} -24th, November, 2015.
- Lohithaswa H C, Krishnappa M R, Shekara B G, Chikkarugi N M, Manasa N, MFC-09-1 A New Forage Cowpea (Vigna unguiculata (L.) Walp) Variety for South zone. XXIII International Grassland Congress ó IGC-2015, 20th -24th, November, 2015.
- Shekara B G, Lohithaswa H C, Krishnappa M R, Chikkarugi N M, Manasa N, Enhancing Productivity of Guinea grass variety JHGG-08-1 through Agro-techniques in Southern Dry Zone of Karnataka. XXIII International Grassland Congress ó IGC-2015, 20th -24th, November, 2015.

Presentations in Conferences / Symposium / Seminars / other fora: 1

• XXIII International Grassland congress ó IGC-2015 20th -24th, November, 2015 New Delhi,

Important persons visit

- > Dr. Ĥ. Shivanna, Vice Chancellor UAS, Bengaluru.
- > Dr. K. P. Vishwanath, Director of Research, UAS, Bengaluru
- > Dr. Jagadeeshwar, Director of Extension, UAS, Bengaluru.
- > Dr. D. P. Kumar, Director of Education, UAS, Bengaluru
- Mr. Prasanna, Administrative Officer, CADA, Mysore.

Student(s) guided: M.Sc. (Agri.) in Agronomy- 3

FTDs conducted: 50 (10 each) - Guinea Grass var JHGG-08-1; Cowpea var MFC-08-14; Maize var African Tall; Bajra - BAIF Bajra ; Bajra X Napier Hybrid var Co-3

Training conducted for farmers/ NGO/ Govt. officials:

- Training programme 9
- ➢ Field days 5

TV/ Radio talk delivered: 2

Details of seed/ planting material sold

SN	Forage crops	Planting Material Sold (In Lakhs)
1.	Napier Bajra Hybrid (Co-3)	1.20
2	Guinea grass (JHGG-08-1)	0.70
3	Rhodes grass (Selection)	0.20
4	Signal grass(Selection)	0.10

Externally funded projects: 4

GOK projects

- ✓ Development of High oil corn (Zea mays) hybrids for high quality feeds
- ✓ Maintenance breeding of Fodder crop varieties

RKVY projects

- ✓ Augmenting Fodder Production and establishing fodder seed bank at University of Agricultural Sciences, Bangalore (2013-14)(RKVY project)
- ✓ Enhancing quality seed production in important fodder crops and demonstration of production technologies and low cost forage equipments to accelerate fodder production in Karnataka

AICRP (FCU), CSK HPKV, PALAMPUR

Publications

- Bhar, R., Naveen Kumar, Singh, B., Mal, G. and Saikia, P. 2015. Nutritional management of oak toxicity in hill ruminants with special reference to *Quercus leucotrichophora* leaves. Lead paper in National Symposium on õLivestock Production Practices for Small Farms of Marginalized Groups and Communities in India" & XXII Annual Convention of Indian Society of Animal Production and Management at COVS & AH, CAU, Aizawl, Mizoram, 28- 30 January, 2015.
- Naveen Kumar, Navell Chander and Sunil Kumar (2014) Production efficiency and profitability of forage based cropping systems under mid hills of north-western Himalays. *Himachal J. of Agricultural Research* 40(2):126-131
- Rajan Katoch, Naveen Kumar, V.K. Sood and D.K. Banyal (2015). Fodder trees: A potential source to mitigate fodder deficiency in hills of north western Himalayas. All India Coordinated Research Project on Forage Crops, Souvenir National Group Meet April 17-18,2015, PJTSAU, Hyderabad, 51-54.
- Sood, V.K., Indu Rana, Waseem Hussain, Ankita Sharma, Rajan Katoch and H K Chaudhary. 2015. Genetic diversity of genus Avena in North western Himalayas assessed by morphological traits. XXIII International Grassland Congress. November 20-24, 2015 New Delhi, NCR, India
- Singh S.K., Katoch, R. and Kapila, R.K. (2015). Genetic and Biochemical Diversity among Valeriana jatamansi Populations from Himachal Pradesh. The Scientific World Journal Vol. 2015, Article ID 863913, 10 pages <u>http://dx.doi.org/10.1155/2015/863913</u>.
- Rajan Katoch, Kanika Sharma, Sunil Kumar Singh and Neelam Thakur (2015). Evaluation and Characterization of Trypsin Inhibitor from Rice Bean with Inhibitory Activity against Gut Proteases of *Spodoptera litura*. Zeitschrift für Naturforschung Accepted.
- Banyal, D. K., Chaudhary, Jaya and, Katoch, Rajan.2015. Effect of diseases and insect-pests on forage quality of cowpea. Presented in 23rdInternational Grassland Congress, õSustainable Use of Grassland Resources for Forage Production, Biodiversity and Environmental Protectionö held at New Delhi, India on November, 20 to 24, 2015.
- Naveen Kumar, B R Sood and Sunil Kumar (2015). Performance of Improved Forage Species under dry temperate conditions of North Western Himalayas. Presented in 23rdInternational Grassland Congress, õSustainable Use of Grassland Resources for Forage Production, Biodiversity and Environmental Protectionö held at New Delhi, India on November, 20 to 24, 2015.

Important persons visited

• QRT team under the chairmanship of Dr. Panjab Singh. Other members incldued Dr. P.S. Pathak, Dr. K. S. Ramachandra, Dr. K. K. Dutta, Dr. C. L. Acharya, Dr. J. P. Yadvendra, Dr. Sunil Kumar Tiwari and Dr P K Ghosh

Student(s) guided:

- M.Sc. = 6
- Ph.D = 4

Out reach activities

Сгор	Actual Number of beneficiaries
Setaria grass (PSS-1)	20
Napier bajra hyrid (NB-37)	20

TSP activities

Number of families benefited	Type of assets created
40 Families selected	The procurement of seedlings of Setaria grass and NBH
	procured. Bench mark data of families prepared.

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Training conducted for farmers/ NGO/ Govt. officials:

Title of training	No. participants	participan	ts
Eight days Model Training course on õIntegrated farming	20	Govt.	Agri.
system for livelihood and nutritional securityö		Officers	

TV/ Radio talk:

- Lecture delivered to farmers and developmental officers = 6
- Radio talks = 3
- Seed/seedlings of Setaria, NBH, Fescue grass and clovers sold to farmers and other agencies.
- Revenue generated from March 2015 to Dec 2015 = Rs. 10.62 lakh

Breeder Seed Production: Setaria grass = 12 kg

Linkage with Departments

- Department of Agriculture (HP)
- Department of Forest (HP)
- Department of Animal Husbandry (HP)
- Watershed Development Programmes (HP)

Linkage with NGOs

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- ERA, Khudian, Distt. Kangra (HP)
- CORD, Sidhbari, Distt. Kangra (HP)

Linkage with other schemes

AICRPs		
AICRP(IFS) CSK HPKV	Inclusion of fodder crops in the	Development of IFS models for
Palampur	system	different land holding sizes
AICRP (Agroforestry)	Agroforestry systems	Development of Agroforestry
CSK HPKV Palampur		systems for different land uses

Externally funded projects: Project scientists associated in Three Ad hoc projects

Projects submitted: õEvaluation of -amylase inhibitor and isolation, characterization of encoding gene from ricebean (*vigna umbellata*)ö. Submitted to DST, New Delhi.

Annual Report Kharif-2015
AICRP (FCU), BAIF, URULIKNCHAN

Publications (books, research papers, bulletins etc.)-

- Takawale, P. S., S. S. Jade and S. D. Ghorpade (2015) Nutritional values and economics of leguminous blocks as goat feed. 23rd International Grassland Congress (IGC 2015) held at New Delhi during 20-24 Nov. 2015.
- Kauthale, V. K., P. S. Takawale and S. D. Patil (2015) Effect of planting methods and forage crop combinations on fodder productivity through moisture conservation. 23rd International Grassland Congress (IGC 2015) held at New Delhi during 20-24 Nov. 2015

Important persons visit

- Mr. Prakash Singh Badal, Honøble Chief Minister, Punjab
- Mr. Deepak V. Kesarkar, Honøble Minister of State for Finance Planning & Rural Development, Govt. of Maharashtra
- Mr. T. Satyanarayana, Member of A. P. Agriculture Development Commission, Hyderabad.
- Mr. T. Nanda Kumar, Chairman, NDDB, Anand
- Dr. P. S. Minhas, Director, ICAR- National Institute of Abiotic Stress Management (NIASM), Baramati, Pune

FTDs conducted: Twenty seven demonstrations of Maize and Bajra-Cowpea.

TSP activities: Following activities were planned in Chondvade and Belakund villages of Nandurbar district of Maharashtra. The total no. of participants is fifty.

Activities	Objective					
Supply of Hy. Napier cuttings (500	To promote new varieties of perennial grass for round the					
stumps/ farmer)	year green fodder availability					
Ensilaging and quality enhancement	To demonstrate the technology of silage making and					
of pasture grasses (50 units)	improve nutritive quality of native pasture grasses					
Supply of chaffcutter (2 units)	To create common facilities for chaffing of jawar straw and					
	other crop residues					
Provide diesel pump set and PVC	To generate water lifting mechanism for irrigation					
pipes (10 units)						
Distribution of bucks (10 bucks)	To improve local goats with Osmanabadi breed					
Training of Farmers	To build the capacities of the farmers					

Training conducted for farmers/ NGO/ Govt. officials: Ten training programmes of three days duration on õLivestock Management and Fodder Developmentö were organised by BAIF and 184 individuals have participated in the training programme. The lectures on Fodder production technologies and silvipasture were delivered by the Scientists working in AICRP on Forage Crops.

TV/ Radio talk delivered by AICRP-FC staff/ extension activities: Attended two meetings of Agricultural Advisory Committee for Krishidarshan Programme of Doordarshan Kendra, Pune.

Details of seed/ **planting material sold:** Participatory seed production programme of Forage Maize and Bajra was organised at farmerøs field in BAIFøs operational area of Maharashtra. Technical staffs of the project were involved in providing technical inputs and monitoring of fodder seed production programme.

AICRP (FCU), KAU, VELLAYANI

Publications

- Anita, M. R. and S. Lakshmi, 2015. Growth characters of green fodder cowpea mixtures as influenced by row ratio. *Green Farming*, 6(6). P.1340-1344
- Cuckoo Rani, M. and Usha C Thomas, 2015. Standardization of media and organic nutrient scheduling for Bhindi in soilless cultivation. *Trends in Biosciences*. 8(15).p. 3915-3919
- Soumya, A and Usha C Thomas, 2015. Impact of different growth media, nutrient sources and nutrient levels on yield and quality of tomato. *Trends in Biosciences*. 8(15). P.3953- 3959.

Conference papers

- Sudrik B.P., Mareen Abraham and Usha C Thomas. 2015. Genetic divergence in guinea grass (*Panicum maximum J.*). International grassland congress, New Delhi
- Lakshmi, S. and Anita 2015. Quality of grass fodder cowpea mixtures as influenced by row ratio, International grassland congress, New Delhi
- Lakshmi, S. and Anita 2015. Quality of fodder cowpea varieties as influenced by soil moisture stress levels. International grassland congress, New Delhi

Student(s) guided:

- M.Sc. (Agri.) in Plant Breeding and Genetics ó 2;
- Ph.D in Plant Breeding and Genetics ó 2,
- M.Sc. (Agri.) in Agronomy-2

Dr. Mareen Abraham

- B Sc (Ag) courses-
 - Pbgn 3105- Breeding of crops and intellectual property rights,
 - Pbgn 1101- Morphology and systamatics of crop plants
- PG courses- Principles of genetics, Genomics in crop improvement, Biodiversity

Dr. Usha C Thomas

- BSc (Ag) courses-
 - Irrigation and water management(Agro1203)
 - Agricultural Meteorology (Agmt 1101)
 - Field Crops-1(Agro 2205)
- PG Course- Agrostology and Agroforestry

Trainings organized

• Dr. Usha C Thomas was the course co-ordinator of sponsored training programme on Capacity building of master farmers under JLG Kudumbasree mission on productivity enhancement of major crops of Kerala for 15 master farmers of 2 days duration on 21-22 December, 2015.

AICRP (FCU), BAU RANCHI

- Teaching M.Sc.
- Distributed seed material among the farmers
- TV/Radio talk- 4
- Training conducted for farmers-2

AICRP on Forage Crops & Utilization

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AICRP (FCU), AAU, JORHAT

Publications

- Sharma, K. K., P. Sutradhar and S. B. Neog (2015). Productivity of Perennial Grasses under *Machillus bombicinii* Tree in Assam. XXIII International Grassland Congress IGC 2015, held on 20 24 November 2015 at Delhi NCR, India
- Abhishek Krishna, Vinit Kumar, H. C. Pandey, Shahid Ahmed, Vikas Kumar and, K K Sharma (2015). To study the micro and macro nutrient, pH and EC on soil quality at Bundelkhand Region. Agricultural Science Research Journal 5(5): 77- 84
- Sharma, K. K. and S. B. Neog (2015). Prospect and Management of Forage Crops in Assam. Souvenir, National Group meet, Kharif, 2015, AICRP on Forage Crops and Utilization held at PJTSAU, Hyderabad, April 17-18,2015
- Chakrabarty, M and S. B. Neog (2015). Studies on genetic variability in forage maize, *Forage Res.* 41(2): 126-129

Extension leaflet – 3

- Cultivation of perennial forage crops in Assam (in Assamese)
- Cultivation of forage crops in Assam (in Assamese)
- Feeding nutritious forage crops (in Assamese)

Student(s) guided:

- M. Sc. (Agri.)- PBG 2
- M. Sc. (Agri) Agronomy-3;
- Ph. D in Agronomy- 2

FTDs conducted: 20

TSP activities: Adopted 7 villages in two TSP districts viz. Dhemaji and Karbi Anglong

Training conducted for farmers/ NGO/ Govt. officials: 8

TV/ Radio talk delivered by AICRP-FC staff/ extension activities: 3

Details of seed/ planting material sold

Forage crops seed/planting materials supplied (2014-15)

S	Forage crops	Root Slips	Total quantity (l	kg)
Ν		(No)	Foundation seed (kg)	TFL seed
1	Hybrid Napier CO-3,CO-4	1.2 lakh		
2	Setaria Kazungula, PSS-1	1.1 lakh	-	
3	Rice bean Var. Shyamalima		20 kg	
4	Oat Var. Kent nnd JHO 822			2.40 q
	Grand Total	2.30 lakh	20.00 Kg	2.40 q

AICRP (FCU), GBPUAT, PANTNAGAR

Publication

Journals

- Birendra Prasad. 2015. Seed yield and quality as influenced by planting ratio of parental lines of forage sorghum hybrid. *Journal of Hill Agriculture* 6 (2): 176-179.
- Pal, M. S. and Bhatnagar, A. 2015. Effect of nitrogen scheduling on productivity, profitability and nitrogen use efficiency in maize (*Zea mays* L.) under Tarai region of Uttarakhand. *International Journal of Basic & Applied Agricultural Research* 13(1): 5-9.
- Pal, M.S. 2015. Effect of macro and micro nutrients on herbage yield and quality of berseem (Trifolium alexandrinum L.) in Tarai region of Indo-Gangetic plains of India. *Indian Journal of Plant &* Soil 2(2): 77-80.
- Bhatnagar, A., Singh, G and Pal, M. S. 2015. Weed control options for maize (Zea mays L.) and effects on succeeding wheat (Triticum aestivum L.) crop in Tarai region of Uttarakhand. International Journal of Basic & Applied Agricultural Research 13(2): 245-249
- Geeta Pandey, Rajendra Prasad, Birendra Prasad and Priyamvada Chauhan.2015. Co-efficient of variation, heritability, genetic advance and variability for ricebean genotypes under mid hill condition of Uttatakand. *Journal of Applied and Natural Sciences* 7 (2): 794-798.

Proceedings

- Pal, M. S. 2015. Forage production strategies for enabling livestock development in under privileged areas. Lecture delivered in CAFT training, -Management of under privileged Agricultureø on 20th Feb 2015.
- Pal, M. S. 2016. Scholastic frontier technologies for sustainable food production. Lecture delivered in CAFT training on ÷Revitalizing soil and crop productivity for secured agricultureøheld from 3 to 23 Feb. 2016 at Department of Agronomy, Pantnagar
- Pal, M S. 2016. Improved cultural practices and cutting management in sorghum, berseem and other multicut crops in view of good seed production. Advanced training on,ø Fodder Seed Productionø organized by ICAR-IISS, Mau (UP) from 15 to 19 March 2016 at GBPUAT, Pantnagar.
- Pal, M S. 2016. Weed control in fodder crops. Advanced training on,ø Fodder Seed Productionø organized by ICAR-IISS, Mau (UP) from 15 to 19 March 2016 at GBPUAT, Pantnagar.
- Prasad, B. 2016. Quality seed production technology of oat and legume forages. Advanced training on,ø Fodder Seed Productionø organized by ICAR-IISS, Mau (UP) from 15 to 19 March 2016 at GBPUAT, Pantnagar.

Popular Articles

- Pal, M. S. 2015. Berseem fodder for high milk production. Indian Farmersø Digest 48 (10); 19-23.
- Pal, M S. 2015. Scholastic frontiers technologies for sustainable food production. Indian Farmers; Digest 48 (12): 37-40
- Verma, J. S. 2015. Scientific cultivation of improved forage cowpea, maize and sorghum varieties. *Kisan Bharti* 44 (6) : 31-32.
- Verma, J. S. 2015. Quality seed production in forage cowpea. Kisan Bharti 46 (6): 21-23.
- Verma, J. S. 2015. Successful cultivation of Berseam for quality green fodder. *Kisan Bharti* 47 (1): 38-40.
- Verma, J. S. 2015. Case and management of planted winter forage crops. Kisan Bharti 47 (3): 36-39.

Outreach activities

- **Tribal Sub Plan-Forage Crops**: Field demonstrations on tribal area of U S Nagar are going on. Three villages namely Kanpura, elkhera and Kaithulia of Sitarganj block have been adopted for forage production under TSP-FC.
- FLDs on Forage Crops: 50 field demonstrations on kharif forage crops including maize, sorghum, cowpea, ricebean conducted on farmers fields during Kharif 2015-16.

AICRP on Forage Crops & Utilization

Important Visits:

• Dr S Ray Smith, Professor & Forage Extension Specialist, University of Kentucky, USA visited forage program in November 2015,

Technology Development

- Oat variety UPO-06-1 has been developed
- Pre emergence application of Pendimethalin @ 0.3 kg ai/ha + Imazethapyr @ 0.1 kg ai/ha after 1st cut or alone application of Pendimethalin@ 0.3 kg ai/ha may be recommended for effective weed control in berseem for higher green forage yield, seed yield and also net returns

Awards/Recognition:

• **Dr. Birendra Prasad** awarded with outstanding achievement award by Astha Foundation in the discipline of Plant Breeding on GRISAAS-2015 during 12-13 Dec 2015 at Rajmata Vijayaraje Scindhia Krishi Vishwavidhylaya, Gwalior, MP.

Capacity Building

- 21 days training on Revitalizing soil and crop productivity for secured agriculture from 3-23 Feb 2016 was organized under CAFT Agronomy. Dr Mahendra Singh pal, Professor Agronomy served as the course coordinator.
- 10 Farmersø meeting organized in selected villages under TSP and FTDs,
- 12 field days were organized.

TSP-Forage Crops

• Total 156 tribal families were benefitted under TSP program. 156 field demonstrations including 71 on maize, 65 on sorghum, 10 on cowpea and 05 on ricebean were conducted during *Kharif* season 2015-16. Three villages namely kanpura, Belkhera nd Kaithulia of Sitraganj block, US Nagar district (Uttarakhand) were selected under TSP.

FTD-FC

• 50 FTDs were conducted during *Kharif* season 2015-16.

Radio Talks: 08

Students guidance

- M Sc: 05
- Ph. D.: 03

New Facilities developed in centers

Development of **Forage Cafeteria** has been initiated at IDF, Nagla. The rabi forage crops like berseem, oat, makhhan grass and other grasses and clovers have been grown.

AICRP (FCU), SKUAST-K, SRINAGAR

Germplasm enrichment:

Maize: Collection of local maize biodiversity has been undertaken to identify the germplasm base available for use in the future breeding programmes. The total collections made are 55 from the districts of Srinagar, Kupwara, Shopian, Pulwama, Ganderbal, Budgam and Anantnag spanning an altitude of 1560-2100m a m s l.

The promising local lines will be crossed to generate population bulks for exploiting dual maize types for food/ fodder as exclusive maize for fodder is not in vogue in Kashmir and all the maize is used for dual purpose of food and fodder. African Tall variety along with Pratap Chari 6 and 8 will be used as testers for crossing with local types to get forage traits from these types and other agronomic traits from local ones by using the contrasting traits available in these germplasm resources. The inclusion of Pratap Chari-6 and 8 is envisaged to improve the genetic base of the breeding materials and also the derivatives from these crosses may be utilized to develop hybrids for forage use as a long term strategy.

Alfalfa: During *Kharif*- 2015, twenty five (25) germplasm of alfalfa were collected from Ladkh region (Kargil & Leh Districts) in the month of August-2015 and the evaluation will be conducted during Kharif-2016 as station programme.

Demonstrations cum Field visit to line departments, KVK ϕ s and farmers ó 05 **TV/Radio talks** – 02 **Publications** – 02

AICRP (FCU) AAU, ANAND

Student guided

- Plant Breeding : 1
- Agronomy : 5

HRD

• Dr. D.H. Desai attended Winter School on "Climate Resilient Soil Management strategies for Sustainable Agriculture" from 14/10/2015 to 03/11/2015 at JNKVV, Jabalpur (M.P.).

FTD conducted

- Pearl millet Var. GFB-1 : 10
- Hybrid Napier Var. Co-3 : 10
- Guinea grass Var. GHGG-8-1 : 5

Seed /planting materials sold farmers/ others

- Hybrid Napier : 104890 Nos.
- Bajra ó GFB-1 : 400 kg.
- Sorghum -GAFS-11, S-1049 : 389 kg.

Externally funded project: Two

- Evaluation of Performance of Makkhan grass hybrid (UPL Ltd.): Grant Rs.1.2 Lakhs
- "Quality Seed Production in Fodder Crops" under Fodder Development Programme: Grant Rs.6.00 Lakhs

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AICRP (FCU), SKRAU, BIKANER

Publications

- Bika, N. K. and S. S. Shekhawat (2015). Genetic variability study in pearl millet (*Pennisetum glaucum* (L.) R. Br. for green fodder yield and related traits. *Electronic Journal of Plant Breeding*, 6(2): 600-602.
- Bika, N. K. and S. S. Shekhawat (2015). Character association studies in pearl millet (*Pennisetum glaucum* (L.) R. Br. for green fodder yield and related traits. *Agric. Sci. Digest*, **35** (3): 191-194.
- Shekhawat, S. S. and S. M. Kumawat (2015). Sankar napier bajra avam gini ghas se poore varsh hara chara utpadan. Centre for Forage management, ARS, SKRAU, Bikaner.
- S. M. Kumawat, Dushyant Singh, Mohd. Arif, Suresh Kumar, P. S. Rathore and S.L. Godara 2015. Effect of planting material and geometry on sewan (*Lasiurus sindicus* Henr.) productivity. *Forage Research*
- S. S. Shekhawat, N. K. Pareek, H. L. Deshwal and Susheel Kumar Compiled and edited Technical Summary (Rabi-14-15) of Agricultural Research Station, SKRAU, Bikaner (2015)

Seminar/Symposium

- Dr. S. S. Shekhawat and Dr. S. M. Kumawat attended XXIII International Grassland Congress at Delhi NCR, India
- Shekhawat, S. S. (2015). Genetic improvement and conservation of range and forage species of arid region of Rajasthan state of India: Achievements and challenges. In: International Grassland Congress-2015(Sustainable use of grassland resources for forage production, biodiversity and environmental protection) held on Nov. 20-24, 2015 at Delhi NCR.
- Shekhawat, S. S., S. M. Kumawat and S. L. Godara (2015). Pasture establishment and sustainability in arid region of Rajasthan, India: Prospects and constraints. In: International Grassland Congress-2015(Sustainable use of grassland resources for forage production, biodiversity and environmental protection) held on Nov. 20-24, 2015 at Delhi NCR.
- Kumawat, S. M., Dushyant Singh, Rinku, S. S. Shekhawat, P. S. Rathore, S. Gangopadhyay and S. L. Godara. 2015. Study on Sewan grass Pasture establishment and Seed collection technique in Western Rajasthan. In: International Grassland Congress-2015(Sustainable use of grassland resources for forage production, bio-diversity and environ protection) held on 20-24, Nov. at NCR, New Delhi.
- Kumawat, S. M., Rinku and Dushyant Singh.2015. Role of Zinc and Thiourea on Seed Yield and Quality of Fodder Oats (*Avena sativa* L.) under Western Rajasthan. In: International Grassland Congress-2015(Sustainable use of grassland resources for forage production, bio-diversity and environ protection) held on 20-24, Nov. at NCR, New Delhi.

Student (s) guided and teaching work

- Dr. S. S. Shekhawat two M. Sc. (Ag.) and one Ph.D. students. Teaching courses -01
- Dr. S. M. Kumawat One Ph. D , One M. Sc ; Teaching of courses 2

FTDs conducted: 25 fodder demonstrations were conducted under AICRP on Forage Crops during Kharif-2015.

Work for fodder development was started in five villages, viz. Khara, Husangsar, Shobasar, Kanasar and Jamsar under the scheme õMera Gaon Mera Gauravö

Training conducted for farmers/ NGO/Govt. Officials

- Farmers training for green fodder production during Kharif season on July 02, 2015.
- Lecture on õForage Management under Biotic and Abiotic Stressesö in a Winter School by Dr. S. S. Shekhawat organised by SKRAU, Bikaner on December 3, 2015.
- Dr. S. S. Shekhawat gave a lecture on õGreen fodder production and pasture establishmentö in a farmersøtraining at KVK, Abusar, Jhunjhunu on August 14, 2015.
- Dr. S. S. Shekhawat gave a lecture on õSeed production and storage of Kharif fodder cropsö in a farmersøtraining organised by Directorate of Research, SKRAU, on August 18, 2015.

AICRP on Forage Crops & Utilization

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Seed/ planting material sold

- Green fodder sale 135 q @ Rs. 150/- q = Rs. 20250/-
- Dry fodder sale 30 q @ 350 / q = Rs. 10500 / -
- Grain ó Rs. 3405/-
- Total -- Rs. 34155/-

Under RKVY project -

- I. Sewan pasture (50 bigha) established- 01 Vill. Momasar, Teh. Sri Dungargarh (Bikaner)
- II. Trainings for farmers organized under
- a) On Campus Sewan grass seed collection technique 01
- b) Off Campus Sewan pasture establishment technique 02 (Vill. Momasar & Benisar)
- c) Field Days organized : Sewan pasture established ó 01

Externally funded project

- RKVY project on õAugmenting sewan seed availability in arid western Rajasthanö.
- Azolla Project of Govt. of Rajasthan under Navachar Programme.

Other activities

- Dr. S. S. Shekhawat acted as monitoring team member for Kharif seed production at KVK, Abusar, Jhunjhunu of SKRAU, Bikaner.
- Dr. S. S. Shekhawat was felicitated in NGM-Kharif-2015 at MPKV, Rahuri for development of new varieties of fodder crops/ grasses.
- Dr. S. S. Shekhawat is working as In charge of Technical Cell of Agricultural Research Station, SKRAU, Bikaner.

AICRP (FCU), IMPHAL

Publications (books, research papers, bulletins *etc.*): 3 bulletins **Important persons visit**

- Shri Mohanbhai Kundariya, Honøble Union Minister of State for Agriculture & Farmers Welfare
- Dr. T. Meinya, Honøble Member of Parliament, Lok Sabha
- Md. Abdul Nasir, Honøble Agriculture Minister, Manipur
- Dr. M. Premjit Singh, Honøble Vice-Chancellor, CAU, Imphal
- Director of Agriculture, Govt. of Manipur
- Ch. Ramananda, Chairman, Manipur Milk Producers Co-operative Union Ltd.

Student(s) guided: M.Sc. (Agri.) in Agronomy ó 2

No. of FTDs conducted: 40 (*kharif-20*, *rabi-20*)

Training conducted for farmers/ NGO/ Govt. officials: 2

Resource person: 2

- Training programme on Production of green fodder organized by Directorate of Agriculture, Govt. of Mizoram.
- Training programme on Round the year green fodder production organized by Directorate of Extension Education, CAU, Imphal.

Details of seed/ planting material sold:

- Interaction programme with dairy farmers on perennial fodder cultivation.
- Interaction with Manipur Milk Producers Co-operative Union Ltd. on popularizing fodder crops among dairy farmers.

S. No.	Perennial fodder	Total quantity (Nos.)				
		No. of cuttings	Total			
1.	Napier hybrid CO-1	2000	2000			
2.	Napier hybrid CO-2	2000	2000			
3.	Napier hybrid CO-3	2000	2000			
	Grand Total	6000	6000			

Perennial fodder production details (2014-15)

AICRP (FCU) CCSHAU, HISAR,

Varieties released during last three years

Crop	Name of the 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	Identified in 2015 for NE and South Zones

Courses taught

Course No.	Course title	Name of the teacher
GP 401	Crop Improvement	Dr. Y. Jindal
GP 403	Heterosis Breeding in Crop Plants	Dr. Y. Jindal
Agron. 509	Agronomy of Fodder & Forage Crops	R.S. Sheoran, Satpal

Student under Guidance:

Name of Student	Research Title	Guide
Tanvi Kumari,	Evaluation and Characterization of Oat genotypes (Avena sps)	Dr Y Jindal
M.Sc.	for morphological, fodder and grain yield traits	
Priyanka, M.Sc.	Chemical weed control studies in Egyptian clover	Dr RS Sheoran

Research projects sanctioned during 2014-15: One

Title	Investigator	Budget	Funding	Status
			Agency	
Farmersø trainings on scientific	PI: Dr. S.K. Pahuja	52.00	RKVY	Project approved for
cultivation of forage crops to	Co-PI: Dr. Yogesh	Lakhs		two years. Farmers
ensure quality seed production	Jindal			Trainings in 20 districts
				of Haryana

Research papers:

Sunil Kumar, Dalbir Phogat and Nabin Bhusal (2015). Characterization of elite forage cowpea genotypes for various DUS traits. Forage Res. 40(4): 232-236.

Ravish, AS Godara, Yogesh Jindal, Satyawan Arya and Pummy Kumari (2015). रबी चारा फसल का बीज

उ पादन In: उ नत बीज उ पादन टकनीक (सं ह पु तक) Editors: Rajesh Kumar Arya, Suresh Kumar,

Arvind Singh, Anil Kumar Godara and Krishan Kumar Dahiya. Chapter 13: 40-43.

Y. Jindal, R.N. Arora, U.N. Joshi and A.K. Mall (2015). Lucerne genotypes performance for fodder yield and its attributes with quality parameters at Hisar and all-India level. Forage Research 41(1): 23-29.

Extension activities - *kisan mela*, farm darshan, T & V training system on monthly basis and farmers visits

Trainings conducted:

Training Programme on feed & fodder development (from 23 to 25 June, 2015) organized by Regional Fodder Station, Dept. of A.H, Dairying & Fisheries, Ministry of Agril., GOI., Regional Fodder Station, Hisar in collaboration with Forage Section, CCS Haryana Agricultural University, Hisar. - Lectures Delivered - 08

Certificate Training Programme on feed & fodder development (from 15 to 17 December, 2015) organized by Regional Fodder Station, Dept. of A.H, Dairying & Fisheries, Ministry of Agril., GOI., Regional Fodder Station, Hisar in collaboration with Forage Section, CCS Haryana Agricultural University, Hisar. Lectures Delivered - 11.

AICRP on Forage Crops & Utilization

AICRP (FCU) BCKV, KALYANI

Research paper:

K. Jana, S. K. Das and A. M. Puste (2015). Production economics of mat-sedges (*Cyperus tegetum* Roxb.) cultivation as influenced by water management practices for economic stability of resource-poor rural people of West Bengal, India. *International Journal of Environmental & Agricultural Research*. (ISSN 2454-1850) (June, 2015), 1 (2): 27-31.

Student(s) guided:

- M. Sc. (Ag.) in Agronomy 2
- Ph. D. in Agronomy- 1

Attached in Courses in Department of Agronomy: Course No. 509,

Name of the course: Agronomy of fodder and forage crops and other courses

No. of FTDs conducted: 50 units (*Kharif*, 2015)

Breeder Seed production programme:

- Ricebean (Bidhan Ricebean-1)-22 kg
- Ricebean (Bidhan Ricebean-2)-16 kg
- Jobøs Tear/ Coix (Bidhan Coix-1)-19 kg

Training conducted for farmers: 3 (Three)

Participated in Agricultural Fair: AICRP on FC & U participated in *Krishi mela*, organized by KVK, Nadia of BCKV at Gayeshpur, Nadia, West Bengal for dissemination of forage technology.

Externally Funded Project: 1 (Private Company)

Participated in seminar/farmers' meeting etc:

- National symposium on Food and nutrition: Need for the futureø, Institute of Agricultural Science, University of Calcutta, Kolkata, 25-27th Feb., 2015
- o Seminar on Food legumes (ICARDA Project) organized by BCKV, Nadia, West Bengal.
- Annual review & planning meeting of India- Morocco food legumes initiative (IMFLI) OCPE-ICARDA Project on 23.06.2015 organized by BCKV.
- Monitoring & planning meeting of AICRP on Groundnut at FACC, BCKV, Kalyani organized by AICRP on Groundnut, Kalyani Centre, BCKV.
- As resource person in farmersø meeting on forage production at Durku watershed area, Purulia organized in collaboration with DDA (Soil and Water Conservation), Purulia District, Department of Agriculture, Govt. of West Bengal.
- $\circ~$ Meet with tribal group at Chhatna area of Bankura and Durku watershed areas of Purulia districts for dissemination of forage technology.
- Meet with farmers at different villages of Nadia district for dissemination of forage technology.
- National Seminar on -Sustainable Agriculture for food security and better environment@on December 17-18, 2015 at FACC, BCKV, Kalyani organized by Department of Agronomy, BCKV, Mohanpur, Nadia, West Bengal.
- o Participated in *Annadataø* programme of ETV News Bangla on Forage production programmeø

Awareness development on 'seed production' of forage crops: Seed production of rice bean and maize by farmers for their own uses as seed for the next year.

Transfer of technology:

• 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 and coastal areas of WB

- Distribution of Rice bean seeds to farmers for popularizing as an under canopy legume crop in nutrient enrichment and fodder production in the Orchards.
- Provide rice bean seeds to the scientist of Department of Genetics & Plant Breeding, UBKV for research & experimental purposes.
- Trainings to the farmers of different districts of West Bengal
- Participated in Agricultural Fair (*Krishi Mela*) conducted by KVKs (Nadia) under BCKV for dissemination of forage technology.
- Distributions of leaflets on forage crops among the farmers

AICRP (FCU), JNKVV, JABALPUR

Publications

- Verma, A.K., A.K. Naidu, P.K. Jain, A.S. Gontia, A.K. Mehta, R.P.Singh(2015) Evaluation of cowpea genotypes for physiological efficiency and productivity under agro climatic conditions of kymore plateau zone, Madhya Pradesh *Progressive Research (10) (Special-VI)* : 3323-3327
- Dubey, Nidhi, A. K. Mehta, H.A. Avinashe and Vinod Kumar (2014) Variability studies for qualitative and quantitative traits in advanced lines of oat (*Avena sativa* L.). *Journal of Soils and Crops.* 24 (2): 247-254.
- Jha, A. K., Shrivastva Arti Raguvanshi , N. S. 2014. Effect of weed control practices on the fodder and seed productivity of Berseem under irrigated condition of Madhya Pradesh. *Range management* & Agroforestry:35 (1)pp 61-65.
- Sinodiya, Pratik and Jha A. K. (2014). Effect of weed management control practices on nutrient uptake n fodder maize. *JNKVV Research Journal* 47 (2): 27630

Important Persons visited

- Board Members of Vishwavidyalaya.
- Dr. Raj Gupta Director, BISA
- Dr R. S. Paroda Ex. DG, ICAR
- > Dr .A. K. Singh, Vice chancellor RVSKVV, Gwalior

Students guided: M. Sc. - 1

FTDs conducted:

- Maize (A.Tall) = 25
- Oat JO1, Kent = 10

TV/Radio talks:

Radio talks = 1

AICRP on Forage Crops & Utilization

B-17

AICRP (FCU) MPKV, RAHURI

Research papers

- Tambe, A. B. and J. R. Kadam, 2015. Population dynamics of aphids and their natural enemies on Lucerne in Western Maharashtra. *Range Mgmt. & Agroforestry.* 36(1): 88-91.
- Damame, S. V., R. V. Bhingarde and S. B. Gore, 2015. Forage and grain productivity, quality and economics of some maize (*Zea mays* L.) varieties. *Applied Biological Res.* 17(3): 259-265.
- Mundhe, R.P., R.P. Andhale and B.T.Sinare, 2015. Response of cabbage varieties to different shade net colours and shading intensities. J. Agric. Res. Technol. 40(1): 169-172.

Other Publications

- Tambe, A. B. and A. H. Sonone, 2015. Role of entomopathogenic fungi in crop protection. Souvenir of National Group Meet (Kharif 2015) held at PJTSAU, Hyderabad: 98-105.
- Andhale, R.P., B.T. Sinare, R.W. Bharud, A.D. Kadlag and P.K. Sarade, 2015. Growth, yield and quality of summer groundnut under inorganic and organic nutrient management. Souvenir, State level seminar on soil health awareness : A Prerequisite to yield sustainability held at MPKV, Rahuri on 21-22 December, 2015. PP 276-277.
- Andhale, R.P., V.L. Amolic and B.T. Sinare, 2015. Studies on the effect of water soluble foliar grade fertilizers on the growth and yield of summer groundnut. Souvenir, National seminar on Sustainable agriculture for food security and better environment held at Mohanpur, West Bengal on 17-18 December, 2015. PP 58-59.

Extension publications:-3

Students Guide: M.Sc. (Agri.)

- Plant Breeding: 02
- Entomology: 01
- Biochemistry: 01

FTDs conducted

• 20 (10 Hybrid Napier var. Phule Jaywant + 5 Maize var. African Tall + 5 Bajra var. Giant Bajra)

TSP activities

• 40 tribal farmers from village Dhulipada, Post Dhanrat, Tal. Navapur, District Nandurbar, were identified for implementation of TSP-2015-16. Seed of Maize variety African Tall, cycle hoe, Laxmi sickle, Khurpi, University diary and six forage variety folders in regional language will be distributed to the selected farmers. Also training on fodder production will be organized to the beneficiary farmers.

Training/Workshop conducted for farmers/ NGO/ Govt. Officials

• Organized NGM (Rabi-2015-16) of AICRP on FC&U at MPKV, Rahuri 2-4September, 2015.

HRD for the AICRP

• Dr. S. V. Damame attended 21-day training programme on PlantOmics ó Emerging Tools and Techniques for Crop Improvement sponsored by the IARI, New Delhi, from 18th November to 08th December, 2015.

TV/Radio talk/ Lectures

- Lecture to farmers- 06
- Radio: 03

Seed Production (Kharif 2015)

SN	Crop	Nucleus (Q)	Breeder seed (Q)	Truthful seed (Q)
1.	Maize- African Tall	1.10	25.0	
2.	Bajra- Giant Bajra	0.03		
3.	Cowpea- Shweta	0.05	0.03	0.10
4.	Phule Jaywant			72,000 slips

Visit of farmers / Government officials to the project: 438 farmers and 22 Govt. officials

AICRP on Forage Crops & Utilization

AICRP (FCU), IGKV, RAIPUR

TV/Radio talks: Radio talks = 1

Student(s) guided: M.Sc. (Agri.) in Genetics and Plant Breeding = 2

Teaching in Post Graduation and PhD Programmes:

1	PG	GP-502	Principles of Cytogenetics	3(2+1)
2	PhD	GP-608	ADVANCES IN BREEDING OF MAJOR FIELD CROPS	2(2+0)
3	PhD	GP-606	Crop Evolution	2(2+0)

Other Projects : from Vishvidyalaya funds

SN	Projects	Title	Lead PI	Co-PIs	(Rs. lakh)	in
1	GPB- 85	Exploration, Maintenance, evaluation and storage of forage germplasm of Chhattisgarh	Mayuri Sahu	-	0.40	
2	Broom grass GPB-86	Development of broom grass from Narayanpur District	Mayuri Sahu	Manoj Sahu	0.50	
3	AGRON -35	Round the year fodder availability cropping modules for 19 KVKøs	S. K. Jha	Mayuri Sahu, PC & KVKs Farm managers	1.00	
4	AGRON -37	Survey of fodder cultivation, issues and problems with Goshalas and organized dairy farmers	S. K. Jha	Mayuri Sahu, N. Kerkatta, AL Rathore	0.50	

WEATHER REPORT FOR KHARIF -2015

The weather report of the AICRPFC Coordinating, Cooperating and Voluntary centers across the different zones of the country during Kharif 2015 has been presented in this section. The weather parameters from 26th Standard Meteorological Week (June 25, 2015) to 44th Standard Meteorological Week (November 04, 201) were taken into consideration, which covers the *Kharif* 2015 season for all the testing locations for trial conduction [Table MET-M1 to M15]. 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, on seasonal mean basis, Srinagar remained the coolest, recording mean minimum temperature of 13.1° C, whereas, Palampur recorded highest average maximum temperature (29.0°C). Almora recorded the coolest low temperature of 6.9° C during 43^{rd} SMW. At Srinagar, maximum temperature was recorded (31.4° C) during 32^{nd} SMW. In North-East zone, Faizabad recorded the lowest minimum temperature (13.7° C) during 44^{th} SMW. On the basis of mean minimum temperature on the season, Imphal was coolest whereas, Faizabad, Kalyani and Bhubaneswar recorded nearly equal mean Maximum temperature. Maximum day temperature was recorded at Faizabad (36.6° C) during 36^{th} SMW. Least variation for minimum and maximum temperature over the season was observed at Bhubaneswar followed by Kalyani. In North-West Zone, Bikaner recorded lowest minimum temperature (13.6° C) during 44^{th} SMW followed by Pantnagar (13.7° C) during same week. Maximum temperature was recorded at Bikaner (42.2° C) during 37^{th} SMW. The highest mean min (24° C) and mean max temperature was recorded at Ludhiana and Bikaner, (24° C), respectively.

In Central Zone, Jabalpur recorded the lowest minimum temperature (17.0^oC) during 44th SMW followed by Rahuri (17.4^oC) in the same week. The maximum temperature was recorded at Anand (38.8^oC) during 42nd SMW followed by Jhansi (37.8^oC) during 27th SMW. Rahuri recorded lower mean minimum temperature over the season as compared to rest of the locations. Whereas Jhansi recorded higher mean maximum temperature during the season. The least fluctuation in maximum temperature over the season was at Urulikanchan. In South zone, the lowest minimum temperature was recorded at Dharwad (14.7^oC) during 35th SMW followed by Mandya and Hyderabad (18.1^oC) 38th and 43rd SMW, respectively. The maximum temperature was recorded at Hyderabad *viz.*, 34.8^oC during 28th SMW. On the seasonal mean basis, Hyderabad and Coimbatore experienced higher maximum temperature as compared to other locations in the Zone. The minimum difference in mean (T.max. and T. Min.) temperature was observed at Vellayani during the season.

Rainfall

During *kharif* season some of the states received very less amount of rainfall especially Maharashtra (Rahuri-185.4 mm and Urulikanchan-192.0 mm). In Hill Zone, Palampur received highest rainfall (1818.7 mm) followed by Almora (259.5 mm in 37 rainy days). In North East Zone, Imphal received highest rainfall (1185.6 mm) followed by Jorhat (1106.8 mm) and lowest being at Faizabad (376.9 mm). The maximum number of rainy days was recorded at Imphal (77 rainy days) followed by Jorhat (73 rainy days) and lowest being at Faizabad (22 rainy days).

In North-West Zone, Pantnagar received highest rainfall (993.7 mm) followed by Ludhiana (527.6 mm), Bikaner (393.0 mm) and lowest being at Hisar (342.3 mm). In Central Zone, maximum rainfall (1011.2 mm) was received at Jabalpur followed by Raipur (678.8 mm) and lowest being with Rahuri (185.4 mm in 15 rainy days).

Maximum number of rainy days were observed at Jabalpur (41) followed by Raipur (32) and lowest being at Anand (13). In South Zone, Vellayani received maximum rainfall (1044.7 mm) in 54 rainy days followed by Hyderabad (376.1 mm in 28 RD) and lowest total rainfall was at Mandya (210.2 mm in 15 RD). In the same zone the good distribution of rainfall was observed at Vellayani and Hyderabad.

Relative Humidity (RH)

In hill Zone, the morning RH was highest at Almora (97.6 % in 26th SMW). Morning RH was recorded higher throughout the crop season at Almora in comparison to Palampur. In North-East Zone, maximum RH of 99.0% was recorded at Kalyani during morning hours in 26th SMW followed by 97.0 % at Jorhat during 38th SMW. Minimum RH during morning and afternoon hours was recorded at Faizabad (67.0% in 41 SMW) and (46.8% in 41 SMW), respectively. However, the average RH was recorded highest at Kalyani (95.8%).

In North-West Zone, RH ranged from 59.0 to 94.0 % in morning hours and between 27.0 to 43.0% in afternoon. The lowest RH during morning hours was recorded at Bikaner (59.0%) during 37th SMW, whereas, highest morning RH was recorded at Hisar (94.0%) during 33rd SMW and Ludhiana (94.0%) during 42 and 44th SMW. In the same zone, the maximum afternoon RH was recorded at Ludhiana (82.0%) during 28th SMW.

In Central Zone, maximum RH in morning hours (100 %) was recorded at Urulikanchan during 43^{rd} SMW and lowest RH (56.0%) in morning was observed at Rahuri centre during 42^{nd} SMW. In South Zone, the maximum RH (96.0%) was recorded in the morning hours at Hyderabad during 37 and 40^{th} SMW. The minimum fluctuation in the morning RH was recorded at Hyderabad. The lowest afternoon RH was recorded at Dharwad (32.0%) during 43^{rd} SMW.

Sunshine hours

In Hill Zone, maximum sunshine hours were recorded at Palampur (10.5 during 40 SMW) followed by 9.6 h in 32nd SMW at Srinagar. In the same zone, over the season, the maximum mean sunshine hours were recorded higher at Srinagar than Almora. In North-West Zone, more sunshine hours were recorded at Ludhiana and Hisar (10.2 h during 36 and 37 SMW), respectively. On mean basis, Bikaner and Hisar recorded higher sunshine hours (8.0 and 7.3 h, respectively) followed by Ludhiana (6.8 h).

In North-East Zone, Ranchi recorded maximum sunshine hours (9.2 h) followed by Kalyani (9.0 h). On seasonal mean basis Maximum average sunshine hours were recorded at Ranchi (6.3 h) followed by Faizabad (5.5 h) and Bhubaneswar (4.7 h) and lowest being with Jorhat (1.5 h). Jorhat experienced lowest sunshine hours over the season as compared to other locations.

In Central Zone, the maximum sunshine hours were recorded at Anand (9.8 h in 44^{th} SMW). On mean basis, the maximum sunshine hours was recorded at Anand (6.4 h) followed by Jabalpur (6.2 h) and lowest being with Raipur (5.2 h). In South Zone, maximum sunshine hours was recorded at Coimbatore (9.9 h) followed by Hyderabad (8.9 h). On mean basis, Coimbatore recorded maximum sunshine hours (7.2 h) followed by Hyderabad (5.9 h) and lowest being with Mandya (5.2 h).

Met. Week		Met. Week	
26	June 25-July 01,2015	36	Sep. 03-Sep. 09, 2015
27	July 02-July 08, 2015	37	Sep. 10-Sep. 16, 2015
28	July 09-July 15, 2015	38	Sep. 17-Sep. 23, 2015
29	July 16-July 22, 2015	39	Sep. 24-Sep. 30 2015
30	July 23-July 29, 2015	40	Oct. 01-Oct. 07, 2015
31	July 30-Aug. 05, 2015	41	Oct. 08-Oct. 14, 2015
32	Aug. 06-Aug 12, 2015	42	Oct.15-Oct. 21, 2015
33	Aug. 13-Aug. 19, 2015	43	Oct. 22-Oct.28, 2015
34	Aug. 20-Aug. 26, 2015	44	Oct. 29-Nov. 04, 2015
35	Aug. 27-Sep. 02, 2015		

Std.		PALAMPUR						ALMORA					
Week	Temp	erature	Humid	lity (%)	Rainfall	Sunshine	Temper	rature	Humid	ity (%)	No. of	Rainfall	Sunshine
No.	(°C)			(mm)	hrs	(C	()			Rainy	(mm)	hrs
	Max.	Min.	RH1	RH2			Max.	Min.	RH1	RH2	days		
26	27.7	17.9	73.0	68.0	27.8	6.1	27.8	18.7	97.6	80.9	5	30.6	3.0
27	27.9	19.1	85.0	78.0	143.8	4.3	27.7	19.8	96.1	83.6	4	19.9	2.9
28	25.4	18.5	91.0	89.0	144.8	1.5	28.4	22.2	94.0	82.6	4	45.4	3.2
29	25.9	19.8	94.0	90.0	159.6	1.4	29.6	21.9	93.0	75.0	2	12.2	5.9
30	27.2	19.0	92.0	86.0	230.8	3.9	28.2	21.0	90.8	79.3	5	40.7	2.0
31	26.2	19.2	97.0	88.0	276.2	2.1	28.6	21.2	91.3	84.6	3	16.5	3.5
32	25.6	19.7	97.0	91.0	416.0	0.9	28.7	22.4	92.4	80.4	3	7.9	4.8
33	26.0	18.5	90.0	89.0	90.7	2.9	29.9	22.2	90.3	87.9	4	28.0	5.8
34	26.3	17.7	91.0	84.0	91.0	4.2	30.9	19.5	93.6	61.9	2	6.2	6.5
35	27.9	16.9	92.0	83.0	114.0	7.4	30.4	20.0	88.7	61.6	-	0.0	7.4
36	27.1	15.5	88.0	77.0	32.0	8.1	31.6	18.9	88.6	57.9	-	0.0	7.4
37	28.6	16.6	90.0	75.0	0.2	8.7	30.6	18.6	90.0	65.0	4	12.1	5.6
38	26.5	16.7	86.0	82.0	39.4	4.1	30.7	16.9	96.6	57.6	-	0.0	8.6
39	25.3	13.6	80.0	65.0	29.6	7.4	30.6	11.6	91.9	49.3	-	0.0	9.0
40	27.7	13.8	64.0	48.0	0.0	10.5	29.4	13.5	87.1	65.7	1	40.0	5.9
41	26.5	14.7	82.0	65.0	0.6	7.9	27.1	13.4	87.5	50.5	-	0.0	7.2
42	25.1	12.9	73.0	52.0	9.0	7.7	27.3	6.4	79.6	43.4	-	0.0	8.4
43	23.4	10.5	72.0	48.0	13.2	7.1	24.6	5.9	88.1	39.8	-	0.0	6.7
44	22.6	10.2	80.0	54.0	0.0	7.1							

Table M 1: Meteorological data in Hill zone during crop growth period of Kharif-2015

Std. Week		<u>J</u>	SR	INAGAR		
No.	Tempe	rature (C)	Humi	dity (%)	Rainfall	Sunshine hrs
	Max.	Min.	RH1	RH2	(mm)	
26	29.3	13.9	72.0	43.8	0.6	8.8
27	30.4	14.3	76.5	40.2	0.0	8.1
28	30.1	14.5	76.5	46.5	0.0	8.6
29	28.1	12.6	75.4	48.5	3.6	7.9
30	28.9	13.1	76.0	50.7	1.3	7.8
31	30.1	14.1	76.9	44.8	0.0	8.9
32	31.4	13.6	77.3	40.8	0.0	9.6
33	30.2	14.0	77.5	50.7	0.0	7.9
34	28.4	14.1	80.4	52.3	8.4	7.6
35	27.6	13.6	78.0	50.4	3.1	7.2
36	27.3	13.1	78.3	53.5	0.0	6.4
37	25.4	13.0	80.4	55.1	4.1	5.3
38	24.2	12.9	80.6	56.3	0.0	6.9
39	24.0	13.0	82.1	56.3	0.0	7.1
40	22.4	11.1	82.5	55.1	2.3	6.3
41	22.1	11.3	84.1	58.3	0.0	6.8
42	20.8	10.9	84.0	55.6	0.0	6.3
43						
44						

Table M 2: Meteorological data in Hill zone during crop growth period of Kharif-2015

Std.			Н	IISAR						BIKAN	NER		
Week	Temp	erature	Humid	lity (%)	Rainfall	Sunshine	Tempe	erature	Humid	ity (%)	No. of	Rainfall	Sunshine
No.	(C)			(mm)	hrs	(C)			Rainy	(mm)	hrs
	Max.	Min.	RH1	RH2			Max.	Min.	RH1	RH2	days		
26	35.7	25.0	86.0	62.0	94.9	7.9	39.3	25.9	66.1	42.5	3	64.2	8.1
27	37.6	25.8	80.0	49.0	15.8	8.0	37.9	27.1	69.8	41.7	0	0.0	6.4
28	32.8	25.6	90.0	78.0	61.7	1.7	38.4	25.4	80.4	42.2	2	10.2	7.6
29	34.6	26.7	84.0	58.0	9.7	6.6	38.9	27.0	74.0	41.5	1	8.3	7.1
30	35.5	26.8	88.0	64.0	77.3	7.8	33.6	24.7	88.2	69.4	4	104.5	5.8
31	32.0	25.1	89.0	73.0	2.9	5.8	33.6	25.0	89.1	66.7	4	93.6	2.6
32	34.9	26.2	90.0	62.0	7.4	4.6	37.5	26.2	78.1	54.8	2	43.3	7.6
33	33.3	26.5	94.0	76.0	32.5	2.1	35.9	25.4	86.4	55.2	2	62.5	6.8
34	35.0	26.2	86.0	55.0	4.5	7.8	36.2	25.6	75.2	53.0	0	0.0	10.1
35	36.6	25.6	80.0	54.0	8.8	9.8	37.4	25.2	74.1	49.5	0	0.0	9.9
36	36.9	23.3	74.0	39.0	0.0	9.5	37.4	23.4	62.5	39.0	0	0.0	9.9
37	37.1	22.4	73.0	35.0	0.0	10.2	40.2	23.2	59.0	29.5	0	0.0	9.8
38	36.3	24.2	80.0	42.0	7.9	7.2	34.6	23.8	78.1	50.0	1	2.2	5.9
39	33.5	22.2	81.0	54.0	3.7	6.8	35.9	22.1	69.2	31.7	0	0.0	8.9
40	35.1	19.2	86.0	34.0	8.2	9.4	38.0	20.4	70.1	39.0	0	0.0	9.7
41	37.1	19.3	72.0	29.0	0.0	9.5	37.7	20.0	77.5	44.2	0	0.0	9.7
42	35.8	20.5	80.0	36.0	0.0	8.5	36.1	19.2	69.4	41.0	0	0.0	9.4
43	34.0	18.4	77.0	27.0	0.0	8.2	32.5	14.3	65.8	30.5	1	4.2	9.1
44	28.6	14.8	90.0	42.0	7.0	7.0	31.0	13.6	72.2	28.5	0	0.0	7.5

Table M 3: Meteorological data in North West zone during crop growth period of Kharif-2015

Annual Report Kharif-2015

Std.				JO	DHPUR					PAN	TNAGAR		
Week	Temp	erature	Hun	nidity	No. of	Rainfall	Sunshine	Tempera	ature (C)	Humid	ity (%)	No. of	Rainfall
No.	((C)	(2	%)	Rainy	(mm)	hrs	•			• 、 /	Rainy	(mm)
	Max	Min.	RH1	RH2	Days			Max.	Min.	RH1	RH2	Days	
	•												
26	38.3	28.4	72.0	46.0	1	4.9	8.5	31.4	23.8	90.0	76.0	3	230.8
27	37.6	28.9	67.0	42.0	0	0.0	5.5	32.7	25.7	87.0	72.0	4	110.0
28	37.8	27.9	72.0	44.0	1	19.7	6.7	32.0	25.4	88.0	72.0	5	184.0
29	37.1	27.7	73.0	53.0	2	10.3	6.1	32.5	26.6	84.0	72.0	2	9.8
30	32.1	25.0	90.0	76.0	6	136.5	2.2	33.8	25.9	83.0	63.0	2	6.4
31	31.2	25.4	85.0	61.0	2	6.5	4.0	31.4	25.7	87.0	74.0	4	148.8
32	35.1	27.1	79.0	56.0	0	2.2	6.1	30.4	25.4	91.0	76.0	4	89.9
33	33.2	25.6	90.0	64.0	3	86.7	5.7	32.6	26.1	90.0	67.0	3	50.6
34	33.6	25.8	80.0	52.0	0	0.0	9.1	32.4	24.9	89.0	69.0	3	28.6
35	34.9	25.5	76.0	48.0	0	0.0	9.3	33.3	25.4	92.0	65.0	1	22.2
36	36.1	24.9	67.0	35.0	0	0.0	9.8	33.7	23.9	91.0	60.0	0	0.0
37	39.1	26.8	60.0	29.0	0	0.0	10.2	34.1	25.0	87.0	59.0	0	0.0
38	35.9	26.4	72.0	48.0	1	19.5	6.7	33.0	24.4	84.0	62.0	1	112.1
39	34.9	23.3	74.0	32.0	0	0.0	10.1	32.1	21.7	90.0	61.0	0	0.0
40	38.6	21.5	59.0	59.0	0	0.0	10.1	31.8	20.2	83.0	51.0	0	0.0
41	37.9	20.5	63.0	63.0	0	0.0	9.9	32.3	20.3	82.0	52.0	0	0.0
42	38.4	22.4	63.0	63.0	0	0.0	9.4	31.6	19.3	86.0	51.0	0	0.0
43	35.6	20.1	55.0	55.0	0	0.0	9.5	30.2	13.9	88.0	48.0	0	Trace
44	31.2	19.6	57.0	41.0	0	0.0	9.0	29.4	13.7	90.0	43.0	1	0.5

 Table M 4: Meteorological data in North West zone during crop growth period of Kharif-2015

Std. Week				LUDHIA	NA		
No.	Тетр	erature (C)	Hum	idity (%)	No. of Rainy	Rainfall	Sunshine hrs
	Max.	Min.	RH1	RH2	Days	(mm)	
26	36.1	26.4	72.0	44.0	1	4.1	9.1
27	35.6	27.7	77.0	55.0	3	11.8	5.4
28	31.2	25.8	89.0	82.0	4	181.0	4.6
29	32.9	27.6	86.0	71.0	2	60.1	3.8
30	34.2	27.8	75.0	62.0	0	0.0	8.9
31	32.6	32.6 27.0 32.2 26.9		65.0	2	7.0	7.1
32	32.2	32.0 27.0 32.2 26.9 32.0 25.0		74.0	3	48.0	1.5
33	33.8	26.0	85.0	68.0	2	87.0	5.2
34	33.3	25.7	86.0	67.0	1	26.8	8.2
35	35.0	27.2	84.0	57.0	0	0.0	9.6
36	34.6	25.4	82.0	47.0	0	0.0	10.2
37	35.3	25.2	86.0	58.0	0	1.4	7.0
38	30.9	23.7	91.0	68.0	3	65.6	4.7
39	31.7	21.7	92.0	60.0	1	18.4	9.9
40	33.1	20.5	93.0	47.0	0	0.0	10.1
41	32.7	22.0	87.0	52.0	1	7.0	6.5
42	31.5	19.2	94.0	46.0	0	0.0	7.4
43	29.5	16.4	84.0	39.0	1	9.4	7.0
44	27.8	14.4	94.0	43.0	0	0.0	3.8

 Table M 5: Meteorological data in North West zone during crop growth period of Kharif-2015

Std.			URUL	IKANCH	AN					JHA	NSI		
Week	Temper	ature	Humid	ity (%)	No. of	Rainfall	Tempera	ature (C)	Humid	ity (%)	No. of	Rainfall	Sun
No.	(C)			Rainy	(mm)					Rainy	(mm)	shine
	Max.	Min.	RH1	RH2	days		Max.	Min.	RH1	RH2	days		(hours)
26	22.3	32.0	88.4	73.3			35.7	24.9	79.0	52.0	2	25.8	8.8
27	22.9	32.3	84.2	69.2			37.8	27.5	74.0	55.0	2	43.8	0
28	27.7	29.9	86.7	72.4			33.0	25.2	90.0	68.0	4	18.4	0
29	29.0	25.0	92.4	82.0	1	6	33.0	25.3	94.0	78.0	4	101.8	0
30	29.9	25.1	89.8	78.6	2	8.8	31.7	24.0	92.0	75.0	5	51.4	0
31	30.3	25.0	89.6	78.1			33.0	24.7	87.0	63.0	2	14.3	0
32	28.1	26.7	89.8	77.2			33.1	24.6	93.0	79.0	3	171.6	0
33	20.9	32.5	92.7	75.1			32.7	24.7	93.0	75.0	4	75.2	0
34	21.5	32.3	89.4	72.9			33.3	24.2	88.0	63.0	0	0.0	0
35	29.4	26.6	92.0	75.2			35.0	24.5	88.0	57.0	0	0.0	0
36	35.2	26.5	91.9	69.2	2	19.2	37.0	24.5	84.0	46.0	0	0.0	0
37	33.9	24.8	99.6	86.4	3	62	37.3	23.3	82.0	48.0	0	0.0	0
38	30.8	24.9	99.7	81.8	1	12.6	35.6	24.3	88.0	58.0	2	16.6	0
39	34.3	25.8	99.2	69.7			35.1	20.7	80.0	58.0	0	0.0	0
40	27.0	28.6	97.4	80.2	4	43.4	37.1	20.1	78.0	47.0	0	0.0	0
41	20.2	33.3	94.4	75.3	1	40	37.2	19.1	76.0	38.0	0	0.0	0
42	18.6	33.9	99.5	67.4			36.2	19.5	84.0	36.0	0	0.0	0
43	18.6	34.8	100.0	66.4			34.6	16.9	80.0	38.0	1	16.2	0
44	17.8	32.0	96.2	67.2			26.9	15.6	91.0	51.0	1	17.8	0

 Table M 6: Meteorological data in Central zone during crop growth period of Kharif-2015

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Std.				AN	NAND					RA	HURI		
Week	Temp	oerature	Hun	nidity	No. of	Rainfall	Sunshine	Tempera	ature (C)	Humid	ity (%)	No. of	Rainfall
No.		(C)	(*	%)	Rainy	(mm)	hrs	_				Rainy	(mm)
	Max	Min.	RH1	RH2	days			Max.	Min.	RH1	RH2	days	
26	33.8	25.2	88.3	55.0	1.0	53.0	5.9	33.8	23.3	66.0	45.0	0	0.0
27	35.7	26.2	82.0	54.0	0.0	0.0	6.6	34.7	23.3	66.0	43.0	0	0.0
28	35.7	26.3	77.7	50.1	0.0	0.0	4.7	34.5	23.4	68.0	41.0	0	0.0
29	34.3	25.9	86.4	65.7	0.0	1.1	2.9	32.5	23.7	74.0	57.0	1	17.4
30	29.6	23.6	95.3	87.7	6.0	296.2	0.6	30.8	23.5	71.0	60.0	1	8.4
31	31.9	24.2	92.0	71.9	1.0	12.8	3.2	30.8	22.4	77.0	59.0	1	7.4
32	33.6	25.1	87.6	63.1	0.0	0.0	4.6	30.4	22.2	76.0	60.0	1	4.0
33	32.2	24.6	91.6	71.4	1.0	8.4	3.4	31.8	23.1	71.0	49.0	0	0.0
34	33.8	24.3	88.9	58.6	0.0	0.0	7.0	33.0	21.9	69.0	49.0	0	1.0
35	34.2	24.4	91.1	61.4	0.0	0.0	6.8	33.1	21.4	71.0	47.0	0	03.0
36	34.8	23.1	89.7	55.3	0.0	0.0	9.6	33.3	23.9	81.0	55.0	2	20.6
37	35.8	24.4	89.4	55.6	0.0	0.0	7.7	31.8	22.9	79.0	58.0	3	48.4
38	31.9	23.6	91.9	82.9	4.0	79.1	3.4	30.2	22.6	79.0	58.0	3	54.6
39	33.0	22.2	89.3	52.7	0.0	0.0	9.4	33.5	19.7	68.0	40.0	0	0.0
40	37.0	21.9	87.9	39.1	0.0	0.0	9.4	32.8	21.0	76.0	50.0	3	20.6
41	37.7	22.4	88.0	38.0	0.0	0.0	9.2	34.2	20.9	71.0	39.0	0	0.0
42	38.8	20.7	98.4	35.4	0.0	0.0	9.6	35.0	19.1	56.0	30.0	0	0.0
43	36.5	19.2	88.0	32.9	0.0	0.0	8.6	34.7	20.3	57.0	36.0	0	0.0
44	33.9	17.1	77.6	39.9	0.0	0.0	9.8	32.2	17.4	57.0	37.0	0	0.0

 Table M 7: Meteorological data in Central zone during crop growth period of Kharif-2015

Std.		8		JABAI	LPUR						RA	IPUR		
Week	Temp	erature	Humid	ity (%)	No. of	Rainfall	Sunshine	Temp	erature	Humid	ity (%)	No. of	Rainfall	Sunshine
NO.	(<u>(C)</u>			Rainy	(mm)	hrs	(C)			Rainy	(mm)	hrs
	Max.	Min.	RH1	RH2	days			Max.	Min.	RH1	RH2	days		
26	32.8	23.6	84.0	61.0	5	83.3	4.6	33.5	25.0	87.0	59.0	4	25.8	4.3
27	33.8	24.7	78.0	55.0	3	51.0	5.9	33.6	25.2	79.0	64.0	2	41.8	5.9
28	30.4	24.2	91.0	74.0	6	203.2	6.8	31.2	25.2	89.0	80.0	5	72.8	1.7
29	31.5	24.2	89.0	70.0	5	72.8	2.8	31.8	25.6	91.0	71.0	1	7.8	2.4
30	30.6	23.5	87.0	67.0	2	84.9	4.5	30.7	25.1	90.0	70.0	1	43.6	3.4
31	29.8	23.6	90.0	70.0	2	149.4	4.7	31.2	25.2	86.0	69.0	3	48.7	4.6
32	31.2	24.2	91.0	69.0	2	14.0	4.6	30.8	24.7	94.0	73.0	1	36.6	2.5
33	31.2	24.5	91.0	73.0	4	116.8	3.0	31.7	25.3	94.4	73.0	3	126.4	4.1
34	31.3	23.6	88.0	64.0	1	9.4	7.4	32.3	25.9	87.0	65.0	1	23.6	6.5
35	30.4	22.9	93.0	76.0	5	104.6	3.0	30.8	25.0	94.0	80.0	6	37.9	1.2
36	32.2	24.2	87.0	57.0	1	8.2	6.7	33.0	25.5	93.0	64.0	1	10.0	6.9
37	33.5	23.1	91.0	55.0	1	3.4	8.4	33.5	25.4	93.0	62.0	2	68.4	6.8
38	32.0	23.7	92.0	64.0	3	70.2	5.6	30.1	25.1	94.0	78.0	2	135.4	3.1
39	32.6	21.1	84.0	45.0	0	0.0	9.2	32.5	24.6	92.0	57.0	0	0.0	7.2
40	33.1	19.5	88.0	35.0	0	0.0	9.3	33.7	24.4	92.0	51.0	0	0.0	7.7
41	35.1	17.9	88.0	31.0	0	0.0	9.5	33.9	22.2	89.0	47.0	0	0.0	8.7
42	34.0	19.0	86.0	36.0	0	0.0	9.2	33.4	22.8	91.0	45.0	0	0.0	8.7
43	33.3	18.4	87.0	47.0	0	0.0	6.9	33.7	21.3	90.0	37.0	0	0.0	8.2
44	28.0	17.0	92.0	58.0	1	40.0	5.8	30.0	19.4	90.0	55.0	0	0.0	6.7

 Table M 8: Meteorological data in Central zone during crop growth period of Kharif-2015

Std. Week				KANPUR		
No.	Tempera	ature (C)	Humidit	y (%)	No. of Rainy	Rainfall
	Max.	Min.	RH1	RH2	days	(mm)
26	33.8	23.1	83.0	66.0	3	48.8
27	36.3	24.9	79.0	65.0	2	17.2
28	34.3	23.8	88.0	66.0	3	21.8
29	33.7	24.9	84.0	69.0	2	25.3
30	33.7	24.8	81.0	64.0	1	11.0
31	32.9	23.6	83.0	62.0	2	8.6
32	33.8	23.3	87.0	71.0	3	92.1
33	<u> </u>		89.0	72.0	2	11.1
34	34.1	22.9	85.0	64.0	1	12.0
35	35.2	24.1	82.0	61.0	0	0
36	37.0	22.9	70.0	44.0	0	0
37	35.4	22.0	85.0	64.0	2	49.1
38	34.5	22.9	88.0	68.0	2	49.9
39	34.7	19.5	85.0	51.0	0	0
40	35.8	18.1	88.0	50.0	0	0
41	35.3	17.8	78.0	52.0	0	0
42	34.7	18.3	86.0	53.0	0	0.6
43	31.2	14.2	81.0	56.0	2	17.2
44	30.2	12.6	94.0	53.0	0	1.5

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 Table M 9: Meteorological data in Central zone during crop growth period of Kharif-2015

AICRP on Forage Crops & Utilization

Std.				J	ORHAT						RANC	CHI	
Week	Temp	erature	Hun	nidity	No. of	Rainfall	Sunshine	Tempe	rature	Hum	idity	Rainfall	Sunshine
No.	(C)	(0	%)	Rainy	(mm)	hrs	()	<u>C)</u>	(%	(0)	(mm)	hrs
	Max	Min.	RH1	RH2	days			Max.	Min.	RH	RH		
	•									1	2		
26	34.0	25.5	92.0	72.0	4	144.3	2.6	30.1	19.8	83.7	65.6	32.3	4.3
27	34.4	26.0	91.0	70.0	5	79.2	1.8	31.3	19.3	82.4	64.7	27.2	3.8
28	33.6	26.0	93.0	78.0	5	33.1	1.9	29.8	20.3	82.7	61.7	62.8	4.3
29	32.3	24.5	95.0	78.0	7	230.7	2.4	27.2	20.4	83.7	58.1	63.1	3.1
30	34.8	25.2	83.0	62.0	2	4.3	3.1	30.0	21.1	83.0	61.3	14.4	4.6
31	31.9	25.1	94.0	79.0	5	141.0	1.7	27.2	20.2	84.1	64.1	232.7	4.3
32	34.0	24.6	95.0	77.0	6	100.7	2.0	32.6	22.8	83.0	61.3	0.0	7.5
33	31.0	25.0	94.0	78.0	4	18.1	2.5	30.3	20.7	82.0	59.0	12.1	6.1
34	31.7	25.1	95.0	82.0	7	23.4	1.1	30.5	21.7	82.9	60.3	10.6	6.8
35	29.6	24.5	94.0	89.0	7	117.1	1.0	30.5	21.1	82.9	68.9	38.3	6.5
36	32.7	25.1	91.0	78.0	4	57.0	1.1	33.8	21.6	83.1	53.4	0.0	9.2
37	33.3	25.4	90.0	73.0	2	1.2	1.0	33.6	21.9	82.1	65.0	1.0	7.1
38	32.0	24.2	97.0	81.0	7	103.0	1.4	30.2	22.4	83.4	68.7	26.9	4.4
39	33.9	23.9	89.0	72.0	0	0.0	0.6	31.4	20.7	82.3	62.4	0.0	8.4
40	31.8	23.5	92.0	85.0	2	27.2	1.0	30.0	20.9	83.1	61.0	37.1	8.3
41	30.2	20.7	88.0	69.0	2	11.0	1.2	30.0	21.1	82.1	58.9	12.5	8.9
42	31.2	20.5	93.0	70.0	1	8.6	0.6	28.7	19.5	81.6	71.4	0.0	9.2
43	29.8	17.9	94.0	67.0	1	0.0	1.1	28.2	15.3	84.1	65.4	0.0	9.0
44	27.4	18.7	94.0	74.0	2	6.9	0.8	26.9	17.1	82.6	62.3	65.5	5.1

 Table M 10: Meteorological data in North East zone during crop growth period of Kharif-2015

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Std.				IMP	HAL						FAIZA	ABAD		
Week	Temp	erature	Hum	idity	No. of	Rainfall	Sunshine	Tempe	erature	Humid	lity (%)	No. of	Rainfall	Sunshine
No.	(C)	(%	6)	Rainy	(mm)	hrs	((C)		• • •	Rainy	(mm)	hrs
	Max	Min.	RH1	RH2	days			Max.	Min.	RH1	RH2	days		
	•													
26	28.5	22.0	90.4	81.7	6	183.7	1.6	32.7	25.3	89.9	67.8	4	89.9	1.9
27	29.7	22.6	91.4	69.1	6	57.2	5.5	34.7	26.7	80.5	62.8	2	28.0	3.9
28	28.2	22.7	88.9	80.6	7	96.1	2.1	32.7	21.9	87.0	74.7	3	140.4	4.1
29	28.1	22.9	92.0	75.7	4	61.6	2.1	32.8	27.0	84.8	70.7	2	28.0	4.7
30	27.3	21.6	92.9	78.7	6	147.3	2.4	33.7	26.7	84.5	69.5	1	2.0	6.1
31	26.0	20.9	88.7	85.4	6	149.0	1.2	32.9	26.0	85.8	69.8	2	6.8	3.6
32	28.5	22.9	88.9	70.4	3	54.7	3.8	36.3	25.9	84.7	66.8	3	13.8	5.6
33	30.2	22.6	90.4	77.3	5	6.4	3.9	35.5	26.5	88.0	71.5	2	29.2	4.2
34	28.1	22.5	88.3	79.6	6	70.9	2.5	34.2	29.4	85.4	67.2	2	23.6	6.4
35	29.1	21.7	94.0	83.4	6	35.1	3.5	34.9	26.2	84.5	71.2	0	0.0	6.5
36	28.4	22.0	92.9	82.7	4	74.6	2.3	36.6	24.5	78.2	51.1	0	0.0	8.0
37	30.1	22.4	85.1	72.7	0	0.0	4.1	36.0	25.7	82.2	64.0	0	0.0	5.4
38	30.9	21.8	85.7	72.1	2	54.9	5.4	35.9	25.8	80.0	58.2	1	15.2	6.9
39	28.2	20.0	90.1	77.3	5	56.8	3.4	35.7	22.3	72.0	49.8	0	0.0	6.7
40	31.4	23.1	90.0	68.9	1	2.2	7.3	31.2	21.0	67.1	49.5	0	0.0	6.8
41	26.9	22.4	89.7	80.9	6	109.6	2.7	34.3	20.3	67.0	46.8	0	0.0	7.3
42	26.8	21.4	77.0	79.1	2	11.1	5.8	35.2	19.2	70.4	52.1	0	0.0	5.8
43	28.9	16.5	88.3	64.1	0	0.0	8.4	28.8	18.7	68.2	53.0	0	0.0	6.1
44	26.0	15.5	89.6	69.4	2	14.4	5.1	30.3	13.7	79.1	53.1	0	0.0	4.6

 Table M 11: Meteorological data in North East zone during crop growth period of Kharif-2015

Std.				K	ALYANI					E	BHUBA	NESWAR		
Week	Temp	erature	Hun	nidity	No. of	Rainfall	Sunshine	Тетре	erature	Hum	idity	No. of	Rainfall	Sunshine
No.	(C)	(1	%)	Rainy	(mm)	hrs	- - -	C)	(%	()	Rainy	(mm)	hrs
	Max	Min.	RH1	RH2	days			Max.	Min.	RH	RH	days		
										1	2			
26	30.2	25.4	99.0	96.9	7	169.0	1.8	35.4	25.9	89.0	65.0	2	3.2	5.4
27	34.1	26.0	97.7	88.9	6	59.4	2.8	35.7	25.9	85.0	60.0	2	4.1	5.1
28	32.9	26.4	97.7	89.6	6	164.3	3.2	34.0	25.0	91.0	71.0	5	49.3	4.3
29	32.1	25.8	97.6	84.9	7	69.3	1.8	33.2	24.4	94.0	77.0	5	60.2	2.3
30	30.7	25.6	98.6	88.3	7	103.4	2.2	30.9	24.5	95.0	81.0	5	106.9	0.7
31	31.2	25.4	98.3	86.4	7	164.5	3.8	32.6	24.7	90.0	66.0	3	41.4	2.4
32	35.0	27.2	91.1	66.6	2	0.3	6.8	34.2	25.6	89.0	78.0	2	41.2	8.4
33	33.3	36.4	93.4	77.9	4	11.1	2.7	32.1	24.9	94.0	84.0	4	36.8	3.8
34	34.0	26.7	95.4	74.1	3	40.4	4.2	33.3	24.8	91.0	73.0	4	124.0	4.3
35	32.5	25.3	97.4	81.6	5	36.4	2.0	32.0	25.3	94.0	81.0	3	54.4	4.1
36	35.4	26.1	95.7	62.4	2	45.1	7.5	33.4	24.2	91.0	69.0	4	58.5	3.4
37	33.7	26.9	94.7	73.4	1	10.6	4.4	32.8	24.8	92.0	83.0	4	59.7	4.5
38	32.6	26.0	97.4	84.0	6	89.4	3.5	32.3	25.5	94.0	78.0	3	23.9	4.4
39	34.6	25.6	95.4	61.3	1	10.0	7.5	33.7	25.5	89.0	67.0	1	9.4	5.7
40	35.0	26.0	93.4	64.1	2	32.9	7.3	33.9	24.7	92.0	75.0	3	35.8	6.4
41	33.0	24.7	97.0	66.9	1	7.0	5.7	32.7	22.9	92.0	64.0	3	36.4	5.8
42	33.4	23.8	94.1	65.1	2	2.2	7.6	32.9	23.9	93.0	68.0	1	3.3	7.1
43	33.3	21.4	92.4	53.4		0.0	9.0	33.6	22.8	96.0	58.0	0	0.0	7.5
44	31.4	21.4	94.0	63.6		0.0	5.1	30.2	22.0	90.0	68.0	2	7.5	5.1

Table M 12: Meteorological data in North East zone during crop growth period of Kharif-2015

Std.				HYDE	ERABAD					VELI	LAYAN	I	
Week	Temp	erature	Hun	nidity	No. of	Rainfall	Sunshine	Tempera	ature (C)	Hum	idity	No. of	Rainfall
No.	(C)	(9	%)	Rainy	(mm)	hrs	_		(%	(0)	Rainy	(mm)
	Max.	Min.	RH1	RH2	days			Max.	Min.	RH1	RH2	days	
26	33.2	24.2	77.7	50.9	1	3.0	1.5	30.5	24.0	92.0	86.6	6	161.6
27	34.4	24.1	74.3	46.4	0	0.0	8.7	31.6	25.3	90.1	79.6	1	5.0
28	34.8	24.4	79.0	51.9	1	16.2	6.4	31.9	25.2	88.1	80.9	1	10.2
29	32.2	23.4	57.3	56.9	1	5.4	6.4	30.6	23.8	90.1	81.1	2	35.1
30	33.2	23.4	56.3	45.9	1	3.6	6.4	31.3	24.1	87.9	76.9	1	3.2
31	32.8	23.0	80.1	47.7	2	8.0	6.3	31.3	24.5	87.6	78.1	-	2.3
32	31.4	23.8	87.1	66.0	2	10.8	3.9	31.8	24.7	90.0	76.1	-	4.4
33	30.4	22.4	89.7	69.0	4	30.0	3.7	32.4	24.5	87.9	73.4	2	57.6
34	31.5	22.7	90.6	64.6	2	49.4	6.6	31.8	24.7	91.3	76.7	2	15.9
35	30.1	22.1	83.3	66.7	2	28.6	3.9	31.9	24.7	89.9	81.1	-	-
36	33.4	22.9	88.4	59.1	3	29.4	7.2	31.5	24.2	91.7	84.3	5	101.2
37	28.4	21.9	96.0	86.0	3	65.2	1.7	31.2	24.0	93.4	86.4	4	67.3
38	30.4	22.2	90.0	61.0	3	71.6	3.6	31.0	24.6	93.1	81.9	4	66.0
39	31.9	22.3	89.0	58.0	0	0.0	7.5	31.8	24.5	88.9	83.0	2	55.3
40	31.4	21.1	96.0	55.0	2	36.6	5.8	31.2	23.9	91.9	79.0	6	34.8
41	33.4	19.6	88.0	37.0	0	0.0	7.9	31.3	23.8	92.6	80.6	5	149.1
42	32.8	19.1	92.0	42.0	0	0.0	8.4	31.4	24.4	91.1	78.9	2	20.7
43	32.4	18.1	89.0	44.0	0	0.0	8.9	31.2	24.2	93.3	82.4	4	50.9
44	31.3	20.7	92.0	51.0	1	18.3	7.3	31.1	23.5	92.7	83.1	7	204.1

 Table M 13: Meteorological data in South zone during crop growth period of Kharif-2015

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Std.	COIMBATORE								MANDYA							
Week	Temperature Humidity		nidity	No. of	Rainfall	Sunshine	Temperature		Humidity		No. of	Rainfall	Sunshine			
No.	(C)		()	%)	Rainy	(mm)	hrs	(((C)		6)	Rainy	(mm)	hrs		
	Max	Min.	RH1	RH2	days			Max.	Min.	RH1	RH2	days				
26	31.3	24.1	77.0	56.0	1	6.5	7.3	30.6	19.4	85.0	59.0	0	3.0	5.7		
27	33.1	22.4	84.0	46.0	0	0	9.9	31.5	18.9	83.0	56.0	0	0.0	7.2		
28	32.3	23.1	88.0	49.0	0	0	7.1	31.6	20.0	81.0	52.0	0	0.0	3.3		
29	30.9	23.1	84.0	59.0	1	4.2	3.3	29.6	19.1	80.0	53.0	0	1.2	3.4		
30	31.9	22.9	86.0	46.0	0	0.9	6.8	30.1	19.3	85.0	55.0	0	0.0	3.7		
31	32.4	22.5	89.0	51.0	0	0	6.9	30.9	19.3	84.0	56.0	1	11.5	5.3		
32	32.3	24.1	76.0	50.0	0	0.4	9.1	30.1	19.3	76.0	58.0	0	1.4	3.4		
33	32.1	23.6	91.0	58.0	2	25.7	5.9	30.3	19.3	90.0	65.0	0	0.0	8.1		
34	32.2	22.9	91.0	53.0	0	2.0	6.8	19.6	30.3	86.0	67.0	2	15.7	4.2		
35	33.1	22.7	85.0	44.0	0	0.2	9.3	29.8	18.1	89.0	58.0	0	0.0	5.7		
36	32.7	23.9	88.0	50.0	0	2.0	4.9	29.2	18.5	92.0	54.0	2	19.4	5.1		
37	32.5	24.4	72.0	41.0	0	0	8.8	29.9	18.2	93.0	68.0	1	2.6	6.1		
38	33.0	23.9	80.0	47.0	0	0	7.2	29.5	18.1	92.0	55.0	0	0.0	5.4		
39	33.6	23.1	91.0	49.0	4	64.0	8.2	30.0	19.3	91.0	61.0	3	60.6	5.4		
40	31.1	23.1	90.0	57.0	1	12.6	5.8	29.3	20.1	89.0	60.0	1	21.0	2.4		
41	31.2	23.2	85.0	55.0	1	26.4	8.8	29.2	18.8	91.0	57.0	1	13.6	6.2		
42	32.3	23.6	87.0	50.0	0	0.0	8.8	29.6	18.6	91.0	58.0	0	0.0	7.5		
43	31.5	23.3	90.0	48.0	0	1.2	5.7	29.6	19.2	90.0	62.0	0	0.0	6.4		
44	31.3	22.8	94.0	59.0	3	123.6	6.3	29.3	19.1	88.0	58.0	4	60.2	4.3		

Table M 14: Meteorological data in South Zone during crop growth period of Kharif-2015

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Std. Week	DHARWAD										
No.	Tempe	rature (C)	Humi	dity (%)	No. of Rainy	Rainfall					
-	Max.	Min.	RH1	RH2	days	(mm)					
26	28.0	21.5	87.0	78.0	3	22.2					
27	29.2	20.9	86.0	70.0	1	12.6					
28	29.6	22.2	86.0	70.0	2	7.6					
29	28.8	21.3	87.0	72.0	0	4.8					
30	27.7	20.7	90.0	77.0	1	8.6					
31	28.4	20.4	86.0	78.0	2	9.8					
32	27.7	20.8	91.0	79.0	0	4.2					
33	29.0	20.7	85.0	71.0	0	2.8					
34	29.9	20.6	85.0	69.0	2	6.2					
35	20.1	14.7	65.0	59.0	2	14.0					
36	30.1	20.4	95.0	62.0	3	17.8					
37	28.4	21.7	95.0	75.0	2	4.2					
38	28.8	20.6	94.0	65.0	0	0.0					
39	32.4	20.9	89.0	51.0	0	0.2					
40	29.7	20.5	95.0	68.0	4	165.8					
41	30.2	20.5	89.0	56.0	2	11.6					
42	32.4	19.3	71.0	35.0	0	0.0					
43	32.2	17.9	61.0	32.0	0	0.0					
44	30.9	19.6	90.0	65.0	3	7.6					

 Table M 15: Meteorological data in South Zone during crop growth period of Kharif-2015

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APPENDIX-IV: FORAGE CROPS BREEDING TRIALS AT A GLANCE: (KHARIF-2015)

Kharif-2015		Tr1	Tr2	Tr3	Tr4	Tr5	Tr6	Tr7	Tr8	Tr9	Tr10	*Tr11	*Tr12	Tr13	Tr14	Tr15	Tr16	Tr17	*Tr18	Total
Zone	Location	IVTM	AVTM-1	IVTPM	AVTPM-2	AVTPM-2 (Seed)	IVTC	AVTC-2	AVTC-2 (Seed)	IVT Rice bean	VT Cen. Cilaris- 2015 (1⁵t Year)	VT Cen. Setigerus 1 st Year	VTBN- 2015 (1 st Year)	VTBN- 2013 3 rd Year	VT Sehima- 2013 3 rd Year	VT Dichan. 2013 3 rd Year	VT Cen. Ciliaris 2013 (3 rd Year)	VT Clitoria- 2013 (3 rd Year)	VT Seteria 2015 (1 st Year)	
1 (HZ)	Palampur	DR	DR				TF						Α	DR					Α	3/4
2	Srinagar	DR	DR				DR													3/3
3	Almora		DR				DR						A						A	2/2
4	Bajaura (Kullu)																		A	
5	Mukteshwar																		Α	
6 (NWZ)	Bikaner			DR	DR	DR	DR				A	A	А	DR	TF	DR	DR	DR		8/9
7	Jalore	DR	DR	DR	DR		DR				A	A								5/5
8	Hisar	DR	DR	DR	DR	DR	DR				A		A	DR	TF	DNR	DNR	DR		8/11
9	Ludhiana	DR	DR	DR	DR	DR	DR				A		A	DR	TF	DR	DR	DR		10/11
10	Pantnagar	DR	DR				DR													3/3
11	Udipur	DR	DR				DR													3/3
12	Meerut			DR			DR													2/2
13	Avikanagar										A	A								
14	Jodhpur										A	A								
15	Pali											A								
16 (NEZ)	Jorhat	DR	DR				DR	DR	DR	DR			A	DR					A	7/7
17	Kalyani						DR	DR	DR	DR										4/4
18	Bhubaneswar	DR	DR	DR			DR	DR	DR	DR			A		TF	DNR				7/9
19	Ranchi	DR	DR	DR			DR	DR	DR	DR			A		TF	DNR				7/9
20	Pusa			DR						DR										2/2
21	Faizabad	DR	DR	DR			DR	DR	DR											6/6
22	CAU Imphal	DR					DR			DR										3/3
23	Shillong									DNR										0/1
24 (CZ)	Jhansi	DR		DR			DR				A	A	A	DR	DR	DR	DR	DR		8/8
25	Rahuri	DR		DR			DR				A	A	Α	DR	DR	DR	DR	DR		8/8
26	Urulikanchan	DR		DR			DR				A		A	DR	TF	DR	DR	DR		7/8
27	Kanpur						DR													1/1
28	Anand	DR		DR			DR				A	A	A	DR	TF	DR	DR	DR		7/8
29	Jabalpur	DR		DR						DR	A		A	DR	TF	DR	DR	DR		7/8
30	Raipur	DR					DR						A							2/2
31	Palghar									DR			A	DR						2/2
32	Dhari			DR								A								1/1
33 (SZ)	Hyderabad	DR		DR	DR	DR	DR				A	A	Α		TF	DNR	DNR			5/8
34	Mandya	DR		DR	DR	DR	DR				A	А	А	DR	TF	DNR	DNR			6/9
35	Coimbatore	DR		DR	DR	DR	DR				A	A	A	DR	TF	DR	DR			8/9
36	Dharwad						DR				A		A	DR	TF	DNR				2/4
37	Vellayani						DR			DR			A							2/2
38	Raichur			DR			DNR													1/2
39	Karaikkal	DR			DR		DR					A								3/3
Total Locat	ion	22/22	12/12	19/19	8/8	6/6	27/29	5/5	5/5	9/10	15	13	20	14/14	2/14	8/14	8/11	8/8	5	153/177

DR=Data Reported, DNR=Data not reported, TF-Trial Failed, A=Trial Allotted, Data Report (%) =86.4 Note: 1st year trial of perennial crop is an establishment year not counted in total of trials conducted and data reported

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APPENDIX V: FORAGE CROP PRODUCTION TRIALS AT A GLANCE: (KHARIF-2015)

Location/ Trial	PS-14- AST-1	PS-14- AST-3	K-12- AST-4	K-14- AST-13	K-12- AST-5	K-14-AST-3 (NT)	PS-12- AST-1	PS-12-AST- 3	CS-13- AST-4	K-15- AST-13	K-15- AST-	K-15- AST-1 L	K-15-AST-2 L	K-15- AST-3 L	K-15- AST-6 L	K-14- AST-1	K-14- AST-2	Total (DR&TC)/
										C	8C							Allotted
HILL ZONE																		
Palampur										DR								1/1
Srinagar			TNC		TNC													0/2
				-				NOR	TH WEST	ZONE								
Hisar																DR		1/1
Ludhiana	DR								DR	DR						DR		4/4
Bikaner	DR										DR					DR		3/3
Pantnagar																		-
Barelli																		-
Fatehpur											TF							0/1
Bhilwara											TF							0/1
NORTH EAST ZONE																		
Faizabad													DR				DR	2/2
Ranchi						TC											DR	2/2
Kalyani							DR										DR	2/2
Bhubaneswar							DR										DR	2/2
Jorhat				DR			DR										DR	3/3
Imphal														DR				1/1
Shillong																		
								CE	NTRAL ZO	DNE								-
Jabalpur							DR											1/1
Rahuri															TC			1/1
Urulikanchan																		
Anand																		
Raipur	DR					TC												2/2
								S	OUTH ZO	NE								-
Hyderabad																DR		1/1
Mandya		DR						DR				TC				DR		4/4
Coimbatore																DR		1/1
Vellayani																		
Dharwad		DR																1/1
Raichur																		
Total (DR & TC)/ Allotted	3/3	2/2	0/1	1/1	0/1	2/2	4/4	1/1	1/1	2/2	1/3	1/1	1/1	1/1	1/1	6/6	5/5	32/36

Abbreviations: DR = Data reported, TC = Trial continued and data to be reported after completion of the sequence, TNC = Trial not conducted, TF = Trial failed, Success index (%) = 32/36 * 100 = 88.9%

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APPENDIX-VI: FORAGE CROP PROTECTION TRIAL AT A GLANCE (KHARIF-2015)

Locations /Trial	PPT-1	PPT-2	PPT-15	PPT-16	PPT-17	PPT-18	PPT-19	Total	Success index (%)
Hyderabad	A (DR)	A (DR)					A (DR)	3/3	100 (%)
Palampur	A (DR)	A (DR)	A (DR)			A (DR)		4/4	100 (%)
Rahuri	A (DR)	A (DR)		A (DR)	A (DR)			4/4	100 (%)
Ludhiana	A (DR)	A (DR)	A (DR)			A (DR)		4/4	100 (%)
Dharwad	A (DR)	A (DR)			A (DR)			3/3	100 (%)

Abbreviations A=Trial Allotted, DR=Trial Conducted and Data reported

Note: Trials allotted to OUAT, Bhubaneswar centre could not be conducted as post was vacant

Trials allotted to IGFRI, Jhansi centre could not be conducted as post was vacant

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APPENDIX VII: DIRECTORY OF SCIENTIFIC STAFF: AICRP ON FORAGE CROPS & UTILIZATION CENTERS

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